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Achieving USS1 Tn by 2040



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Achieving US \$1 Tn by 2040!

The Indian Chemical industry has immense growth potential due to a large consumer base, increasing urbanization, rising disposable incomes and government initiatives to support manufacturing activities. The industry is also known for its cost competitiveness which is primarily driven by skilled workforce, availability of raw materials and lower labour costs compared to developed nations. This provides a competitive advantage in global markets for Chemical manufacturing in India.

The Indian Chemical industry is contributing to India's GDP as well as Gross Value Addition (GVA) in manufacturing. The Indian Chemical industry stands 6th globally in terms of sales values and the market size was around US\$ 212 billion in 2022 and the sector is expected to grow at 9.3 per cent. In agrochemicals, India is the 4th largest producer and 2nd largest exporter globally. Similarly, in dye-stuffs, India is the 2nd largest producer and exporter globally. The Indian Chemical sector contributes 9.40 per cent of manufacturing GVA and 1.69 per cent of national GVA. The sector employs around 4 million people directly and indirectly.

In India, people's aspirations are growing and the purchasing power has increased. As a result, the demand in the Chemical sector is increasing. The overall Indian economy is expected to touch US\$ 40 trillion by 2047 and estimates suggest that the Chemical sector may touch US\$ 2 trillion if it grows at 9.3 per cent (according to India's Parliamentary Standing Committee Report on Chemicals). If we consider a conservative growth of 6 per cent, then the Chemical sector will be about US \$1 trillion which will be 2-3 per cent of the total global Chemical market size.

The Indian Chemical industry produces a wide range of products and companies are increasingly exporting their products to the global market. Competitive pricing, quality products and adherence to international standards have helped Indian Chemical manufacturers to penetrate global markets effectively. India is the net importer of Chemicals and the trade deficit stood at Rs. 1.75 lakh crore in FY 2020-21. The main reason for net imports is non-availability of feedstocks and mining agents.

There is a growing demand for Specialty Chemicals in India's domestic market, driven by the country's expanding manufacturing and construction sectors. Many Indian Chemical companies are shifting their focus from commodity chemicals to specialty chemicals to take advantage of this trend. Even Indian Chemical companies are coming out with new molecules of their own or in partnership with global majors to meet sustainability targets.

While expanding their manufacturing base, the industry has also been investing significantly in R&D activities to develop innovative and sustainable products. The growth is also supported by digital technologies, such as automation, AI and IoT, which are transforming the Chemical industry by optimizing operational processes, reducing costs and increasing productivity.

Notably, Indian manufacturers are increasingly adopting sustainable and eco-friendly practices in production and processing. This has led to a surge in demand for green and sustainable chemicals, such as bio-based chemicals and biodegradable plastics.

The Government of India is proactively taking steps to support the growth of the Chemical industry through favourable policies, incentives and regulations. Overall, the Indian Chemical industry is undergoing rapid changes, as companies adapt to meet evolving market demands and embrace new technologies. As the industry becomes more specialized, innovative and sustainable, it offers opportunities for growth and investment.

The Compendium provides an in-depth analysis of the sector by featuring perspectives and interviews from leaders in the government, industry, academia, associations and R&D organizations. CIO 2024 has sections on Chemicals, EV & Battery, Supply Chain, Digitalization, Sustainability, Petrochemicals and Energy.

Looking forward to your valuable feedback!

Happy Reading!

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MESSAGE

I am delighted to know that Indian Chemical News (<u>www.indianchemicalnews.com</u>) is publishing the 4th edition of its compendium titled 'Chemical Industry Outlook 2024' in May 2024.

The theme of the Compendium is 'Achieving US \$1 Tn by 2040'. The Compendium, a Collector's Issue, focuses on ways and means of achieving this goal through interviews/opinion of the Captains/Thought Leaders of the industry.

Indian alkali industry has witnessed the compounded annual growth of 7% for Caustic and 3% for Soda Ash for the last 5 years. The Caustic Soda capacity in the country is expected to increase from approx. 56 lacs tons per annum to 77 lacs ton per annum by 2029. The Soda Ash capacity is expected to grow to 57 lacs ton per annum from 44 lacs tons in the similar period of 5 years.

The future of India's alkali market looks highly promising, with robust growth projections. As the demand for alkali products continues to rise across various industries, the potential for this market continues to expand.

Indian Chemical News (ICN) is a credible information platform for Chemicals, Petrochemicals and Energy sectors and trying to contribute to the growth of these sectors by creating awareness about the latest development/trends of these sectors.

I am sure that the Compendium discusses and highlights all contemporary issues and offer a growth chart for the development of the Indian chemicals and petrochemicals sectors.

I extend my best wishes and success to the 'Chemical Industry Outlook 2024'.

Cylin

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MESSAGE

Over the years Indian Chemical News (<u>www.indianchemicalnews.com</u>) is collating and publishing its compendium titled 'Chemical Industry Outlook'. I am pleased to learn that the 4th edition is underway to be brought out in May 2024.

The theme of the Compendium is 'Achieving US \$1 Tn by 2040' where agriculture has a vital role to play with 14.5cr farmers and their families making untiring effort to make India self-sufficient and sustainable.

Agrochemicals, a Champion sector, is a trade surplus industry by Rs 29520cr. where exports at Rs 44,380cr. to over 150 countries are higher than domestic consumption. However inspite of govt policy to Make in India towards Atmanirbhar Bharat, increase in imports at Rs 14760cr is a cause of concern when we have the capacity and capability to manufacture indigenously. Increase in custom duty of ready to use finished formulations is the only logical step contemplated by the Govt to curtail unnecessary imports and save valuable foreign exchange

Though India ranks 2nd in the World agricultural production, the country is the 4th largest manufacture of agrochemicals after USA, China and Japan. With the emergence of the newer pest & diseases, India remains one of the lowest in terms of per capita consumption of pesticides at 380g/ Ha with potential for significant growth on all crops of economic importance

Globally, as in our case, generic pesticides dominate the market with tried and tested molecules. Another aspect worth appreciating is the cost of indigenous manufacturing which is 30-65% lower than imported formulations

I am sure that the Compendium would discuss and flag all issues plaguing these sectors and offer implementable solutions.

I extend my best wishes and success to the 'Chemical Industry Outlook 2024'.

Harish Mehta/ Senior advisor



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The macro environment for the agrochemicals industry will always remain positive and will be driven by strong fundamental growth, rising domestic demand, improved export opportunities due to the tight supply from China, strategic partnerships with global counterparts, robust product launches, tie-ups with innovators for new products and substantial prospects to explore products going off – patent.

India's agrochemical consumption is one of the lowest in the world with per hectare consumption being just 0.6 kgs as compared to the United States (5-7 kgs/hectare) and Japan (11-12 kgs/hectare). With the increase in awareness and market penetration, consumption is likely to improve in the near future.

Indian Chemical News (ICN) is a credible information platform for Chemicals, Petrochemicals and Energy sectors and trying to contribute to the growth of these sectors by creating awareness about the latest development/trends of these sectors.

I am sure that the Compendium discusses and highlights all contemporary issues and offer a growth chart for the development of the Indian chemicals and petrochemicals sectors.

I extend my best wishes and success to the 'Chemical Industry Outlook 2024'.

With Best Regards, Agro Chem Federation of India Dr. Kalyan Goswaho Director General +919871960014 Kalyan goswami@acfiindia.com



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According to reports, the global agrochemical market size is estimated to grow from US \$243.55 billion in 2023 to US \$296.32 billion by 2028, at a CAGR of 4%. It is estimated that annual crop losses could double without the use of crop protection products. Food crops must compete with 30,000 species of weeds, 3,000 species of nematodes and 10,000 species of plant-eating insects. Agrochemicals are the last and one of the key inputs in agriculture for crop protection and better yield.

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I extend my best wishes and success to the 'Chemical Industry Outlook 2024'.

Yours sincerely,

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Durgesh C Sharma Secretary General CropLife India



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There's a great opportunity for India to beef up its capacities for the technical side of agrochemicals sector. India's domestic agrochemical market is around \$2.8 billion and uses around 62,000 MT (75% insecticides and fungicides, 15% bio pesticides). More and more businesses are going into technical and contract manufacturing as more multinationals look toward India. Another, opportunity are in generics. Products worth \$4.2 billion are expected to go off patent and that will present opportunity for manufacturing more than two dozens of active ingredients as generic molecules.

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I extend my best wishes and success to the 'Chemical Industry Outlook 2024'.

Pradip Dave President, PMFAI & Chairman, Aimco Pesticides Ltd.

BEIL GROUP – TIMELINE

The timeline is of Major Projects that are undertaken by the Group.



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Today, India ranks 6th in the world and 3rd in Asia as a chemical producer, out of which Gujarat contributes more than 30% of the chemical's production and exports.

Gujarat's chemical industry contributes 62% of petrochemical production, 53% of chemical production, and 45% of pharmaceutical production. It is also positioned as the 'Petrochemical and Chemical Capital of India and has a marginal role in the growing economy of India.

Currently, Gujarat has over 11,000 chemical units, which can produce 3-4 million tonnes of chemicals and satiate the high export demand.

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I extend my best wishes and success to the 'Chemical Industry Outlook 2024'.

Dr. Jaimin Vasa President Gujarat Chemical Association



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MESSAGE

I extend my hearty congratulations on the release of the 4th issue of Indian Chemical News' compendium titled 'Chemical Industry Outlook 2024'.

The theme of the Compendium 'Achieving US \$1 Tn by 2040'is ambitious and reflects the significant potential and growth opportunities within the Indian chemical and energy sectors. This goal signifies a collective vision to propel these industries forward, driving economic growth and contributing to India's overall development. The Compendium, a Collector's Issue, is indeed a significant step forward in sharing knowledge and fostering collaboration within the energy industry.

India is emerging as an epicenter of the global energy landscape. The energy sector represents one of the most critical components of India's growth. India is currently the world's 3rd largest consumer of oil, 3rd largest LPG consumer, 4th largest LNG importer, 4th largest refiner, 4th largest automobile market. Further, India is likely to account for 25% of global energy demand growth over the next two decades. With the energy sector's dedicated focus towards investment in clean energy technologies viz; green hydrogen, renewables, biofuels, decarbonization through CCUS, etc., there is renewed optimism that exists within the Indian oil & gas industry.

India, too, has committed to a net-zero emissions target by 2070 which reflects a commendable dedication to sustainability and environmental responsibility. It is encouraging to note that the energy companies in India are aligning their strategies with clean energy technologies and emphasizing accessibility, availability, and affordability alongside sustainability goals.

The emphasis on finding a balance between energy security, affordability & sustainability is crucial and it is heartening to see the industry's proactive approach to addressing these challenges. With such positive energy sentiment, it gives India a unique opportunity to lead efforts on running the path of energy transition, and at the same time keep climate goals in tandem with the net-zero objective.

Indian Chemical News's role as a credible information platform for Chemicals, Petrochemicals and Energy sectors is invaluable. By creating awareness about the latest developments and trends in these sectors ICN contributes significantly to the growth & development of these industries. I commend the entire team for their dedication and efforts in developing this edition and look forward to seeing more such editions in the future. I believe that a common platform like this will not only put forward many industry interactions and deliberations on important issues pertaining to the energy sector, but also act as an important resource for all the stakeholders in the Indian energy sector.

I extend my best wishes to the entire team for their continued efforts in publishing future editions of the Chemical Industry Outlook.

smeet Ac Gurmeet Singh

Director General

Federation of Indian Petroleum Industry

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India plans to achieve 5 million metric tons (MMT) per annum of green hydrogen production capacity by 2030 and expects capacity to eventually reach 10 MMT per annum, depending on the growth of the export market. The mission is expected to attract around Rs. 8 lakh crore of investment, create 600,000 jobs, reduce 50 MMT of CO2 emissions, and bring huge savings on fuel imports. Currently, India spends around US\$ 160 billion on energy imports.

An addition of around 125 GW (gigawatts) of associated RE capacity for green hydrogen production is expected under the mission. Electrolyzer capacity of 15 GW is required to meet the production target by 2030, but the government expects 60 GW of capacity could be added with industry leadership.

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(Dr. R. K. Malhotra) President Hydrogen Association of India (Regd. Under Society Act)

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Chemicals

Catalyzing India's Growth Story



EYEING GLOBAL DOMINANCE

The Indian chemical industry remains steadfast on its mission to achieve the target of US\$ 300 billion by 2025, driven by consumer demands, technological advancements and government support **TEAM ICN**

ueled by consistent revenue growth and high margins, the chemical industry in India is poised for exceptional growth and transformation. Estimated to be worth US\$ 220 billion in 2022, the sector is anticipated to grow to US\$ 300 billion by 2025 and US\$ 1 trillion by 2040.

The growth will be driven by various factors including domestic demand predicted to increase by 20%, and slated to reach between US\$ 850 billion

to US\$ 1,000 billion by 2040. ADITYA BIRLA Contributing around 7% of the GDP, the Indian chemical industry is ranked sixth in the world and third in Asia. Offering more than 80,000 commercial products, the industry is extremely diversified and can

be broadly classified into bulk chemicals, chemicals. agrochemicals. specialty petrochemicals, polymers and fertilizers.

India is expected to account for more than 10% of the world's growth in petrochemicals. Being the fourth-largest producer of agrochemical after the United States, Japan and China, India's agrochemical export touched US\$ 5.4 billion in FY 2022-23, positioning the country as the second highest exporter in the world. It is projected to grow at 8-10% CAGR till 2025. Indian colourants industry has emerged as a key player with a global market share of $\sim 15\%$. A world leader in generics, biosimilars and vaccines, India is contributing more than 50% of the global vaccine supply. Accounting for 16-18% of the world's production of dyestuff and dye intermediates, India's exports in the segment totaled US\$ 1.69 billion during April to December 2023.

The Indian chemical industry is expected to further grow with a CAGR of 11-12% by 2027, increasing India's share in the global specialty chemicals market to 4% from 3%. With sspecialty chemicals accounting for more than 50% of total chemical exports from India, Indian specialty chemicals companies are expanding their capacities

to cater to rising demand from domestic and overseas.

In terms of challenges, the industry has been dealing with inadequate infrastructure facilities, high costs of basic raw materials and feedstocks, high cost of capital, supply chain issues and

need for technological modernization of its facilities.

Advantage India

India is pitted to be the biggest beneficiary of China+1 Strategy that seeks to develop an alternate manufacturing hub in the backdrop of global companies seeking to de-risk their supply chains dependent on China. In the midst of changing geopolitics, trade war, increasingly stringent environmental norms, and increasing compliance and labour costs for manufacturers in China, the Indian chemical industry is in massive tailwind for unprecedented growth in the coming years. The country has an extra edge over its competitors in various aspects, which include material costs,

cheap labour, and the domestic availability of petrochemicals. In addition, the country also has highly skilled leaders who can strategically overcome challenges and take advantage of new opportunities. Presently, the Indian chemical industry employs over 2 million people.

Trends shaping the sector

One of the defining trends in the Indian chemical industry is the increasing focus on specialty chemicals. With rising disposable incomes and changing consumer preferences, there is a growing demand for high-value specialty chemicals across various end-user industries such as pharmaceuticals, automotive, personal care, and agrochemicals. This presents a lucrative opportunity for chemical manufacturers to innovate and develop specialized products tailored to specific market needs.

Environmental sustainability is another crucial aspect shaping the future of the chemical industry in India. Investing in green technologies and sustainable practices not only aligns with regulatory requirements but also enhances brand reputation and fosters long-term growth prospects. As a major supplier of generic drugs, agrochemicals, and other chemical products, India holds a competitive edge in terms of cost-effective manufacturing and skilled workforce. Leveraging this advantage, Indian chemical companies are expanding their footprint in international markets through strategic partnerships,



Creating Bonds that touch **Millions of Lives**



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acquisitions, and exports, thereby tapping into new revenue streams and diversifying their global presence. Furthermore, the adoption of digitalization and Industry 4.0 technologies is poised to revolutionize the Indian chemical industry, driving efficiency, productivity, and innovation across the value chain. From smart manufacturing processes to predictive analytics and supply chain optimization, digital transformation presents immense opportunities for chemical companies to stay ahead of the curve and maintain a competitive edge in the market.

Policy push

The sector will be integral to government's aspiration of developing an 'Aatmanirbhar Bharat' as well as growth aspirations of making India a US\$ 30 trillion economy by 2047. The Indian government has been implementing policies to promote domestic manufacturing and reduce dependency on imports. 'Make in India' initiative and other policy reforms are expected to drive investment and expansion in the chemical sector. Initiatives such as

the National Chemical Policy, PCPIR, focus on hydrogen fuel etc. provide a conducive environment for industry players to enhance their production capacities, improve infrastructure, bolster competitiveness and on both domestic and global fronts. Continued investments infrastructure, including in petrochemical complexes and chemical parks, aim to enhance the industry's manufacturing capabilities and efficiency.

Under the Interim Union Budget 2024-25 the government allocated Rs. 192.21 crore (US\$ 23.13 million) to the Department of Chemicals and Petrochemicals which intends to bring Production Linked Incentive (PLI) in the



chemical & petrochemical sector and will redraft the Petroleum, Chemicals and Petrochemicals Investment Region (PCPIR) guidelines. Under the policy of the PCPIR, India aims to attract an investment of US\$ 284 billion (Rs. 20 lakh crore) by 2035. This policy is designed in a cluster strategic way to boost the chemical sector on a large scale.

Outlook

The chemical industry in India is aspiring for the global dominance. With a steady

Key highlights

- FDI inflows in the chemicals sector (other than fertilizers) reached US\$ 22.07 billion during April 2000-December 2023
- An investment of Rs 8 lakh crore (US\$ 107.38 billion) is estimated in the Indian chemicals and petrochemicals sector by 2025
- During April to December 2023, exports of organic chemicals stood at US\$ 5.49 billion & inorganic stood at US\$ 1.50 billion
- Imports of organic chemicals were US\$ 11.21 billion and inorganic chemicals US\$ 5.01 billion from April to December 2023
- The Dahej PCPIR project in Bharuch, has attracted an investment of Rs. 1 lakh crore (US\$ 12 billion) and is expected to generate 32,000 jobs

growth rate in its favour, the emergence of India as a global chemical manufacturing hub isn't a far off possibility. Growing local demand for chemicals and focus on exports is backed by technological advancements, and strategic initiatives aimed at fostering innovation and sustainability. Of late, India has been increasingly focusing on the production of specialty chemicals due to higher margins and growing demand, and this trend is likely to continue as companies invest in research and development and explore niche markets.

With environmental concerns and becoming increasingly regulations important, companies are expected to invest in sustainable practices and technologies to meet consumer demands for eco-friendly products. Expanding their presence in global markets through partnerships, acquisitions, and exports, companies aim to tap into international markets and diversify their revenue streams. Adoption of digital technologies and automation is likely to accelerate in the Indian chemical industry, leading to improved efficiency, productivity, and quality. By embracing these trends and capitalizing on emerging opportunities, chemical companies can navigate the evolving landscape successfully and emerge as key contributors to India's economic growth and industrial development.



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ENHANCING COMPETENCE: TRAINING & CAPACITY BUILDING IN INDIAN CHEMICAL INDUSTRY

Capacity building initiatives by R&D institutions play a vital role in driving innovation, competitiveness and sustainability within the global chemical industry



he Indian chemical industry stands as one of the country's oldest and most significant sectors, playing a crucial role in various domains such as agriculture, pharmaceuticals, textiles, and manufacturing. Chemicals, petrochemicals and energy sectors are going to play a significant role in realizing the national target of a US\$ 30 trillion economy by 2047. The chemical industry is expected to contribute about 3% to this target. With its vast potential for growth and innovation, the industry continually seeks to bolster its workforce's skills and competencies through robust training and capacity-building initiatives. This article delves into the importance of challenges and strategies for training and capacity building in the Indian chemical industry.

In a globalized market, where competition is fierce, investing in training

and capacity building is essential for Indian chemical companies to stay competitive. Well-trained employees contribute to higher productivity, quality output, and innovation, enabling companies to maintain their edge in the market. The areas which need to be focused on are compliance, safety, technological advancements, talent retention and motivation.

The chemical industry operates within a stringent regulatory framework due to safety and environmental concerns. Proper training ensures that employees

Leveraging technologyenabled learning solutions can enhance accessibility, flexibility and scalability of training initiatives understand and adhere to safety protocols, minimizing the risk of accidents and ensuring compliance with regulations. The chemical industry is witnessing rapid technological advancements, including automation, digitalization and data analytics.

Training programs help employees adapt to these changes, empowering them to leverage new technologies for improved efficiency and effectiveness. Offering training and development opportunities demonstrates a company's commitment to its employees' growth and career advancement. This, in turn, fosters loyalty, enhances job satisfaction and reduces turnover rates, thereby retaining top talent within the organization.

Challenges faced in training and capacity building

Challenges faced in training and capacity building are basically skill gap, cost constraints, infrastructure and resistance to change. The Indian chemical industry faces a significant skill gap, with a shortage of qualified professionals in various domains such as chemical engineering, process optimization and regulatory compliance. Bridging this gap requires targeted training programs tailored to industry-specific needs. Implementing comprehensive training programs can be costly, especially for small and mediumsized enterprises (SMEs) operating on tight budgets. Finding cost-effective solutions without compromising on quality



and effectiveness poses a challenge for many companies.

Inadequate training infrastructure, including facilities, equipment and qualified trainers, hampers the delivery of effective training programs, particularly in remote or underdeveloped areas. Investing in infrastructure development is crucial to address this challenge. Employees may resist training initiatives due to fear of change, reluctance to learn new skills, or skepticism about the benefits of training. Overcoming this resistance requires communication. effective employee engagement and demonstrating the tangible value of training.

Strategies for training and capacity building

Conducting a thorough needs assessment to identify skill gaps and training requirements is the first step towards designing effective training programs. This involves consulting with industry experts, analyzing performance metrics and gathering feedback from employees. Developing customized training programs tailored to the specific needs and job roles within the chemical industry



ensures relevance and effectiveness. These programs may include technical skills training, safety training, leadership development and soft skills enhancement.

Leveraging technology-enabled learning solutions such as e-learning platforms, virtual reality simulations and mobile-based training apps can enhance accessibility, flexibility and scalability of training initiatives, overcoming geographical barriers and minimizing costs.

Establishing partnerships between industry players and academic institutions facilitates knowledge exchange, curriculum development and hands-on training opportunities for students, bridging the gap between academic learning and industry requirements. Incorporating on-the-job training, apprenticeships and mentorship programs provides practical experience and real-world exposure to employees, accelerating their learning curve and fostering skill development in a workplace setting.

Cultivating a culture of continuous learning and professional development within the organization encourages employees to seek learning opportunities proactively, whether through formal training programs, self-study, or peer learning forums. Regular evaluation of training programs and solicitation of feedback from participants are essential for gauging effectiveness, identifying areas for improvement and making necessary adjustments to enhance the impact of future training initiatives.

Capacity building initiatives by R&D institutions

Capacity-building initiatives by Research and Development institutions play a crucial role in shaping the trajectory of the global chemical industry. These initiatives encompass a wide range of activities aimed at enhancing the capabilities, skills, and resources of professionals and organizations operating within the sector. The key capacity-building initiatives undertaken by R&D institutions in the global chemical industry cover areas as research collaboration technology transfer and licensing, training and workshops, incubation, start-up support, education and training programs, open innovation platforms, policy advocacy and advisory services and global networking and partnerships.

Transferring and dosing challenging products





R&D institutions foster collaboration academia. industrv between and agencies to advance aovernment scientific knowledge, develop innovative technologies and address industry challenges. Collaborative research projects provide opportunities for knowledge exchange, interdisciplinary collaboration and leveraging of complementary expertise.

Institutions need to facilitate technology transfer and licensing agreements to disseminate cutting-edge research findings, patents and proprietary technologies developed in-house. This enables industry players to access and adopt new technologies, accelerate product development, and gain a competitive edge in the market. Organizing training programs, workshops and seminars on various topics such as chemical process

R&D institutions foster collaboration between academia, industry and government agencies to advance scientific knowledge and address industry challenges optimization, sustainability, regulatory compliance and emerging trends enhances the skills, knowledge and capabilities of professionals working in the chemical industry, empowering them to tackle complex challenges and drive innovation.

Many R&D institutions operate incubators, accelerators and technology parks to nurture entrepreneurship and support the growth of start-ups and small businesses in the chemical sector. These initiatives provide access to infrastructure, funding, mentorship and networking opportunities, enabling aspiring entrepreneurs to commercialize their innovations and bring new products to market.

R&D institutions can collaborate with universities and technical institutions to develop specialized degree programs, courses and certifications in areas such as chemical engineering, polymer science, materials science and nanotechnology. These educational initiatives cultivate a pipeline of skilled professionals equipped with the latest knowledge and tools required to excel in the chemical industry.

Institutions can establish open innovation platforms and consortia where industry stakeholders can collaborate on pre-competitive research projects,

share resources and collectively address common challenges. These facilitate knowledge platforms sharing, technology scouting and co-innovation, fostering a culture of collaboration and mutual benefit within the industry. R&D institutions engage in policy advocacy and provide advisory services to governments, regulatory agencies and industry associations on matters related to research funding, intellectual property rights, environmental regulations and technology standards. By influencing decisions and shaping policy the regulatory landscape, these institutions contribute to a conducive environment for innovation and sustainable growth in the chemical industry.

Establishing strategic partnerships and collaborations with counterparts around the world to access global expertise, share best practices and participate in international research consortia enhance the visibility, credibility and impact of R&D efforts, while also fostering cross-cultural collaboration and knowledge exchange. Overall, capacitybuilding initiatives by R&D institutions play a vital role in driving innovation, competitiveness and sustainability within the global chemical industry. By fostering collaboration, providing education and training, facilitating technology transfer and advocating for supportive policies, these institutions contribute to the advancement of science and technology and the overall growth of the chemical sector on a global scale.

Training and capacity building play a pivotal role in driving growth, innovation and sustainability within the Indian chemical industry. By investing in the development of their workforce, companies can overcome challenges, capitalize on opportunities, and establish themselves as leaders in a highly competitive market landscape. With strategic planning, collaboration and a commitment to lifelong learning, the Indian chemical industry can unlock its full potential and contribute to the nation's economic prosperity and industrial development.

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UNLOCKING CHEMISTRY: TRANSFORMING INDIA INTO A GLOBAL MANUFACTURING HUB

Continued investments in innovation, R&D and capacity expansion are imperative for Indian chemical companies to capitalise on the immense opportunities



n recent years, India has emerged as a beacon of opportunity in the global manufacturing landscape. Its diverse industries, ranging from semiconductors to automobiles, textiles to aviation and even aerospace, are propelling the country towards becoming a global manufacturing hub. One industry that exemplifies this trend is the Contract Development and Manufacturing Organisation (CDMO) sector, which has witnessed remarkable growth and is poised to play a pivotal role

India has all the necessary ingredients to solidify its position as a favoured outsourcing destination in the agrochemical sector in India's manufacturing narrative.

The CDMO industry in India is characterised by its sector-agnostic approach. Catering to a wide array of industries such as agrochemicals, pharmaceuticals and consumer products, this versatility has been a key factor in India's rapid ascent in the global market.

According to a joint study by McKinsey and the Indian Chemical Council (ICC), the global chemicals market is expected to grow by 11-12 per cent during 2021-2027, followed by a strong 7-10 per cent growth from 2027-2040. India, currently ranked as the world's sixth-largest seller of chemicals and the fourth-largest in Asia, is projected to triple its contribution to global sales by 2040, reaching a staggering market value of US\$ 850 - US\$ 1,000 billion. [1]

India's attractiveness as a manufacturing hub

Several factors are driving this growth. One of the primary drivers is India's appeal as a global outsourcing hub.

With innovator companies focusing on their core genesys of research and development of novel sustainable molecules, they are increasingly turning to CDMO companies for reducing timeto-launch in the market and cost-effective solutions. Indian companies have emerged as preferred partners in this outsourcing boom, thanks to their credibility, expertise, time-to-market and cost-effectiveness.

India's skilled workforce, comprising engineers, chemists and scientists, has been instrumental in moving the country up the value chain. This, coupled with its strong process chemistry skills, competitive operational costs and protection of intellectual property rights, has made India an attractive destination for outsourcing. Many global companies, for instance, are shifting their chemical manufacturing assets from their homecountry to India as the cost of setting up manufacturing facilities is nearly twothird in India, and it has developed frugal engineering capabilities.

The Indian government's proactive measures, such as the production-linked incentive (PLI) scheme and budget provisions to the Department of Chemicals and Petrochemicals, Govt. of India have further bolstered India's position as a manufacturing hub. These support and policies have created a favorable environment for Indian CDMOs to thrive and expand their growth potential.

Need for an investment in R&D and de-risking supply chain

Despite the remarkable growth witnessed by India's CDMO industry and its allure as a global hub, there are still untapped opportunities. India's share of global chemicals sales remains at 10-12%, and its agrochemicals exports to key markets like the United States are growing but still lag behind countries like China.

To fully realise its potential, India must address several challenges. One of the key areas that require attention is backward integration. The sector still imports roughly 50% of its basic chemicals and intermediates from China. In fact, India's chemical industry continues to be a net importer.

This underlines the need for investment in R&D and the development of key starting raw materials. While some players are already actively engaged in R&D through dedicated innovation hubs set up locally, on an industry-wide scale, innovation has been lacking. This is a situation that needs to be turned around. And it is here

that incentives can encourage local R&D into sustainable chemistries and enable the industry to commercialise technology platforms like continuous chemistry, vapour phase reactions, etc.

Innovation will play a crucial role in India's manufacturing landscape, not only in terms of raw materials but also in the manufacturing process as a whole. The U.S., for example, has introduced incentives to lure companies to manufacture locally, emphasising the importance of innovation and automation in remaining competitive.

Another challenge that India must address is its infrastructure inadequacies. To address this, the government has approved setting up four Petroleum, Chemical and Petrochemical Investment Regions (PCPIRs). However, with countries like China having more PCPIRs, Innovation will play a crucial role in India's manufacturing landscape, not only in terms of raw materials but also in the manufacturing process as a whole

it gives them a competitive-edge. Hence, for India to up its game, we need to invest in more such facilities. The same can result in cutting down higher costs for container necessary ingredients to solidify its position as a favoured outsourcing destination in the agrochemical sector. Continued investments in innovation, R&D, and capacity expansion are imperative for Indian chemical companies to capitalise on the immense opportunities that lie ahead and establish India as a dominant force in global manufacturing.

Moreover, India's focus on sustainability and green chemistry could further enhance its global appeal. As the world shifts towards sustainable practices, India has an opportunity to position itself as a leader in environmentally-friendly chemical



freight from India to key international markets thereby raising market share.

Additionally, it would aid us de-risk supply chains and integrate more closely with global supply chains. While Indian fine and specialty chemical companies are already making strides in this direction, these efforts need to be further amplified to reduce logistics costs and enhance efficiency.

The road ahead

India's CDMO industry has evolved significantly in recent years, positioning the country as a key player in the global chemical manufacturing landscape. With planned investments in infrastructure, a skilled workforce, and favourable government policies, India has all the manufacturing. This could not only attract more business but also align with global sustainability goals.

Furthermore, India's rich heritage in traditional medicine and natural products could be leveraged to drive innovation in the pharmaceutical and agrochemical sectors. By combining traditional knowledge with modern research and technology, India can develop unique and sustainable solutions that cater to global needs.

India's journey towards becoming a global manufacturing powerhouse is fueled by its diverse industries, skilled workforce, and conducive government policies. By addressing challenges and leveraging its strengths, India is wellpositioned to lead the way in the global chemical manufacturing landscape.

^[1] India: The next chemicals manufacturing hub

POLICY REFORMS TO TAKE AGROCHEMICALS TO THE NEXT LEVEL

First and foremost big-ticket reform is the reduction in registration timelines for crop protection products so that the farmers are equipped with the latest technologies to combat various challenges

Dr. K. C. Ravi Chairman, Crop Life India Chief Sustainability Officer Syngenta India

et's first look at what the agrochemical sector in India has achieved since the first Insecticides Act of 1968 was framed even though there are players who have been serving the farmers of our country much before the sector was regulated. Today, India has become the fourth largest producer of agrochemicals in the world and more recently it has surpassed the USA as the second largest exporter after China. The agrochemicals along with other inputs has helped India's agriculture production reach record levels. They have also helped Indian agriculture tackle many national exigencies when the very survival of our major crops like Rice, Cotton and Wheat were threatened by pests and diseases. The industry has taken its responsibility very seriously and is bringing cutting - edge technologies that have reduced the application rates to as

low as 4 grams with new chemistries from 3-4 kilograms in the sixties. The sector is also embracing Artificial Intelligence and digitization seamlessly to further make breakthroughs in precision and sustainable agriculture.

But in spite of this sector spending close to US\$ 6 billion in R&D, the perception is

Provision of minor changes in formulations will not only benefit the industry but also enhance the overall regulatory framework by imbibing this internationally recognized best practice as though chemicals are mixed by hand in shady shacks. In spite of the fact that a molecule goes through close to 11 years of research at a cost of US\$ 300 million from discovery to commercialization before reaching the farmers, they are subject to arbitrary scrutiny and ban without a scientific basis. In spite of India hardly using on an average 300 grams compared to 11-13 kgs in other countries, there is unsubstantiated criticism from various quarters.

And most importantly, whenever we talk about reforms of this sector, it is viewed from the lens of MNC vs. domestic, import vs. indigenous, patented vs. unpatented and chemical vs. organic.

So, what are the policy reforms that need to be taken to take agrochemicals to the next level? And here we need to look at this in the context of the aspiration of India to become a 'Viksit Bharat' by 2047. By then, India's population is also expected to increase to around 1.7 billion from 1.4 billion at present. For feeding the population, India needs to not only increase agriculture production but also the overall productivity to ensure food and more importantly nutritional security of the nation.

One hectare of land used to feed 2 people in 1950. The same hectare of land would have to feed 5 people by 2050. The production of food grains has to correspondingly increase by 5 million tonnes annually.

Climate change is already creating huge disruptions in India's agriculture
landscape. Global warming, caused by the increase in concentration of greenhouse gases (GHGs) in the atmosphere, is emerging as one of the most prominent environmental issues in India. Carbon dioxide (CO2), methane (CH4) and nitrous oxide (N2O) from major crops like rice and others are causing disruptions.

India has also lost 668,400 hectares of forest cover in the last 30 years, and the Food and Agriculture Organization (FAO) estimates that the rate of deforestation was 668 square kilometers per year between 2015 and 2020 mainly for agriculture.

Nearly 147 million ha of land is subjected to soil degradation, including 94 million ha from water erosion, 23 million ha from salinity/alkalinity/acidification, 14 million ha from water-logging/flooding, 9 million ha from wind erosion and 7 million ha from a combination of factors due to different forces.

Thus, the only way out is to continue to increase productivity per unit of input in the foreseeable future with the least environmental footprint. It will require proper management of soil, water, nutrition, seeds and agri inputs.

The start has already been made when during Covid pandemic, this sector was identified as one of the 12 champion sectors where India can play a major role. Second and more crucially, we had for the first time nine sectoral and national industry associations coming together to discuss the reforms on the policy and regulatory front that would take the sector to new heights. There were 29 progressive agenda items that were coined 3-D (Discuss, Decide and Deliver) and a three day interaction was organized with key stakeholders from the government. Subsequently, the issues were deliberated under the Chairmanship of the Secretaries of Agriculture and Chemicals. But somewhere down the line the meetings have discontinued. There are decisions taken on certain aspects of the reform agenda, but not in a holistic manner. The focus has to be brought back to the core reforms outlined in the 3D agenda.

The only lens through which the issues should be viewed is through the lens of Science and Farmers. The reforms need



to be viewed from the perspective of the requirements of the country. An attempt should be made to look at the gaps and a roadmap should be developed.

However, the more I think about certain policy reforms that would take agrochemicals to the next level, the more I am reminded of the old Hindi movie song "Sau saal pehle". Probably the new version would be "Dus saal pehle", it was the same problems, "aaj bhi hai, aur kal bhi rahega" unless there is absolutely a new lens through which this sector is viewed! This is important as because of the dissenting notes from various stakeholders, a whole host of critical reforms are being sidelined. I will outline a few in the following paragraphs.

The first and foremost big-ticket reform is the reduction in registration timelines for crop protection products so that the farmers are equipped with the latest technologies to combat the various challenges.

Registration is the most critical process in the product life cycle of agrochemical products. Lengthy registration process

Whenever we talk about reforms of this sector, it is viewed from the lens of MNC vs. domestic, import vs. indigenous, patented vs. unpatented and chemical vs. organic in India has long been a bottleneck for introduction of new molecules.

Moreover, the farmers are not able to reap the benefits of the agrochemical products sooner. There is tremendous scope of improvement with respect to policy changes, process changes and administrative capacity changes thereby reducing timelines and fostering innovative plant protection solutions for Indian farmers. The changes proposed can reduce the time to bring new molecules to the market by almost 3 years, which will be beneficial not only for agro chemical companies but also the farmers of India.

One of the important policy and process related changes is with respect to introduction of pre-submission dossier consultation. This will minimize the gap between the submitter and the reviewing authority, providing applicants with advanced knowledge of data acceptability. This, in turn, will enable them to generate and provide the required data to the authority in the shortest possible time.

A cut-off timeline for the completion of the first review by each division should be a maximum of 12 months. Unresolved/ recurring queries after two deficiencies can be resolved through face-to-face interactions. MRL setting also takes a lot of time and can be shortened if they can be organized in parallel to registration review/ grant. Another important provision that can speed up registration is a mechanism to grant exigency/provisional registration for new molecules.

As for the administrative capacity

roposed reduction in registration timelines						
Process	Changes	Current (Months)	Proposed (Months)			
Import Permit	Policy And Process Changes	4-6	Less Than 1			
Pre-Submission Data Generation	Policy Changes	30-36	18-24			
Pre Submission Consultation	New Addition	0	1			
Pre-Scrutiny	Process Changes	1-2	<1			
Online Allocation	Process Changes	2	<1			
Review	Process Changes. Administrative Capacity Changes	28-34	16 – 22			
Mrl & Certification Of Registration (Should Be In Parallel To Registration Grant	Process Changes New Addition	3-4	0			
Total			38 – 50			
Total Reduction						
	Process Import Permit Pre-Submission Data Generation Pre Submission Consultation Pre-Scrutiny Online Allocation Review Mrl & Certification Of Registration (Should Be In Parallel To Registration Grant	ProcessChangesImport PermitPolicy And Process ChangesPre-Submission Data GenerationPolicy ChangesPre Submission ConsultationNew AdditionPre-ScrutinyProcess ChangesOnline AllocationProcess ChangesReviewProcess Changes. Administrative Capacity ChangesMrl & Certification Of Registration (Should Be In Parallel To Registration GrantProcess ChangesTotal Reduction	ProcessChangesCurrent (Months)Import PermitPolicy And Process Changes4-6Pre-Submission Data GenerationPolicy Changes30-36Pre Submission ConsultationNew Addition0Pre-ScrutinyProcess Changes1-2Online AllocationProcess Changes. Administrative Capacity Changes28-34Mrl & Certification Of Registration GrantProcess Changes Changes3-4Mrl & Certification Of Registration ChangesProcess Changes Administrative Capacity Changes3-4Mrl & Certification Of Registration Should Be In Parallel To Registration GrantProcess Changes Changes New Addition68-84Total Reduction60-34			

Proposed reduction in registration timelines

changes are concerned, they can be streamlined in the following lines:

Thus, the whole process can be shortened to 30-34 months.

Another issue which has been in discussion since 2012 is minor changes. Crop protection products generally consist of at least one technical active substance and co-formulants. New scientific and technical knowledge, economic demands, unavailability of supply, improved performance/classification/concerns regarding certain critical co-formulants can make it necessary to change the chemical composition of products with regard to their co-formulants.

The key objective of minor changes is to overcome practical concern of significant and non-significant changes of the chemical composition of crop protection products for India. While there is no doubt that at present registration authority are considering minor change proposal for ongoing registration on a case by case basis, this practice is risky as approval criteria is open ended (caseby-case), and in absence of documented criteria, it is limiting Industry to come forward as the approval is subjective.

To bring clarity to this matter via written guidelines, a subcommittee needs to be formed with Terms of Reference and stipulated term say 2 months for delivering the guidance/criterion/ data requirement on minor change in formulations.

The need of this regulation is becoming far more significant as to help to substitute the hazardous constituents with the safer ones and thereby helping compliance at the international level and further improve the image of the agrochemical sector of India.

In other words, if one is to make such minor changes in the existing chemical composition, it qualifies as a new formulation and requires to be registered with the total data package all over again under the Insecticides Act 1968 and Rules 1971 at present.

This issue has been deliberated at various registration committee meetings in the last 7-8 years without any conclusion. Provision of minor changes in formulations will not only benefit the industry but also enhance the overall regulatory framework by imbibing this internationally recognized best practice.

The third and the most debated issue has been the issue of Regulatory Data Protection. The data submitted by the first time registrant is given protection for a certain number of years the world over. This is given for the registrant to not only stabilize and steward the product in the market but also for recouping the massive investment he incurs in bringing the new product. This issue has been hotly debated from Satwant Committee to various other committees. The industry is divided and a closure to this issue will bring closure to the other 80percent of the issues outlined in the 3-D reform where there is consensus.

Industry wants to bring the latest technologies to India but the other set of problems related to state licenses, sales permissions, arbitrary bans etc. need to be also streamlined.

Looking at the road ahead we need to ensure the following to take agrochemicals to the next level:

- A predictable, science based policy and regulatory regime for the proper growth of the crop protection sector to make our farmers and Indian agriculture sustainable
- Forward looking progressive regulations which promotes innovation and new product introduction to address the current and future challenges of the farmers
- Encouragement to introduction of cutting edge technologies like Artificial Intelligence, Drones and digitization in service of the farmers
- Public Private Partnership we would like to be "Partners in Progress"

(Views expressed by the author are personal)



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OLEOCHEMICALS: DRIVING POSITIVE SUSTAINABILITY IMPACT IN CHEMICAL INDUSTRY

Exploring technologies such as microbial production and enzymatic reactions to further enhance sustainability in future



The chemical industry produces a vast array of products essential to our daily lives. While it generates substantial economic and social value, it also relies heavily on non-renewable resources and raises significant environmental concerns. Given the finite nature of these resources, it is crucial to use and protect them judiciously.

The industry must prioritize the development of products that provide sustainability benefits and are manufactured through green, sustainable processes using renewable feedstocks. By adopting the principles of green chemistry, chemical manufacturing can achieve significant sustainability benefits, a fact that has garnered considerable recognition in recent years. Oleochemicals, derived from renewable sources, exemplify this approach and contribute to a more sustainable future in the chemical industry.

Oleochemicals, derived from natural fats and oils such as palm oil, sunflower oil, rapeseed oil, canola oil and coconut oil, offer a renewable and sustainable alternative to traditional petrochemicals. These chemicals boast several environmentally friendly qualities, including biodegradability, low toxicity, and the ability to decompose without

Oleochemicals play a significant role in the production of biodiesel, further emphasizing their importance in sustainable development causing pollution.

Moreover, fats and oils can be easily converted or derived into a variety of useful chemicals, such as fatty acids, alcohols, esters, amines, nitriles and quaternary compounds. These derivatives have applications across numerous industries, making oleochemicals a versatile and eco-friendly choice.

Application of oleochemicals

Oleochemical derivatives are used in a wide range of industries, including: Personal care, home care, food and beverages, pharmaceuticals, agrochemicals, paints and coatings, textiles, lubricants, oil and gas etc.

With growing consumer awareness, stringent regulatory requirements, and heightened environmental concerns, oleochemicals are finding new applications in these segments. Additionally, oleochemicals play a significant role in the production of biodiesel, further emphasizing their importance in sustainable development.

Enhancing sustainability in oleochemicals at Godrej Chemicals

Godrej Chemicals is dedicated to integrating green chemistry principles into our oleochemical production, emphasizing sustainable practices, and minimizing environmental impact. This commitment positions us as a leader in the shift towards more sustainable industrial practices, offering a competitive and environmentally friendly alternative to traditional petrochemicals.

Renewable and safer feedstocks:

We prioritize the use of bio-based renewable feedstocks. ensuring a sustainable supply through controlled By adopting agricultural practices. sustainable practices like **RSPO** (Roundtable on Sustainable Palm Oil), we promote circularity and reduce environmental impact. Our oleochemicals, derived from natural sources, exhibit low toxicity, making them ideal for use in home and personal care products, including baby care products.

Environmentally friendly processes:

Godrej Chemicals is dedicated to safer chemical synthesis by reducing toxicity to human health and the environment. We are developing innovative catalysis methods using biobased catalysts, such as enzymes and fermentation processes. For instance, biodegradable surfactants derived from vegetable oils (Fatty Alcohol Sulfates and Ethoxylates) can replace petro-based surfactants (Alkvl Benzene and Nonyl Phenol) in household and personal care products, significantly reducing their environmental impact. Additionally, the linear and aliphatic nature of vegetable oils and oleochemicals makes them naturally and readily biodegradable, ensuring they break down into harmless products and do not persist in the environment.

Energy and waste efficiency:

Despite the high energy requirements of traditional oleochemical processes, we offset this through benefits like coldprocessable formulation ingredients and continuous efforts to enhance energy efficiency. Our processes maximize material utilization, minimizing waste. For example, the fat splitting process yields glycerine and fatty acids, both of which are fully utilized, resulting in zero waste. We also minimize solvent use, often relying on aqueous media and neat reactants.

Advanced monitoring and safety:

We employ monitoring techniques such as HPLC and GC to ensure high product quality and minimize waste generation. Stringent controls and mitigating systems are implemented to minimize the risk of chemical accidents. including managing emissions and safely handling potentially hazardous substances. Additionally, we are exploring technologies such as microbial production and enzymatic reactions to further enhance sustainability in the future. By integrating these practices, we emphasize our commitment to sustainability and reduced environmental impact.

About Godrej Chemicals and our commitment to green chemistry

Godrej Chemicals has a long history of innovation and commitment to sustainability. As pioneers in the Indian oleochemical industry, we have

consistently led the way in developing environmentally friendly products and processes.

Godrej was the first company in India to manufacture soaps from fatty acids, quickly transitioning from to a animal fats focus on 100% vegetable oil-based fatty acids. This early shift underscores our long-standing dedication to sustainable renewable and resources.

We were also the first organization in the world to c o n c e p t u a l i z e making a surfactant from vegetable oil. Although this concept was not viable in the early 1990s, it has gained renewed interest and evaluation by global leaders since the early 2020s. This innovation led to the introduction of Alpha Olefin Sulfonate (AOS) in India, which is now produced from Alpha Olefins obtained by the oligomerization of ethylene.

Furthermore, we pioneered the manufacture of fatty alcohols from vegetable oils in India, continuing our tradition of using renewable resources to create high-quality oleochemicals.

Our commitment to green chemistry is evident in our continuous efforts to enhance the sustainability of our processes and products.

The GEM mantra: Guiding our path to sustainability

At Godrej Chemicals, our commitment to sustainability is encapsulated in our GEM Mantra, which stands for Green, Effective, and Multifunctional. This approach guides our product development and operational practices, ensuring we deliver high-quality, sustainable solutions.



Good and green:

The "G" in GEM signifies our dedication to using oleochemical sources, ensuring our products are green and renewable. While we aim to maximize sustainability, we recognize the need for practicality and prefer to use the term "As Green as Possible." This reflects our commitment to balancing environmental considerations with the specific requirements of end-use applications.

Effective and efficient:

Effectiveness is central to our sustainability efforts. By enhancing the delivery of active ingredients through additives like penetrants and solubilizers, we create formulations that are more efficient and economical. This means using less of the active ingredients, which reduces both costs and environmental impact by minimizing waste. Our focus on effective formulations supports our overarching goal of promoting sustainable practices.

Milder and multifunctional:

Multifunctionality is a key tool in reducing the use of multiple chemicals. For instance, our bio-surfactant serves as an emulsifier, dispersant, antimicrobial agent, and cleaning agent, all in one. This reduces the need for additional chemicals and simplifies formulations. Additionally, many of our pre-mixes are designed to be "Cold Processable," allowing customers to prepare formulations without the need for heating. This conserves energy and improves batch cycle time, further contributing to our sustainability goals.

By incorporating the principles of Green, Effective, and Multifunctional, we produce products that we proudly refer to as GEMs. Each GEM contributes to sustainability and green chemistry principles, ensuring that our products and processes are environmentally friendly and efficient.

Our GEM Mantra is more than just a guideline; it is a commitment to producing innovative solutions that meet the highest standards of sustainability. Through this approach, we lead the way in the oleochemical industry, fostering a greener and more sustainable future.

Bio-surfactants: The future of sustainable and high-performance oleochemicals

GCB-SL50, a sophorolipid developed by Godrej Chemicals, represents a significant advancement in sustainable chemistry. Produced through yeast fermentation using renewable non-edible vegetable oil feedstocks, GCB-SL50 combines green chemistry principles with a reduced carbon footprint.

Consumers are increasingly demanding natural, mild products made from renewable resources, and GCB-

SL50 meets these needs with its nontoxic, biodegradable properties. This bio-surfactant is not only an eco-friendly alternative to synthetic surfactants but also promotes clean beauty throughout its lifecycle.

We have optimized the production of GCB-SL50 for commercial-scale manufacturing at a reasonable cost. The bio-surfactant offers several benefits: it produces less foam, making it ideal for cleansers and face washes; it is effective in anti-acne and anti-dandruff formulations: and it is naturally mild, making it suitable for baby and sensitive skin products. Additionally. GCB-SL50 excels in color dispersion for cosmetics like lipsticks and eyeliners. It also functions as a super emulsifier/dispersant, forming micro and nano emulsions for applications in personal care, home care, agro products, and more.

GCB-SL50 is poised to revolutionize the personal care industry with its sustainable and high-performance properties, meeting the growing demand for eco-friendly and effective products.

Conclusion

Godrej Chemicals is advancing sustainability in the chemical industry through the innovative use of renewable oleochemicals. By integrating green chemistry principles, we prioritize ecofriendly processes, renewable feedstocks, and efficient resource utilization. Our GEM

> Mantra—Green, Effective and Multifunctional-ensures the development of highquality, sustainable solutions. The introduction of biosurfactants exemplifies our commitment to innovation, offering а biodegradable and non-toxic alternative to synthetic surfactants for a variety of applications. This commitment to sustainable innovation drives us to create impactful, eco-friendly solutions that will shape the future of the chemical industry.



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DISCOVERING THE EDGE: PIP SETS THE STANDARD FOR CHEMICAL CLUSTERS

Fast emerging as an optimal choice for emerging industries, the park boasts of cutting-edge infrastructure, water resources, waste management and best connectivity

ndia's recent economic surge owes much to its industrial growth, bolstered by specialized zones like industrial parks. These hubs provide essential infrastructure and services vital for sectors such as manufacturing and logistics to thrive. Inspired by this model, Arete Group's groundbreaking venture, PIP (Payal Industrial Park) located in Dahej PCPIR (Petroleum Chemicals and Petrochemical Investment Region) has emerged as an ideal destination for burgeoning industrial sectors aiming for sustained growth and contribution to India's GDP.

Spread across 3,500 acres, PIP offers state-of-the-art infrastructure, ample water resources, efficient waste management, and multi-modal connectivity. Its strategic positioning within Dahej PCPIR near Gujarat's industrial hubs translates into lower transportation expenses and quicker delivery schedules for vital cargo.

Strategic location: Key for chemistry of success

Finding an ideal industrial park tailored to their needs often becomes a multifaceted and challenging endeavour for the chemical companies. One of the major challenges is selecting a location that minimizes transportation costs while ensuring proximity to suppliers and skilled labor is paramount for business success.

The central location helps PIP to capitalize on its multi-modal connectivity, providing easy access to ports, railways, airports and highways. Positioned on the Delhi-Mumbai Industrial Corridor via National Highway 48, PIP enjoys proximity to three major ports - Dahej, Kandla and Mundra - all located on the western coast and renowned as India's largest ports. Furthermore, PIP is conveniently located near two major international airports, Surat and Ahmedabad, and benefits from its proximity to the western railway network, enhancing its accessibility and connectivity for industrial operations.

PIP, situated in Gujarat, a state renowned for its robust economy and dynamic industrial landscape, emerges as an ideal destination for both established enterprises looking to expand and emerging industries aiming to establish

their presence in the competitive global market. Its strategic location enhances its appeal, offering proximity to key markets in Southeast Asia, the Middle East, Europe and Central Asia, enabling industries to capitalize on the vast potential of these regions. Additionally, PIP plays a crucial role in the Indian government's PCPIR program, designed to boost chemical industry

Chemical excellence flourishes at PIP: Here's why

- Strategic Location
- World Class Infrastructure
- More Cost Effective
- Latest Amenities and Facilities
- Support For Regulatory & Approval Processes

investments in Asia. The West India PCPIR, covering 453 square kilometres, has secured the necessary environmental clearances, significantly streamlining the process of setting up industries in the region.

Optimal infrastructure for industrial growth

Adequate infrastructure is essential for any industrial park, as its absence can lead



planning ensuring a conducive environment for industrial operations. Approved for a total of 92 MLD of treated water, with 50 MLD in Phase 1 and a 66 kVA substation within the park, PIP ensures a reliable supply of resources. Additionally, the park benefits from its proximity to 33 planned and operational substations in the surrounding area, ensuring uninterrupted power supply.

PIP is also developing a 2.5 MLD CETP in Phase 1, with approval for a total of 50 MLD CETP from the Ministry of Environment, Forestry & Climate Change Department, and a 40 MLD deep sea discharge line in the GIDC pipeline. With shovel-ready plots available, construction can commence immediately, making PIP an ideal choice for businesses seeking a seamless setup process.



Cutting-edge effluent treatment facility

PIP boasts a state-of-the-art CETP (Common Effluent Treatment Plant) that sets new standards with its comprehensive inlet norms for chemical industries. The project, a pioneering effort in India, targets an inlet COD (Chemical Oxygen Demand) level of 5,000 ppm, intending to treat parameters to meet marine discharge COD norms of 250 ppm. This innovative approach allows most chemical industries to focus solely on establishing their preliminary treatment processes without the need for installing biological treatment processes on their premises, thus saving on the treatment cost. This not only simplifies the setup process but also optimizes space utilization for manufacturing purposes.

World class experience center

PIP boasts one-of-a-kind а technologically advanced Experience Center within the PCPIR. This center offers an immersive tour, providing industry professionals with a first-hand look and feel of the facilities. The Experience Center sets PIP apart from other industrial parks, offering a three-dimensional virtual tour that simplifies and enhances the experience for visitors. Industry professionals are taken on an insightful demonstration tour of the park, showcasing its exceptional facilities and providing inspiration for businesses seeking space or fresh ideas. Since its establishment, this cutting-edge facility has engaged and educated industry players through its ground-breaking virtual experience. Visitors from around the world can gain insight into planning and envisioning their future expansion, providing a glimpse into their new manufacturing plants' operational look and feel.

Assistance with ancillary tasks

Locating suitable industrial land involves navigating numerous approval

processes, including obtaining environmental clearances, securing water and electricity connections, managing construction and acquiring sufficient manpower. Even after establishment, ongoing support is crucial for smooth operations.

PIP's focus lies in supporting all non-core activities and creating valuable products around them. The primary goal of PIP is to enable industries to concentrate on their core activity of manufacturing services and establishing markets. PIP provides solutions for regulatory approvals and compliance, such as those from Gujarat Pollution Control Board, as well as water procurement, waste treatment and disposal and livability solutions. In addition to infrastructure, PIP places a strong emphasis on creating value-added services around these non-core activities.

The Ministry of Environment, Forest and

Climate Change (MoEFCC) has granted PIP Environment Clearance under 7(C) A Category. This clearance enables industries in sectors such as Chlor-Alkali, Fertilizer, Agrochemicals, Petrochemicals, Textiles, Dyes & Dye Intermediates, Pigments & Pigment Intermediates, Synthetic Organic Chemicals, Specialty Chemicals, Polymers and Inorganic Chemicals to swiftly begin construction of their greenfield projects.

The perfect destination for breaking ground

During the course of the last two years, PIP has successfully done business with several renowned clients who have begun setting up their industries. Notable clients include Yasho Industries, Spak Orgochem, Silox India, Halcyon, Neogen Ionics, Gharda



Strategic market access

Providing a convenient access to the Indian market, PIP has readily available workforce and ancillary products within the industrial cluster. It stands as an ideal location for water-intensive and pollution-creating industries such as chemicals, agrochemicals, fertilizers, dye intermediates, pigments, polymers, rubber, metals, and more. Industries associated with PIP are poised to gain a significant advantage in the Indian market

> Chemicals, Indospec Chemicals, Hindalco, and Samnan Chemicals. In Phase 1, the CETP is fully operational in the current year along with essential infrastructure facilities such as water supply, drainage, roads and electricity. Additionally, physical office spaces are available for companies to use while setting up their industries, ensuring uninterrupted work processes.

> As businesses seek fertile ground to flourish and expand, PIP stands out as a focal point for driving commerce and innovation, perfectly aligned with the visionary aims of the Arete Group to serve as a formidable growth engine for enterprises across the nation. By leveraging the inherent strengths of this mega industrial park, the chemical industry is poised to unlock new avenues of growth, innovation, and socio-economic development.







SECRET OF LONG LIFESPAN, EFFICIENCY AND RELIABILITY OF GRAPHITE EQUIPMENT

Fluoropolymer resins used to impregnate the equipment graphite have a significant impact on the properties of the graphite



mpregnated graphite is being used for the manufacture of pressure vessels to handle highly aggressive media viz. acids and alkalies. It provides an opportunity to have unique raw material considerations for design, fabrication and testing. Metallic vessels are made from materials having well established allowable stresses based on measured values of tensile and ductility properties. On the other hand, the parts made from impregnated graphite are brittle and the properties of the parts are dependent upon the fabrication process.

There are no published specifications for impregnated graphte. These are made from different combinations of graphite grades and impregnating agents. Impregnated graphite manufacturing process is specified by the manufacturer and is proprietary. The "specified processes" include grade of graphite, type of resin, combinations of pressure, vacuum and temperatures for different holding periods during impregnation cycles and any other steps to produce the desired grade of impregnated graphite.

Graphite is basically manufactured by finely grinding PET Coke residues available from petroleum refineries mixed with the coal tar binder pitch with preliminary heat treatment for proper binding as well

Graphite is basically manufactured by finely grinding PET Coke residues available from petroleum refineries mixed with the coal tar binder pitch as venting unwanted volatiles from base PET Coke. The density of binder pitch is higher than the PET Coke and thus implies that the resultant properties of graphite depend upon the combination of PET Coke and binder pitch. More the binder pitch, more is the resultant density and vice versa. Intermediate graphite is then taken to pressing by way of Extrusion or Vibro molding or Isostatic compression followed by carbonization. This is one critical step in manufacture of graphite and any deviation in the process will lead to production of inferior quality graphite.

Graphite is naturally a porous material and hence it must be impregnated with Fluoropolymer resin in controlled autoclave cycles at various combinations of pressure and temperatures for specified periods as given in proprietary recipe.



COLUMN	[47]
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Effect of excess binder pitch and fluoropolymer resin on properties of Graphite					
No.	Property	High Binder Pitch	High Resin		
1.	Conductivity	Lower	Lower		
2.	Density	Higher	Higher		
3.	Compressive strength	Lower	Lower		
4.	Tensile strength	Lower	Lower		
5.	Porosity	Lower	Lower		
6.	Heat transfer co-efficient	Lower	Lower		
7.	Heat transfer efficiency	Lower	Lower		
8.	Corrosion resistance	Lower	Lower		

manufacturer and may also vary the grades of graphite manufactured. Hence it calls for very tight control on impregnation process to ensure the material achieves specific minimum values specified of properties.

Almost all the impregnated g r a p h i t e manufacturers in India uses Extrusion process while blocks made

Fluoropolymer resins are bad conductors of heat and electricity. Use of these fluoropolymers should be as optimum as possible to make it impervious but preserve thermophysical properties of resultant impervious graphite very close to pure graphite and make it impervious to gases and liquids and make it suitable for construction of pressure vessels/ equipment. However, Fluoropolymer resins used to impregnate the equipment graphite have a significant impact on the properties of the graphite. The impregnation cycle and resin type vary from manufacturer to by Vibro molded or Isostatic method are imported from various countries like Germany, France, Italy, USA, China etc. Blocks made from Vibro mold/Isostatic method have lower porosity than that of Extrusion method and require less Fluoropolymer resin impregnation.



DHANUKA TO SCALE UP BIOLOGIQ BUSINESS IN FY 2024-25

Company will continue to focus on meeting the evolving needs of farmers while promoting sustainable and responsible agricultural practices



What are the emerging trends that you foresee for the global and Indian agri-input sector in 2024?

Globally, the agrochemical industry is shifting from red triangle toxic products to new green chemistry products which are used in minute quantity in production, in comparison to earlier products which were used in larger volumes.

The global agrochemicals market is expected to grow at a CAGR of 3.7% from 2023 to 2028, reaching a value of US\$ 282.2 billion by 2028. This growth is driven by factors like rising population, emergence of invasive pests due to globalization in agriculture and climate change, increasing food demand and focus on improving agricultural yields.

There is perceptible shift towards precision agriculture. Technologies

like drones, satellites and sensors are enabling farmers to apply agrochemicals more precisely and efficiently, reducing unnecessary waste and environmental impact.

Also, there is an increased awareness regarding safety of pesticides exacerbated by the myths spread by unknown entities for vested interests. Thus, there is

Dhanuka Agritech aims to make strategic decisions that create value for all parties involved while advancing its mission of empowering farmers and supporting sustainable agriculture more emphasis being directed towards innovation in developing safer and more environmentally friendly alternatives.

The discovery of a new molecule costs a whopping Rs. 3,000 crores and a time span of 8 - 10 years. This has reinstated acquisition of mergers of many MNC's in recent times significant few among which includes Dow-Dupont, Bayer-Monsanto, FMC-Cheminova, Excel crop Care-Sumitomo, and many more. Thus, whatever research & development in this sector is happening, they are in advanced countries like Japan, USA, Germany and Europe. As a result, meagre new technologies and pesticides solutions are coming.

India is perhaps one of the countries with lowest number of 330 pesticides registered for use, compared to more than 1,100 chemistries that the world has and out of 330 pesticides a number of them are outmoded/banned or facing issues awaiting of their discontinuation by the developing countries, for whom perhaps continuing than beyond the IPR regime may not be adequately remunerable. Our farmers thus have very limited choices of product solutions to control pests and diseases emerging due to climate changes.

Thus, data exclusivity for new formulations/chemicals need to be introduced and registered for the first time in the country for a defined period is highly essential for the discoverer to encourage introduction of new product solutions. This data protection is paramount to attract prospective countries to invest in India. Data protection in other countries are not unusual. Countries like USA, Canada and Thailand provide data protection for 10 years. Even countries like China, Indonesia and Malaysia have provisions of data protection for 6 years.

On the contrary, the existing Indian regulation does not have provision for data protection. This is despite the recommendations by eminent govt. authorities/committees constituted by the govt. to have a provision for Protection of Regulatory Data (PRD) 3 to 5 years for encouraging new chemicals in India.

Furthermore, India being signatory to WTO & TRIPS where there is an agreement of PRD under the section 39(3), for 5 to 15 years as indicated above, India too can conveniently create a provision for data protection under Insecticide Act, 1968/ PMB 2020.

What is your take on the Pesticide Management Bill (PMB), 2020?

The PMB 2020 does not enable justice in present form and level playing field between the genuine industry and socalled fly-by-night operators. A stringent penalty with fine up to Rs. 50 lakhs and 5 years imprisonment without differentiating between the habitual offenders and unintentional instances in case of genuine companies is not rational. Such a provision discourages the investment by the prospective national or international industries.

Besides, there are number of unintended ambiguities in the PMB which if not revised and implemented by the inspectors in true spirits will promote proliferation of spurious grey market and lead the unethical players go scot-free.

Companies approach to R&D for new technologies and products. How will it shape the future roadmap of the company keeping sustainability and net carbon zero in picture? Dhanuka is investing in in cuttingedge technologies, collaborating with research institutions, leveraging their resources and fostering a culture of creativity and experimentation, validating the technology of public institutions to facilitate commercialization and driving breakthroughs to bring exciting novel synergistic new products and solutions to market.

Some of the most exciting research areas that the company is currently exploring include: Precision Farming, Biologicals and Bio-stimulants, Genomic and breeding technology, Digital Farmer Solutions, Sustainable Agriculture Practices, Crop-Protection Resistance Management and Climate Resilient crops.

To shape the future roadmap of an agrochemical company with sustainability and achieving net carbon zero, several key strategies can be implemented. These include adopting precision farming, organic alternatives, promoting integrated pest management, use of carbon neutral pesticides, practising carbon sequestration through encouraging agro-forestry, promoting conservation agriculture, crop rotation etc.

Also, through investment in R&D of green technologies, such as bio-based pesticides, biodegradable packaging and eco-friendly formulations, implementation of measures across the supply chain from production to distribution, by investing in renewable energy sources, optimizing transportation logistics and participating in carbon offset programs can shape the future roadmap of companies. Collaboration among various stakeholders is very important.

By integrating all these strategies in its roadmap, an agrochemical company can position itself as a leader in sustainability and contribute to building a more environmentally conscious future.

How has the company adapted to changing market conditions and

evolving consumer preferences and how do you see the future product roadmap?

Dhanuka Agritech has well adapted to changing market conditions. It is envisaging its industry roadmap to reach up to the consumer preferences by focusing on R&D to create innovative products tailored to meet the demands of modern agriculture. We have expanded our product range to include sustainable and eco-friendly biologicals solutions in response to growing consumer interest.

Additionally, we have invested in digital technologies to offer smart farming solutions and helping farmers increase efficiency and productivity. We also invested in Fyllo, precise and Al-driven advice to farmers in order to help them increase their crop productivity and lower input cost. Ensuring 100% customer retention reflects the farmer's confidence in Fyllo's offering. This will contribute to transforming India through agriculture.

As for the future product roadmap, Dhanuka will continue to prioritize sustainability, innovation and technology integration aiming to enhance lives and livelihoods of the farmers. Overall, the company will focus on meeting the evolving needs of farmers while promoting sustainable and responsible agricultural practices.

Company's performance in the agri-biological segment after its foray in 2023? How did the market respond to BiologiQ range of products?

We have launched six biological products: Whiteaxe, Sporenil, Nemataxe, Downil, Omninxt and Myconxt - in 2023 under the umbrella brand: BiologiQ. It has been able to practice sustainable agriculture with a successful business of Rs. 2.05 crore during FY 2023-24.

Post launch of BiologiQ, our channel



We have given field demonstrations, field meetings and flagging off vans under the banner of associations to educate farmers about the safe and judicious use of pesticides

partners appreciated this new initiative as contribution to enhance life of farmers. We started BiologiQ business in Gujarat, Karnataka, Tamil Nadu, Maharashtra and Andhra Pradesh and received very encouraging response through various demand generation activities.

With such innovative practices, Dhanuka envisages to scale up the

BiologiQ business in FY 2024-25 by employing other novel microbes and expanding its area of operations in other states and increasing customer reach.

How does the company plan to augment its position in the crop care product segment?

Dhanuka Agritech plans to augment its position in the crop care product segment

through several strategies:

Innovation: We are continuing to invest in R&D to create new and advanced crop care products. We are also introducing and developing formulations with improved efficacy, safety and environmental sustainability which are transforming farmers' lives.

Market Expansion: The company is exploring new geographical markets to expand its reach and customer base. This could involve entering emerging markets or regions where there is a growing demand for crop care products.

Product Diversification: We aim to diversify its product portfolio by introducing a wider range of sustainable crop care solutions tailored to cater different crops, pests, and environmental conditions. This can help in capturing a larger share of the market and meet the diverse needs of farmers.

iverse needs of farmers.

RPartnershipsandCollaborations:Collaborationwithagriculturalresearchinstitutions,universities,andothercompaniescanhelpDhanukaAgritechaccessnewtechnologies,expertiseanddistributionchannels.Effectivepartnershipscanalsofacilitatemarketpenetrationandbrandbuilding

Customer Education and Support:



efforts.

Providing farmers with comprehensive training, education, and technical support on the use of crop care products can enhance customer loyalty and satisfaction. This can include conducting workshops, field demonstrations and providing access to online resources and agronomic advice.

By implementing these strategies, Dhanuka Agritech aims to strengthen its position in the crop care product segment and drive sustainable growth in the agricultural industry.

How are you planning to grow your business in the coming years?

Dhanuka Agritech plans to grow its business by:

Focus on Sustainability: Increasing the development and promotion of sustainable agricultural solutions, such as biopesticides and precision farming technologies, to align with changing consumer preferences and environmental regulations.

Digital Transformation: Embracing digital technologies to offer smart farming solutions that improve farm efficiency, productivity, and sustainability, while also providing data-driven insights to farmers.

International Expansion: Expanding into new international markets with tailored products and strategies to meet the

specific needs and requirements of different regions and crops.

Acquisitions and Partnerships: Exploring strategic acquisitions and partnerships to enhance product offerings, gain access to new markets and strengthen the company's competitive position in the industry.

By leveraging these growth drivers and strategies, Dhanuka Agritech aims to achieve sustainable revenue growth and maintain its position as a leading player in the agricultural sector.

How do you determine the appropriate level of Capex for the company, and



what factors do you consider while evaluating potential investments in new facilities or equipment?

There are two types of Capital Expenses (Capex): For the ongoing factories which is in the range of generally Rs. 10-15 crores per annum.

Any further Capex is driven by any other expense based on the project. There, the Capex is approved after evaluating Rol, future potential, backward/forward integration.

How do you balance the demands of customers, shareholders and other stakeholders when making strategic decisions about the future of the company?

Dhanuka Agritech employs a strategic decision-making process that takes into account the following considerations:

Customer Needs and Preferences: The company prioritizes understanding and meeting the needs of its customers by offering high-quality products, excellent customer service, and innovative solutions that address agricultural challenges effectively.

Shareholder Value: Dhanuka Agritech strives to generate sustainable longterm returns for its shareholders by making strategic decisions that enhance profitability, efficiency and growth opportunities while managing risks effectively.

Stakeholder Engagement: It engages with various stakeholders, including employees, suppliers, distributors, regulatory authorities and local communities, to ensure their interests and concerns are considered in decisionmaking processes. This could involve maintaining transparent communication, seeking feedback and addressing social and environmental responsibilities.

Ethical and Responsible Business Practices: Dhanuka Agritech upholds ethical standards and corporate governance principles in all its operations, ensuring compliance with regulations and fostering trust and credibility among stakeholders.

Long-Term Sustainability: The company takes a holistic approach to decision-making, considering the long-term impact on environmental sustainability, social responsibility and economic viability to enhance lives of the farmers. This includes promoting sustainable agricultural practices, minimizing environmental footprint and contributing positively to the communities in which it operates.

By carefully weighing the interests and expectations of customers, shareholders and other stakeholders, Dhanuka Agritech aims to make strategic decisions that create value for all parties involved while advancing its mission of empowering farmers and supporting sustainable agriculture.

Overview of the company's sustainability initiatives and how do you plan to reduce your environmental impact while still delivering value to customers and shareholders?

Our organization envisions a future where agriculture is not only productive but also sustainable. We aim to reduce environmental impact, promote biodiversity, and ensure the well-being of farming communities through responsible and sustainable agricultural practices.

We have increased our solar power generation from 257 KW to 725 KW. We are reducing our solvent consumption by moving towards water-based formulations. We are signatory to plastic waste management initiative, and we have installed water treatment facilities within our factories and using the treated water for gardening and domestic purpose instead of fresh water.

We have tied an with various universities. We have given field demonstrations, field meetings and flagging off vans under the banner of associations to educate farmers about the safe and judicious use of pesticides and our company is also running vans, and printing posters in the regional languages for farmers' awareness and judicious use of crop protection chemicals.

Our initiatives include promoting integrated pest management, investing in research for eco-friendly pesticides, supporting farmer education programs and actively participating in sustainable agriculture partnerships.

New areas which are opening up for agrochemical companies and what's the role that you foresee for your company?

There are opportunities in generating sustainable innovation and new avenues of market access. For example, developing bio-based and precision agriculture solutions: This aligns with consumer demand for sustainability and increased efficiency.

We are focusing on emerging markets, and making efforts to expand presence in regions with high agricultural potential and increasing demand for food production. We see opportunity in developing small-scale, affordable solutions for resourcelimited farmers. This can improve access to essential agrochemicals in developing countries. We are also strengthening building responsible and strong partnerships with local distributors and retailers that will further ensures efficient distribution and reach in rural areas. A unified approach will require to leverage digital platforms for e-commerce and directto-farmer sales: This can provide convenient access and improved market information.



INDIA KA PRANAM HAR KISAN KE NAAM



NEW INVESTMENT TO RESULT IN GROWTH OPPORTUNITIES FOR CHEMICAL MANUFACTURING

The company has already taken steps to become not just a manufacturer of the chemical intermediates but an approved partner that supplies 'Fit for Effect' compounds and formulations



2024 Industry trends/challenges in Advance Intermediates, Phenol and Acetone?

2024 is a year where 90% of the democratic world goes into elections, which generally result in a vote focused and short-term bias. It is also fraught with geopolitical volatility and for agrochemicals, an El Nino year adds additional uncertainties. Despite these uncertainties, we see several signs of recovery, and India continues to stand out in its business optimism. We, though, must be vigilant of possibilities of increased chemical dumping from our large neighbour to maintain the sector's agility and resilience for powering India's trilliondollar dream. during FY 2023-24 and what's your forecast for FY 2024-25?

Deepak is working towards a wellarticulated goal for the next four years. Its current business and new investments will result in compounded growth opportunities

In FY 2023-24, Deepak Chem Tech Limited (DCTL) has inked MoU worth Rs. 14,000 crore with the Government of Gujarat for manufacturing MMA/PMMA resins & compounds for the entire chemical manufacturing landscape of related and downstream products in the chemical and material science applications landscape.

Capex invested in FY 2023-24 and projects where it was invested? Capex investment for FY 2024-25 and projects where you are planning to invest?

Deepak's considerable investment plans are in line with its 'Right to Win' framework which includes upstream, downstream and sunrise segments. It has also invested into sustainability initiatives which will result in value accretion from FY25 onwards. In FY 2023-24, Deepak Chem Tech Limited (DCTL) has inked MoU worth Rs. 14,000 crore with the Government of Gujarat for manufacturing Polycarbonate, Methyl Methacrylate (MMA)/Poly Methyl Methacrylate (PMMA) Resins & Compounds.

When are you planning to manufacture these products and Capex investment that you are planning to make and for what time duration?

The capital investment plan announced assumes stagewise commissioning for multiple projects over the next 3-4 years. The company has already taken steps to become not just a manufacturer of the chemical intermediates, but an approved partner that supplies 'Fit for Effect' compounds and formulations to marque end customers.

Deepak Nitrite has signed a term sheet with Petronet LNG to offtake 250 KTPA of Propylene and 11 KTPA of Hydrogen for 15 years. How will this help Deepak Nitrite in the long run?

The term sheet with suppliers allows Deepak Nitrite to derisk its investments and reduce its dependency on multi-modal transport of hazardous raw materials. It is pertinent to note that the mission for Petronet LNG is well aligned with Deepak's The world sees India as a 'China +1' destination for manufacturing. Deepak Nitrite acknowledges the strong possibilities and demand for chemicals in India itself, to make it a dynamic and sought after destination in itself. So, we should strive to Make India as 'The One', the right destination for manufacturing. To realise this, policies need to formulate and invest in key infrastructure development be it road connectivity, ports, SEZ and integrated chemical hubs.

Proactive policy support and procedural clearance will help in cutting the red-tape and pave the way for development and give confidence to MNCs to set bases in India.

has made significant progress. When do we see commissioning of this plant?

We have announced commissioning. Presently, ramp up is going in a safe and phase-wise manner.

Other expansion projects including MIBK, MIBC, and hydrogenation among others are taking shape and will be commissioned as per plan. What's the update on this front?

Projects will be commissioned in various quarters of the current financial year.



in building a resilient chemical ecosystem for India's growth story.

What strategy should India adopt to become a global manufacturing hub for Advance Intermediates, Phenol and Acetone products? What role does Deepak Nitrite see for itself in making India a global manufacturing hub? 'Skill-Developed India' will be a backbone to sector development. Government and company supported R&D, training and learning centres will up-skill youth to be industry-ready and be ready for jobs of tomorrow.

Construction work of Photo Halogenation and Fluorination

Initiatives taken by Deepak Group for enhancing process safety across all facilities/processes to make operation intrinsically safe?

Deepak cares for people and the planet. Our processes are guided by steadfast adherence and compliance to safety. Our operations at plants have received ISO





certifications. Deepak Nitrite is one of only 40 companies certified to use 'Responsible Care'. Safety and quality go hand in hand and at our units, we have adopted 5s and six sigma practices to ensure productivity backed with safety. This year, Deepak Nitrite Limited received "Score 'B' which is in the management band, signifying our transparency and innovativeness in creating safety culture in the company.

What is the update on Deepak Research & Development Centre? When are you planning to make it operational and how will it help Deepak Nitrite in the long run?

Our R&D facility is crucial to our success with its ability to develop advanced intermediates which requires complex chemistry and engineering. Its state-of-the-art pilot facility acts as a bridge between R&D trials and commercial production, allowing us to deliver quality products seamlessly. We are targeting this financial year or very early in the next financial year.

What is the sustainability roadmap of Deepak Nitrite? What's the sustainability plan for Deepak Nitrite in FY 2024-25?

Deepak Nitrite will publish its first Sustainable Report in 2024. Guided by the philosophy of Responsible Chemistry, we use new technology to capture new products from downstream, as well as frugal and judicious use of water and steam to reduce dependence on natural water sources. In 2023, we recycled over 420,000 KL water and planted 55,000 trees. We operate the lowest thermal footprint phenol plant in the world.

Key CSR initiatives of Deepak Nitrite in FY 2023-24? Plans for FY 2024-25?

Deepak Medical Foundation has conducted over 115,500 diagnostic tests and 20,200 patients in rural communities along with health and medical camps and mobilehealth units to serve 129,750 OPD cases.

Project Vivek Vidya offers story books, learning material to over 8,000 across three Proactive policy support and procedural clearance will help in cutting the red-tape and pave the way for development and give confidence to MNCs to set bases in India

states covering underprivileged children.

Project Neem Satva offers silk development and economic empowerment to women in rural communities, helping the Self Help Groups to create livelihood opportunities by making and selling soap, sanitizer and hand wash. Education and skill development for over 150 Divyang children at the Gujarat State run Samaj Suraksha Sankul in Vadodara.

Project Sangath communitybased intervention aimed at increasing convergence of eligible households under government schemes and social safety net programmes, benefitting over 85,000 families.



Dhanuka's Technical Synthesis Plant, Dahej, is now offering Bifenthrin Technical!

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- 02 Suite of environmentally conscious initiatives
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 - Expertise in intricate chemical reactions

04

05

Collaboration through CRAMS and contract manufacturing



Breakthrough Achievement: Dhanuka Group's Orchid Pharma Receives European Medicines Agency Approval for New Antibiotic Enmetazobactam



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INDIA KA PRANAM HAR KISAN KE NAAM

LOOKING TO ADD SPECIALTY CHEMICALS TO OUR PORTFOLIO

We increased our Ethanol capacity from 200,000 to 320,000 litres per day. Later, we increased the capacity from 320,000 to 400,000 litres per day and now we have gone from 400,000 to 600,000 litres per day



How does Godavari Biorefineries contribute to development and production of sustainable bio based products?

Biorefinery means conversion of an agricultural biomass into food, energy, biofuels, compressed biogas and even electricity. It also means conversion of biomass into chemicals and materials.

Godavari has always been pioneering the conversion of biomass into these products. In the 1940s, it was sugarcane cultivation and sugar production. In the 1950s, it was the conversion of molasses to Ethanol. In the 1960s, we started small in making chemicals from Ethanol. In the 1990s, we were one of six projects in the country to be chosen by USAID to show how climate change can be mitigated by greenhouse gas mitigation projects. We were awarded a grant from the USAID to demonstrate the making of surplus power from bagasse. In the recent past, we were among the first companies to demonstrate the use of sugarcane juice/syrup as a feedstock for making Ethanol in India.

The company received a Rs. 15 crore grant from the Department of Science and Technology. Can you please share the details?

In biorefining, there is a need to have access to biomass and the question that we are trying to ask is how it can be done

We are looking at finding ways to extract potash out of the ash of the incineration boilers in a distillery

with reasonable cost which refers to Capex and Opex. Sugarcane processing companies save bagasse (8-9% on cane) and so have abundant feedstocks. Secondly, the distilleries make Ethanol seasonally. They have idle capacity. The idea is to use this idle capacity with a bolt-on facility to make Ethanol from bagasse with the addition of bagasse pretreatment. So, there is no need to create a new facility all the way from biomass pre-treatment, collection, pre-treatment, fermentation and purification. We just need the treatment of the biomass to convert to sugar for fermentation. This is the whole concept and we want to try and pioneer and see how it is possible.

When do you see this finally shaping up?

To be able to demonstrate this in a reasonable manner, a policy environment needs to be in place. The creation of PPAs (Power Purchase Agreements) enabled sugar mills to install power plants. Similarly, a mandate for Ethanol blending with a declared price for juice/syrup helped create that investment). Similarly, a policy framework for 2G Ethanol will help spur investment. The moment we create a framework and a market, only will then one allow or incubate innovation to make it happen.

How favourable government policy is accelerating growth of bioenergy, Ethanol and bio-based



speciality chemicals? At the G20 Summit, many nations came together to create an association for Ethanol. How will this help companies like you in the long run?

One is the Indian context and the other is the global context. In India, there is a need to have energy security that supplements and substitutes the energy that the country imports from overseas. India is rich in biomass and the policies have to encourage the conversion of biomass. The government mandates Ethanol blending and is targeting 20% blending in the next couple of years. Similarly, there is a mandate that is going to come for Compressed Biogas (CBG).

India has to look at it also from an energy security as well as climate change angle. India is committed to achieve net zero by 2070.

Moreover, India has a lot of small farmers and their income security is necessary and this is helped by a dual product from sugarcane if it can go to sugar and Ethanol. The infamous sugar cycle that used to have big surpluses and deficits gets insulated because these surpluses can go into the Ethanol.

Are you also looking at focusing on CBG? How many plants are you planning to set up?

We will certainly do that and at the moment we are exploring the setting up of a CBG plant.

How is Godavari contributing to the Government of India's ambition on these fronts?

As mentioned, we were the first off the post when the policy of Ethanol from sugar cane juicer syrup was announced.

We increased our Ethanol capacity from 200,000 to 320,000 litres per day. Later, we increased the capacity from 320,000 to 400,000 litres per day and now we have gone from 400,000 to 600,000 litres per day. We are very active in increasing the Ethanol programme. We are looking at grain and maize as a feedstock in the coming future to make this a multi feedstock facility. We are also looking at CBG in the future.

You are setting up a grain-based Ethanol project. What is the current status of the project and when are you planning to complete it? We have already received necessary approval from the government. It will help us as a dual feedstock and lead to risk mitigation. As it is a short-term crop, in case there is a monsoon failure, it also gives us a twin feedstock to run our facilities, enhancing capacity utilization of the distillery. Grain-based plant is being planned for two lakh litres per day.

What are your plans for biobased chemicals?

In addition to making our Ethanol facility, multiple feedstock facilities, we are also looking to add Specialty Chemicals to our portfolio. We believe that the use of bio-based biomass to make chemicals, and in particular Speciality Chemicals, is going to be also an area of future development.

There is a big thing of looking at biogenic carbon as a feedstock compared to fossil carbon. This is encouraged by either boardroom commitments, regulations or customer preferences. So, Godavari is continuing to work to make Specialty Chemicals that may find application in Pharma Intermediates, Agro Intermediates or in Coatings, Paints and a wide variety of chemical applications.

We are working with customers closely to see whether we make a drop-in product or it could be a green substitute with slightly better properties so that the substitution may create a better category of product. Traditionally, these things don't happen overnight. You are not substituting a fossil commodity with a green commodity and that would not work because it has a very different economic base. It takes time to work with customers. Godavari is definitely looking to work on bringing in new products in the next financial year.

How does biorefinery foster a culture of innovation and how will research and development play in its growth?

We look at research from four points of view. We look at research on the farm and agriculture site because ultimately biomass is grown on the farm. We have laboratories in Mumbai for lab work. We have pilot plants and research facilities with slightly larger lab facilities in the plants and finally we have some pilot plants where we can do a semi-commercial business before we go to commercial. So, we have a comprehensive culture of innovation. We have many scientists and engineers working with us and we also collaborate with people outside.

What sort of approach to waste management and utilization of waste streams in the operations that you do?

I think the first idea is to think of waste as wealth and see how one can find use in all the waste streams that we have. Recycling brings value from it. Around 50-60 years ago, molasses itself was a waste stream and it became Ethanol. Bagasse was a waste stream and it became electricity. We have various streams today. Now, we are looking at finding ways to extract potash out of the ash of the incineration boilers in a distillery. We are making bricks from some of our other ash. We are also working very seriously on recycling streams.

How does Godavari ensure sustainable sourcing practices and support the local agriculture community?

We are now focusing on research for sustainable sourcing. We often see depletion of oil reserves, gas reserves, trees or coal but we don't observe the depletion of the soil carbon. Ultimately, it is the soil carbon that will convert to biomass, which we can either use for food or energy. The depletion of soil carbon depletes will reduce vields of these products. At the same time, if we can increase this soil carbon, we are going to improve the yields and sequester a lot of carbon in the atmosphere. We are executing a big project on this with Somaiya Vidyavihar University. Agriculture researchers are working on this with a lot of farmers and trying to see whether we can do this on a large scale.

How do you see Godavari Refineries integrating sustainable practices into its overall operations, including resource consumption and emission reduction?

Sustainability is part of our DNA. When we work with farmers to improve soil carbon, we also ask them if they can intercrop with nitrogen fixing kinds of crops such as soya to reduce the use of chemical fertilizers. We are working with them to use traditional agro-ecological practices. The success of this will automatically start sequestering more soil carbon and reduce Scope 3 emissions. Secondly, once CBG is in place, one can

We want to build our strategy of converting biomass into biofuels, foods, sugar, electricity and more a whole range of new chemicals also work with tractor manufacturers to start using tractors on CBG. This is futuristic thinking but it is doable.

We are constantly thinking of how we work on energy efficiencies to further reduce Scope 2. We can produce more electricity from the same biomass. When we are continuously innovating to make products from biogenic carbon, we will continue to reduce Scope 3 as we supply.

For us, sustainability is not just environmental but also social, and we keep educating farmers about soil carbon. Hence, it is the wider definition of sustainability that we work on. When we are able to produce a product that may have a better profile for customers, you have actually achieved a complete win. We are also getting certifications from global bodies such as Bonsucro.

When are you planning to achieve net carbon zero?

We published our first sustainability report and we will articulate a strategy going forward. We want to build our strategy of converting biomass into biofuels, foods, sugar, electricity and more a whole range of new chemicals. This is not a 12 month exercise but a continuous exercise. We will continue to innovate and the effect will be seen in quarters and also in years.

Your thoughts on the future of the biofuel programme?

The Prime Minister at the 90th anniversary of the RBI mentioned about the Ethanol programme. He gave an interview in which he talked about the Ethanol Blending Programme and it finds mention in the BJP manifesto. I believe if India has to maintain its path to net zero and maintain its energy security in the light of current geopolitics, the Biofuel programme will grow.

Does the company plan to go for the IPO in this financial year?

We are certainly looking at filing DRHP this year.



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INVESTED OVER RS. 3,000 CRORE IN LAST 24-30 MONTHS

At 2,225 TPD, our plant at Bharuch is the country's largest single location caustic plant



What are the key trends/ challenges facing the Chlor-Alkali industry in 2024?

It is the usual commodity cycle affecting the larger Chlor-Alkali industry today. The good thing is that it was an anticipated downturn and if I may add, most players were getting prepared to face it. Of course, globally, the downturn was caused by macroeconomic factors due to geopolitical instability such as that inflicted by the Russia Ukraine war. In fact, the industry was recovering post Covid and capacities/consumptions were coming back to normal before the unfortunate and unanticipated war broke off. And to make matters worse and as if one war wasn't enough of a suffering for the world to endure, the Israel-Hamas conflict started.

Given that caustic is a globally traded commodity, the Indian Chlor-Alkali market has also witnessed pricing pressures in the recent quarters. Also, with the downstream chlorine industries such as agrochemicals going through a downwards spiral, the pricing pressures on chlorine have been severe. This has been aggravated by new capacities that many players have commissioned or are commissioning. Also, the issue of chlorine being in an oversupply situation in India is expected to get worse with the additional capacities coming on-line. Balancing the additional capacities with new destination industries within a reasonably short span of time is the challenge that the Indian Chlor-Alkali industry is trying to address now.

Having said so, on the pricing front, we

Fiscal Year 2024-25 is likely to witness a marginal recovery in prices but overall the gradient of recovery is likely to be flat expect 2024 to be marginally better than 2023 and this marginal improvement is likely to be caused by modest recoveries in the downstream industries.

How was DCM Shriram Chemicals' performance during FY 2023-24 and plans for FY 2024-25?

Like the rest of the industry, DCM Shriram Chemicals has been impacted on volume and prices and we have also suffered from an inability to find adequate homes for our products in FY 2023-24. Having said so, we have tried to use the downturn as an opportunity and in some manner, have expedited implementation of cost-side interventions, say on fuel mix or salt sourcing, with the objective of improving the overall health of the value chain.

As I said, FY 2024-25 is likely to witness a marginal recovery in prices but overall the gradient of recovery is likely to be flat. We have recently commissioned our 850 TPD caustic capacity expansion and this takes our total installed capacity to a million metric tonnes per annum. Plus, we will very soon be commissioning our Hydrogen peroxide (H2O2) and the Epichlorohydrin (ECH) plants and these will mark our continued diversification beyond core-caustic.

Thus for us, FY 2024-25 will be the year where much of the "new rubber" hits the road and we will be focusing our energies on making sure we stabilize these new plants and run them in a safe and efficient way while working with our customers to offer us the opportunities to maximise their utilizations.



What is the total cumulative production capacity of all plants and what will be the capacity at the end of FY 2024-25?

For DCM Shriram Chemicals, as I said, with the commissioning of 850 TPD of additional caustic soda, we now are a million tonnes per annum caustic player. We have 2 plants manufacturing caustic soda: Bharuch is the larger one at 2,225 TPD and Kota has a caustic capacity of 550 TPD. In fact, at 2,225 TPD, our plant at Bharuch is the country's largest single location caustic plant.

The soon-to-be commissioned H2O2 and ECH plants will have capacities in excess of 50 KTPA each. We have also recently commissioned an Aluminium Chloride plant with a total capacity also of over 50 KTPA. We are now in the final stages of commissioning a new 120 MW state-of-the-art captive power plant to meet the expanded power requirements of our operations. All these plants are located at Bharuch. Just a few months back, we also commissioned close to 44 MW of solar-wind combo of renewable power through the group captive mode.

The company has recently signed an MoU with the Gujarat

Government for investing Rs. 12,000 crore in the state by 2028. Please specify your plans?

Over the last 24-30 months, DCM Shriram Chemicals has invested over Rs. 3,000 crore in Bharuch for the various expansion and new products that I mentioned earlier. Also as I said, the Bharuch plant of DCM Shriram Chemicals is already the country's largest single location caustic plant.

In Bharuch, we are a part of the GIDC cluster (Gujarat Industrial Development Corporation). The advantage of being in a cluster is that there are downstream consumers of the products that we make. These mutual dependencies with our colocated customer industries have over time evolved into a symbiotic relationship between the players and it is almost a scenario where member industries are cooperating with each other for maximizing their own performance potentials.

Given this context and in light of the emergence of the belt as a chemicals hub of the country, we continue to remain bullish about the prospects of the state of Gujarat going forward. The signing of the MoU with the Gujarat government of Rs. 12,000 crore is a manifestation of our continued bullishness towards the state and our own conviction about the long term opportunities on offer in the chemicals space for us. We have very recently announced Rs. 1,000 crore investment in setting up a world class Epoxy and Advanced Materials plant, which will be at a greenfield site in close proximity to our existing plant in Bharuch.

DCM Shriram had approved 2 new projects – Epichlorohydrin (ECH) and Hydrogen Peroxide. Can you share capacities? When will these plants be commissioned?

Both ECH and Hydrogen peroxide plants are coming up inside our existing operations in Bharuch and each will have an installed capacity of over 50,000 tonnes per annum. We are close to commissioning these plants within the next few months.

Can you share the plans for Capex investment for FY 2024-25 and the projects where you are planning to invest?

As I mentioned, we have just commissioned or are in the final stages of commissioning investments worth over Rs. 3,000 crore across 6 projects – Caustic expansion, Aluminium chloride, H2O2, ECH, a new captive power plant and 44MW of renewable power through groupcaptive mode. For FY 24-25, our focus is simple: "to make the assumptions behind these investments come true".

Having said that, we are also working in parallel towards crafting the next wave of investments – As mentioned earlier, we have announced an investment of Rs. 1,000 crore towards Epoxy and Advanced Materials. Significant amount of ground work will start during this fiscal towards setting up of a new Epoxy plant. We are also exploring an opportunistic play in some chlorine downstream areas – some of which are low capex and with short gestation periods. If all goes well, some investments in such areas will also fructify during the current fiscal.

What strategy should India adopt to become a global manufacturing hub for Chlor-Alkali? What role will DCM Shriram play in making India a global manufacturing hub in this value chain?

The India story is everywhere to be read, felt and seen. Across sectors and verticals, the India growth story is being viewed with immense positive anticipation and bullishness. Specific to the Chlor-Alkali space, India's production has been largely a domestic consumption driven affair with modest exports. Going forward, in order to achieve the stature of being a global manufacturing hub for Chlor-Alkali, the industry needs to focus on global scale at competitive costs. Greening requirements in downstream industries will demand Indian players to green their upstream sources, especially around power, a key raw material for the caustic industry. Emissions and effluent handling will play a key and those with optimal realizations across all products and byproducts will be the most competitive in the global context. Also one will have to be prudent about future plant locations and convenient access to ports will be construed as a competitive advantage. Ease of doing business will become even more important with increasing constraints on land availability.

At DCM Shriram, we have a strong balance sheet coupled with the legacy of a 135 year old organization and a deep understanding of the Chlor-Alkali value chain. We have a very strong pipeline of future investments and we are making sure that those investments happen in the right areas and give us that boost in terms of both top-line and bottom-line going forward.

The company is in the process of establishing a Multipurpose Product Research & Development Centre. How will this centre help to achieve the objectives of the company? Will it also serve in areas like waste to wealth?

DCM Shriram Chemicals has recently set-up an Innovation Centre (IC) at a stateof-the art facility in Vadodara, Gujarat. This facility is a reflection of our commitment to innovation/R&D as a vehicle of future growth for the business. While the caustic value chain has been at the core of the business thus far, going forward, as our investments in H2O2 and ECH are testimony to, we are keen to move into specialized value-added chemistries. The Innovation Centre has already been certified by DSIR, Govt. of India and it will be working on 4 key verticals, viz. "Green & Sustainable Chemistries", "Advanced Materials including Epoxy", "Water Treatment & Allied chemicals" and "Other Emerging Technologies". The IC will focus on "applied research" and try to remain close to the customer, understand their requirements and work internally with the manufacturing team to come out with newer products in the new age chemistries that we are looking at.

We have a very strong pipeline of future investments and we are making sure that those investments happen in the right areas

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Can you elaborate initiatives taken by DCM Shriram for enhancing process safety across all facilities/processes to make operation intrinsically safe?

As DCM Shriram Chemicals, we consider safety as a cardinal and indispensable condition for our existence. As part of a 135 year old group with a rich legacy, we, the current crop of managers, can only contribute to the group's heritage if we are able to conduct our affairs in a safe and sustainable manner. It is the abiding principle of "zero harm" that guides us as we conduct our day-to-day affairs. It encompasses "zero harm" to the people in our plants, being it on rolls or contractual, "zero harm" to our equipment /assets and "zero harm" to the environment where we operate. There are specific actions around each of these principles that are underway in our plants.

We have also been working with external safety consultants of global repute and benchmarking our safety systems with those of global Chlor-Alkali players in order to reaffirm our position in the safety journey, especially around the processes and policies we adopt vis-à-vis what the global majors do.

Recently, the chemicals business has undergone a rebranding exercise. What is the objective behind this exercise and how will it help the business in the long run?

I would not classify it as a "rebranding" exercise – it is more an exercise aimed at "refreshing" our brand identity and reiterating the brand promise. We have always been "DCM Shriram Chemicals", but now we have a refreshed logo of the business with a reiterated brand promise of "delivering sustainable solutions". The objective is to ensure continuity while at the same time, taking up a platform where we are promising ourselves and our stakeholders that "sustainability" is now core to our operations and that the business is getting closer to its customers and moving from being a product manufacturer



Going forward, it is a combination of long and short term priorities that will determine the shape of our strategy. While for the long term, it is the opportunities around sustainability and

to being a "solutions provider". The colour tone's metamorphosis

from blue to green is a subtle play to further emphasize the greening of our businesses, now and going forward. Lastly the word "delivering" implies a combination of action orientation, agility and result focus - all of which

are attributes that the business now stands for

DCM Shriram's CSR Policy is aligned with preventive healthcare, sanitation, education, skilling & livelihood, environment sustainability. **Agri-skilling** livelihood, and water in agriculture. Can you share details of projects executed in FY 2023-24 and plans for FY 2024-25?

You are right. As a group, DCM Shriram has always believed in growing with the communities where one operates. Long before rules around CSR were formulated, the group has worked towards improvements of the lives of the





people and communities around us.

At DCM Shriram Chemicals, we're deeply committed to our CSR initiatives, echoing our longstanding group's dedication to community impact. We've tailored CSR endeavours our in alignment with DCM Shriram's overarching

objectives, working closely with the DCM Shriram Foundation to craft programs with the core pillars of convergence, collaboration and creating impact.

For instance, through 'Kishori Utkarsh Pahel' (KUP), supported by the DCM Shriram Foundation, we're actively promoting health awareness with a focus on empowering adolescent girls. The program is in collaboration with the Bharuch District Administration, Health and Education Department and UNICEF as Knowledge partners. We are dedicated to creating measurable impact.

Going forward we have set targets for the next two years where we are striving to enhance our environmental footprint by aiming to plant one million trees and creating surface storage space of one

white spaces in the market that will determine our strategic choices, in the short run, finding newer homes for the excess chlorine will be important. Without adequate and appropriately chosen chlorine tie-ups, the caustic capacity utilization has the risk of remaining suboptimal. The good part is that we don't need to do everything ourselves and intelligent alliances/partnerships can help meet the chlorine objectives in a much shorter time horizon with much lesser investments.

Overall, DCM Shriram Chemicals is an exciting place - happening, intense and fast paced. We are in a hurry and believe we have lots to do in a short span of time. We are today a million tonne caustic player and have chosen for ourselves adjacent platforms to play, whether it is around Epoxy/Advanced Materials or chemistries such as those of H2O2 and Aluminium chloride. We are also closely evaluating options around sustainable energy choices and fuel mix options. Fortunately for us, the spaces that we are in, are growing and thus we need to grow even if we were to maintain our relative position vis-à-vis our peers.

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Plan to spend around Rs. 300 crore on Capex on multiple projects in FY25



2023-24 industry trends/ challenges in Chlor-Alkali, Derivatives and Specialty Chemicals?

2024 was a challenging year for the chemical segment. Post-covid the demand surged which led to big capacities coming to market. At the same time, demand was subdued globally thereby impacting India as well. High interest rates forced western world to keep less stock, triggering destocking and low consumption in China. This led to production from China dumped in the global market leading to drop in realizations for all the products. However, we see recovery shaping up quarter on quarter. Although this is not back to normal, it is improving and we expect it to improve further.

During FY2024, Chlor-Alkali was the most impacted because of subdued demand, over supply and realizations touching all-time low. However, we witnessed things improving just below normal level by the end of the year and we expect it to improve. Derivatives & Specialty business was also low in demand and realizations were at an all-time low but we see situations improving quarter on quarter, especially if end user industries are diversified.

How has Epigral performed during FY 2023-24 and forecast for FY 2024-25?

FY24 was a challenging year for Epigral

India needs to focus on strengthening its position in various feedstocks to create a whole ecosystem

as well, however, we performed better compared to the industry on account of our strategy to diversify business model. In FY24, Chlor-Alkali was impacted both in terms of realization and demand but our Derivatives & Specialty segment which caters to various industries performing better for us. Also the past Capex we did and the projects that we commissioned in FY23 helped to have volume growth of 15% in FY24. Even in this tough environment, our EBITDA margin improved guarter on quarter from Q1 FY24 and we ended the full year with a margin of 25%. Considering Capex we did in the last 3 years, will drive the volume growth in FY25 and FY26. We believe FY25 would be definitely better than FY24 with a volume growth of around 15%.

Epigral is aspiring to reach revenue of Rs. 5,000 crore by 2027. New plants that you are planning to commission to make it a reality?

Yes, we are a growth oriented company and very much focused to bring consistent growth. Projects that we commissioned in FY23 and we will commission in FY25 will drive volume growth both in FY25 and FY26. We have a few projects under our evaluation which we will announce soon. This will further drive growth beyond FY26. These chemicals will be import substitutes, having good growth prospects and will also strengthen our integrated complex.



Total cumulative production capacity of all plants? What would be the capacity at the end of FY 2024-25?

As on 31st March, 2024, our Chlor-Alkali capacity stood at 421,000 TPA and Derivatives & Specialty capacity stood at 190,000 TPA, which included CPVC Resin, Epichlorohydrin, Chloromethanes and Hydrogen Peroxide. We recently commissioned an additional CPVC Resin capacity of 45,000 TPA in FY24 which makes our total capacity standing at 75,000 TPA (world's largest single location plant). In FY25, we will also commission CPVC compound capacity of 35,000 TPA and commission Chlorotoluenes value chain capacity.

Capex invested in FY 2023-24 and projects where it was invested? Capex investment for FY 2024-25 and projects where you are planning to invest?

In FY2024, we invested around Rs. 405 crore in Capex which was towards

additional capacity of CPVC Resin of 45,000 TPA, CPVC Compound capacity of 35,000 TPA and Chlorotoluenes value chain capacity. For FY25, we plan to spend around Rs. 300 crore on Capex on a few of the above projects and on ones we will announce soon.

Strategy India should adopt to become a global manufacturing hub for Chlor-Alkali, Derivatives, and Specialty Chemicals? What role does Epigral sees for itself in making India a global manufacturing hub?

For India to become a global manufacturing hub, we need to spend more on creating new facilities, invest in R&D to strengthen our position in the specialty chemical segment and to get orders from the global market for niche products. India also needs to focus on strengthening its position in various feedstocks as that will create a whole ecosystem to have a full value chain within India, rather than importing major raw materials. Government needs to focus on various initiatives to motivate the manufacturing segment in India. The government also needs to focus on creating robust infrastructure like the PCPIR region of Dahej, and we need more such parks in India for it to become a global hub for chemicals.

How rebranding from Meghmani Finechem to Epigral will help the company to transform as a global multi-product chemical conglomerate?

As per our strategy, we are moving from bulk chemicals to Derivatives & Specialty business. Our Derivatives & Specialty business contributed 45% of total revenue in FY24 vs 0% in FY2019. We have also started exporting our products in the global market. Considering future growth, we are open to various partnerships where we can enter into new chemistries, on the basis of our project execution capabilities. With all these, we are here to enhance the value for our stakeholders. The name change is in line with this spirit and that is where we decided to reposition the company and changed the name of the company from Meghmani Finechem Limited to Epigral Limited.

Epigral is planning to commission a Chlorotoluene value chain plant. What's the capacity and when are you planning to commission it?

Yes, we will be the first in India to set up Chlorotoluene and its value chain plant. The basic capacity for the plant will be of around 15,000 TPA. There are 3 blocks, including one multi-purpose plant. We are going to do various reactions in this segment and will cater to the agrochemical and pharmaceutical industry. In the first phase, we will be launching around 10 to 15 products. We are almost there in setting up the plant and phase wise will commission all 3 blocks. We expect the full plant to get commissioned in Q2 FY25.

Epigral is also venturing into CPVC compound production with a projected capacity of 35,000 TPA. When are you planning to commission the plant?

We are expecting to commission this plant in Q1 FY25.

Epigral has inaugurated its R&D Centre in Ahmedabad in November 2023? New products that you are working on and how will it be beneficial in the long run?

Epigral's new R&D center is a strong pillar for its growth in the Specialty business. We have a good team and we will further increase the team size. The R&D center is working on various molecules and products but immediate focus is on new downstream molecules of the Chlorotoluene value chain. Research is going on and we are positive to announce further growth prospects in these lines, maybe in the coming years.

The company has also commissioned 18.34 MW of green hybrid power plants in the last fiscal? How is this beneficial for the company?



Yes, we commissioned it in FY24 and it has helped us to reduce our carbon footprint and contribute to the environment. It has also helped us to reduce the cost of electricity.

Initiatives taken by Epigral India for enhancing process safety across all facilities/processes to make operation intrinsically safe?

Epigral is very much focused on Environment, Health and Safety and we continuously improve processes and instruments to have a safe environment for our employees to work. During the year, we have taken various initiatives, few of them are validating firefighting measures, new techniques to recycle various by products and effluents, lifeline protection kit, training on various safety topics, strengthening emergency response team, etc.

Sustainability roadmap of Epigral and what's the sustainability plan in FY 2024-25?

Epigral's new R&D center is a strong pillar for its growth in the Specialty business

The company is focused to drive business in sustainable way by adapting various practices like. improvina efficiency to consume less energy per ton of production, adopting latest and best technology to reduce wastage, strong sewage treatment plant to facilitate the reuse of treated water to conserve environment, engaging with local communities through philanthropic initiatives, setting up 18.34 MW wind solar hybrid power plant, creating green belt at the manufacturing facility, etc.

CSR initiatives of Epigral in FY 2023-24 and plans for FY 2024-25?

We are committed to make a positive societal impact through CSR initiatives. The company believes in giving back to the community and participates in education, health, women empowerment, skill development and environmental protection programmes. We have contributed to various charitable trusts and supported diverse social, educational and economic development initiatives. Epigral focuses on empowering women through education and self-employment upskilling opportunities. The and company has established and supported educational and medical facilities, enhancing access to essential services for underserved communities.



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INDIA MUST BRIDGE GAPS IN BUILDING BLOCKS OF RAW MATERIALS

LANXESS is focused on growth in North America and Asia, particularly India



Emerging trends/challenges in the Specialty chemicals in 2024 and how LANXESS India is planning to circumvent it?

Firstly, we are well aware that Artificial Intelligence (AI) is going to bring about transformational changes and exciting opportunities in the chemical industry. We are trying to leverage it and are actively working on the same. We will be doing a pilot scale in India and take that learning to a global level. AI can be used for forecasting, improving productivity, predictive maintenance, supply chain management and also order management to bring operational efficiency. That is one emerging trend we see and we are trying to leverage it fully.

Secondly, LANXESS has transformed into a specialty chemicals company and with headwinds in the chemical industry, we are also working on the Excellence initiative. This will be rolled out in a phased manner till end of Q1 2025. We are going to leverage it to become more efficient for our customers, improve customer management, operational management, logistics, supply chain, procurement and innovation. The focus of innovation is mostly on the development part and not the research part.

In terms of challenges, there is a lot of geopolitical tension because of fluctuations in energy prices and recession in Europe. I think that's also impairing logistics because we are seeing that the shipment is taking a longer route, longer time, and is becoming more expensive. We are trying to circumvent it to the

We have also acquired an additional five-acre land keeping in mind the longterm growth plans extent possible. Comparatively, the demand in the Indian market is still stable but prices are down because of distribution from China but we are trying to keep our top line intact and also trying to improve the bottom line.

Key achievements of LANXESS India in FY 2023-24 and plans for FY 2024-25?

LANXESS is a leading specialty chemicals company, and our core business is the development, manufacturing and marketing of chemical intermediates, additives and consumer protection products. For us, safety is a core value and we have done very well on this front in the last couple of years. Our focus is on asset utilization, and it was quite good last year.

For our safety and sustainability initiatives, we have been acknowledged and rewarded by various industry bodies and associations. In the recent past, we received the FICCI Chemicals & Petrochemicals Award for Sustainability – Excellence in Safety. We also got the prestigious CII Western Region Award for Excellence & Innovation and BCCI Award for Workplace Safety.

Apart from this LANXESS India also received the Global CEO Safety Award 2022. This is an internal award by LANXESS presented to teams who showcase exemplary commitment towards safety over the year and drive successful initiatives and contributions related to safety occupation at LANXESS. The focus is on preventing accidents and incidents by sustainable implementation of safety processes.

Going forward in FY 2024-25, we would

continue to focus on safety and sustainability. Our Excellence initiative is currently in the process of being rolled out and has been very strategically devised keeping in mind that both India as well as the chemical market is on a growth trajectory. Our board members are very excited about the growing India market and we are aligning and adopting strategies for further growth including upgrade of the ERP system.

We are looking at both organic and inorganic growth in the coming years. More organic, as the listed companies are overvalued at the moment. Since 2019, we are increasingly looking at finding attractive companies for takeover in all the segments where we are present like - paints and coatings, polymer additives, water treatment and detergents, tyre and rubber industry.

LANXESS Jhagadia has three production facilities for 3 BUS – Liquid Purification Technologies (LPT), Material Protection Products (MPP), and Rhein Chemie Additives (RCA). How are things progressing on BU fronts? New initiatives at Jhagadia?

The site in Jhagadia is a key manufacturing base for LANXESS globally and has been built to world class standards. The production facilities as well as the utility services at the site ensure safe and environmentally responsible operations.

The National Chemical Safety Committee recently visited our Jhagadia site and appreciated the safety efforts undertaken by LANXESS.

Going forward, we will continue with our focus on Safety. There are many leading indicators that have been set up and actions on finding out near miss incidents and reporting thereof is encouraged. Every employee has a target of reporting near miss incidents and all managerial employees have to conduct periodical safety dialogues. They observe the work and discuss whether it is being done in safe or unsafe manner and then start with a positive dialogue on how it could have been done better.



We have also acquired an additional fiveacre land keeping in mind the long-term growth plans.

C LANXESS India completed and put into operation the expansion of the Rhenodiv production line in Jhagadia on February 1, 2024. What's the update on this front?

We see a potential good market here in India. Currently, we have commissioned the plant and the new Rhenodiv grades are successfully undergoing approval tests at various tyre companies, a fundamental step towards ensuring product excellence and market readiness and we expect to receive full approvals by the end of Q2.

The product will not just be for India but also for the subcontinent including other Asian countries.

What strategy India should adopt to become a global manufacturing hub for LPT, MPP and RCA chemicals? LANXESS India's role for making India a global manufacturing hub?

The global chemical industry is ~US\$ 5 trillion in comparison, the Indian chemical industry that is ~US\$ 180 billion, which is roughly about 3%. It is estimated that the industry will be having a CAGR of 10% plus in next few years. Also, currently the trade deficit of US\$ 20 billion gives us two opportunities either to improve exports in the selected areas or reduce imports by becoming self-sufficient. China plus one strategy was there for quite some time, but it didn't gain much traction in the past. Now we see it gaining traction due to a lot of initiatives taken by the Indian government. India has a large domestic market including a huge middle-class population as a lot of people have been pulled out of poverty. The pull factors are - change in the bankruptcy code during 2016, high quality infrastructure development initiatives and a large pool of manufacturing talent in terms of good engineers.

Having said that India must bridge the gaps in building blocks of raw materials. The chemical industry is looking for good PLI policies. While ease of doing business has improved significantly, it needs to be improved further. This will surely help India to become a global hub for chemicals.

LANXESS AG CEO & Chairman of the Board Management, Matthias Zachert during his recent visit to India was very impressed to see the development and was excited over upcoming infrastructure investments. He commented that LANXESS is focused on growth in North America and Asia, particularly India. This marks a shift from just focusing on China to prioritizing India. I think it's a very powerful and encouraging statement.

What's the sustainability plan for LANXESS India in FY 2024-25?

LANXESS is highly committed to sustainability, and we have launched many initiatives in this direction that we are very proud of; however, as we are aware,



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sustainability is a journey and not a destination. In terms of climate change, we have done a lot on climate change, water utility management, water stewardship and employee safety.

In India, we have achieved about 84% of climate neutrality on annualized basis for Scope 1 & Scope 2 emissions and have significantly reduced the emissions at our plants. We made an inventory of emissions at Jhagadia and Nagda plants. After creating the inventory of emissions, we then looked at process optimization and process improvement. We have done extensive energy audits to bring down the specific consumption of energy. At Nagda, we are generating our own electricity and at Jhagadia we have done a green power purchase agreement.

LANXESS India's plan to achieve climate neutrality by 2040? Milestones that you have set for achieving it and plans for FY 2024-25?

Globally, we are aiming to achieve climate neutrality by 2040, completely eliminating Scope 1 and Scope 2 emissions. Further, we have prepared two guidance documents -First, is decoupling emission growth. Here the growth has to happen, but emissions have to be controlled. Second, is pursuing technology innovation. Here we have to be innovative and see how to keep the growth intact yet reduce the emissions.

C LANXESS is aiming for 30% women management positions globally by 2030. What's LANXESS India's plan on this front?

LANXESS has been globally committed to diversity and inclusion because we feel that diverse teams can make better decisions and

also drive innovation. I think the development and training opportunities have been designed in such a way that it is attractive for women employees. Balancing work between personal and professional life, flexible working and also knowing other colleagues might be needed. Gender sensitive policies, equal pay for work of equal value and also zero tolerance for sexual harassment at workplace have been implemented. We have created an internal platform called WinX for imparting skill and empowering women to know their concerns. About 10% of our workforce in the India organization are women. We have identified the gender-neutral positions where we can take women based on competencies. With this plan in the picture, I am sure 30% women workforce globally should be achievable by 2030.

Key CSR initiatives of LANXESS India in FY 2023-24? Plans for FY 2024-25?

In terms of CSR, our focus areas are education, climate protection, water and culture. We also focus on skill development, employability and healthcare. We engage in sustainable development projects that aim to uplift local communities, promote social welfare, and protect the environment.

In Jhagadia & Nagda region, over the last few years, we have been working on various projects like solar roofing of government schools, solar lighting in villages, facilitating digital smart class for municipal schools, providing basic educational amenities like school bags to municipal schools, vocational training and skill development etc. We are closely involved in uplifting these government schools. Apart from this, we have also supported the communities in times of need by mobilizing our resources and providing them with essential relief material during natural disasters like floods.

In FY 2024-25 also, we will continue to support the communities through our CSR interventions with clear focus on topics of education, climate protection and skill development among others.

Initiatives taken by LANXESS India for enhancing process safety across all facilities/processes to make operations intrinsically safe?

On quality and safety, we share the same standards as followed by any developed and developing countries. Process safety is an important vertical of safety and thus plants are designed in a way that these are intrinsically safe. For that we have a muti-disciplinary team consisting of different experts who identify the hazards and decide on measures. That becomes a basis for getting the licence to operate because without that we cannot start the plant.

There are other important factors under Process Safety Management (PSM). One is the plant asset integrity where we do regular check-up and keep the assets intact. Second important part is the human aspect where we are imparting training and sharing the standard operating procedures with all our employees. After we impart the regular training, we also do an efficacy check to see how much has been understood by the employee. Then there are digital safety audits where the global experts come down and see what mitigation measures are in place and then give rating based on that. We firmly believe that employees should remain safe and go back home safely.

How do you see the chemical sector outlook in 2024?

India's outlook is good as the market is still intact except the fact that we are experiencing price pressures due to distribution from China. We sincerely hope that the Chinese economy picks up so that distribution comes down and the prices improve. While the prices are improving, we need to evaluate how sustainable it is. Globally, we are seeing a little bit of light at the end of the tunnel but how much of it translates into business, needs to be seen.

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Launching over 20 new products annually reflects our dedication to remain at the forefront of market trends



2024 industry trends in printing inks, varnishes, resins and pigments?

Particularly encouraging is the revival of volumes in rural India, approaching pre-COVID levels. A noticeable shift is observed towards sustainable ink systems within the flexible packaging domain. Innovations such as UV LED, EB, Sheetfed Mineral Oil Free (MOF) inks, Web MOF inks, and water-based inks are gaining traction among print buyers, emphasizing a growing commitment to ecofriendly solutions.

How has hubergroup performed during FY 2023-24 and what's your forecast for FY 2024-25?

In 2023-24, our Print Solution business recorded a significant YoY volume growth,

accompanied by a remarkable recovery in business margins compared to the previous fiscal year. Forecasts for FY 2024-25 indicate a similar growth trajectory to that witnessed in FY 2023-24, suggesting continued momentum and positive trends for the company.

For the last 250 years, hubergroup has been providing innovative printing inks and printing aids such as coatings and additives for commercial, packaging and newspaper printing. How difficult was it to develop printing ink families?

We've made substantial strides in expanding our UV oligomer, monomer and ketonic resin offerings Managing and maintaining a leadership position demands relentless effort. At hubergroup, we addressed this challenge by developing innovative printing ink products due to our culture of innovation. We have been constantly refining and expanding our product range to meet the ever-evolving needs of the printing landscape. We have also aligned our offerings to meet market demands. These have reinforced our standing as innovation leaders in the printing domain.

What's your India and Asia strategy for printing inks in FY 2024-25?

Our strategy is centered on two key pillars. Continuous Innovation and Optimization:

We are committed to consistently innovating and optimizing our printing ink product range with a global market perspective to ensure that we stay ahead of the curve.

Expanded Market Penetration: We aim to enhance our presence in specific segments such as Low Migration Low Odour Conventional & UV Inks for offset and web applications (MGA), Premium folding carton inks for Gravure, and water-based inks for Gravure applications. By strategically penetrating these areas, the company can better cater to the diverse needs of the customers and solidify our position in the market.

The Chemicals Division of hubergroup has competence in production of raw materials for printing inks and coatings and has an extensive product portfolio as it addresses
customers all over the world. What's your India and Asia strategy for the Chemicals Division in FY 2024-25?

Our strategy showcases a balanced and forward-thinking approach. Our primary focus is to create new and advanced products, specifically tailored for the ink and coatings sector, to meet the needs of our valued Indian and Asian customers. Our portfolio diversification strategy showcases synergistic offerings tailored to rubber and adhesive applications, enabling us to capitalize on emerging opportunities. Recent successes, such as our advancements in lamination adhesives, demonstrate our expertise in the field.

We've also invested in contract manufacturing services for a couple of leading coating manufacturers to strengthen our industry partnerships and expand our presence. Looking ahead, we're committed to continued innovation and product development while maintaining our high standards of quality and customer satisfaction.

operates two

hubergroup #

In India, hubergroup production plants, which manufactures UV-curable oligomers, polyurethane resins, laminating adhesives (2K PU

systems), modified rosin resins, PVB, ketone resins and polyamides as well as pigment concentrates, alkali blue and adhesion promoters with a cumulative production capacity of almost 300 kilotons.

Industry where these products are being presently used and are you looking at new industry verticals for these products?

As you rightly highlighted, hubergroup stands at the forefront with an impressive manufacturing capacity exceeding 300 KTPA across two state-of-the-art plants. These facilities manufacture a wide range of products catering to an array of industries and sectors, spanning ink, coatings, construction, flexible packaging and adhesives. Our commitment



to innovation is evident in our continuous expansion of product offerings.

We prioritize sustainability and regulatory compliance, developing products that not only meet stringent industry requirements but also align with the growing emphasis on environmentally responsible solutions. Furthermore, we actively explore new industry verticals, seeking opportunities to deliver

roup a value and meet specific market needs. We aspire to continue to lead the market by anticipating trends and delivering innovative solutions that surpass customer expectations.

What strategy should India adopt to become a global manufacturing hub for printing inks, varnishes, resins, and pigments? And, what role does hubergroup see for itself in making India a global manufacturing hub?

India's path to becoming a global manufacturing hub for printing inks, varnishes, resins, and pigments hinges on strategic initiatives. Embracing lean manufacturing, leveraging low-cost automation, harnessing data, and computing for proactive process control, upskilling the existing workforce, optimizing energy usage through advanced machinery and adopting renewable fuels and energy sources are key strategies. hubergroup envisions a pivotal role in this journey. By leveraging our expertise and global experience, we aim to contribute significantly to making India a global manufacturing hub. Through collaboration, innovation and investment in cutting-edge technology, we aspire to drive efficiency, sustainability and excellence in the manufacturing processes.

hubergroup research centers have been investing a lot of time and energy in development of product safety or the identification of environmentally friendly alternatives, and much more by launching more than 20 new products per year.

What's the reason behind this continuous innovation and bringing sustainable products? How will it increase the company's topline and bottomline?

Our steadfast commitment to continuous innovation and sustainability is driven by several key factors. Firstly, the rapid evolution of markets, coupled with an increasing demand for sustainable solutions, propels our drive to adapt and stay ahead of the curve. Moreover, stringent global regulations and the growing emphasis on a circular economy compels us to prioritize the development of environmentally friendly alternatives.

Launching over 20 new products annually reflects our dedication to remaining at the

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GECKO Series Inks for Modern Food Packaging Solutions forefront of market trends and meeting the ever-changing needs of our customers. By enriching our portfolio with products that resonate with global demand, we aim to strengthen our market presence and enhance competitiveness.

hubergroup's collaborative R&D approach, epitomized by our dedicated teams in India and Germany, embodies our philosophy of "Designed in Germany, made in India". We are confident that increased investment in R&D, through the addition of resources and equipment, will expedite our development process, enabling us to introduce innovative products to the market more swiftly.

While financial performance is essential, our ultimate goal extends beyond profit margins. We aspire to contribute meaningfully to India's societal advancement by delivering top-notch product offerings. We firmly believe that our strides in sustainable product development will not only drive long-term organizational success but also positively impact society and the environment.

Last year hubergroup launched three new solvent-based ink series - Gecko Platinum Plus, Gecko Platinum NT and Gecko Gold which are specifically tailored to the needs of the Asian market. How are you planning to position these products in the Asian and Indian market and what is the size of the Asian market?

Our products are strategically positioned as premium inks for the food packaging segment. The response from converters has been highly favorable, with most of our Toluene-free offerings gaining significant traction in the market. In India, the market size for toluene-free inks amounts to approximately 50–60 thousand metric tons annually. Safety and health to all stakeholders would always be a priority at hubergroup.

hubergroup is planning to expand its UV oligomer, monomer, and ketonic resin product range through its own manufacturing unit or custom

manufacturing. What's the update on this front?

We've made substantial strides in expanding our UV oligomer, monomer and ketonic resin offerings. For UV oligomers, we've boosted both our in-house manufacturing capacity and custom manufacturing capabilities. Looking ahead to FY 2024-25, further expansion is on the horizon to meet the escalating demand for energy-curing applications. The expansion of our monomer and ketonic resin product lines has been guided by market demand. We've enriched our portfolio with new monomers and intensified our marketing initiatives for ketonic resin, actively exploring new applications to maximize its utility.

In tandem with these expansions, we're

Our products are strategically positioned as premium inks for the food packaging segment

also enhancing capacities for additional products like PVB and polyamide. These initiatives reflect our commitment to holistically address market needs and deliver a diverse array of premium-quality products to our valued customers.

Initiatives taken by hubergroup for enhancing process safety across all facilities/processes to make operation intrinsically safe?

We are implementing the "Building Defenses Program," which operates on a set of 16 leading indicators to improve safety outcomes. We are very proud of having one of the best effluent treatment and water treatment plants in the industry. We continue to set new standards in the safety of our employees and the society around us through a series of continuous improvement programs.



initiatives of the company in India and Asia in 2024?

We are adopting the CSRD Initiative, which stands for Corporate Sustainability Regulation Directive. This directive will directly impact on our current reporting obligations. Originating from Germany, this initiative aligns with ESG requirements and is equivalent to the compliance standards of EcoVadis for the region.

When are you planning to become Net Carbon Zero? Milestones that you have set for achieving it?

We continue to build strategies and find innovative ways to minimize our carbon footprints. At our sites in India, we are reducing energy consumption through energy-efficient technologies and process improvements. We have implemented photovoltaic systems in our plants. We are also fostering the use of renewable energy sources like wind and solar.

Major CSR initiatives being undertaken by hubergroup in FY 2023-24? Plans for FY 2024-25 with respect to rural healthcare?

Our CSR initiatives span a spectrum of impactful endeavors targeting livelihood improvement specific to health and education, specifically in the neighboring regions of Vapi and Silvassa, where our factories operate. Teaming up with renowned NGOs, we're making a tangible difference in communities. Our Fartu Davakhanu (Mobile Medical Vans) equipped with doctors and nursing staff continues to visit the rural areas of Valsad and provide general healthcare, dental and eye care services.

Anything more you would like to add from your side...?

While going through our daily routine – We are confident that people touch our products a few times a day and we continue to strive to make that experience delightful.

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Industry trends and challenges in the segments Silox India is focusing on?

We are primarily into the inorganic chemical space serving diverse end market segments like textiles, automotive, consumer, paints and coatings etc. 2023 has been a mixed bag. The textile industry has been most impacted, especially the denim segment, factors including global recession, war impact, reduction in demand from North America and Europe, fluctuations in cotton prices and unpredictability of the business badly impacted the demand from textiles. However, the market started stabilizing and picking up and the capacity utilisation improved from 40-50% to around 80% in Jan – March 2024 guarter. The biggest challenge we are facing is whether it's going to be sustained for a longer period of time at this level. The domestic demand for textiles in India seems to be more stable. Also, the demand for synthetic textiles is more predictable and continues to be quite strong. Overall, the textile industry is a mixed bag and while it was tougher, it's getting better.

We primarily supply Zinc oxide and Zinc derivatives to the automotive market (tyres and tubes). We have seen sustained good demand from both the OEM and retail segments. Retail has seen some impact due to unavailability and high price of raw

Silox India has almost 40% of its produce being exported to more than 65 countries materials a year ago but overall the industry seems to be positive in terms of demand.

Moreover, the coatings and infrastructure market is seeing robust demand due to continued investment by the Government of India and private players in infrastructure like railways, airports and roadways.

We see a sustained demand both from the domestic market and global key players whom we work with.

In the consumer segment, we are in unique market segments like jaggery processing, dates processing, etc. We are seeing moderate increase in demand as people are getting more health conscious consuming more jaggery than white sugar. However, availability of sugarcane but for this particular industry getting limited and hence would say this market is more muted.

Combining all these different factors we have seen moderation in export but robust domestic demand. On overall performance, we had pretty strong financial performance even though our top line have seen moderation but improved bottom line due to efficiency improvements, improved Zinc valorisation and introduction of value added product in Zinc derivatives increased our bottom line.

Almost 80% moderation has happened globally. Do you see things going back to 100% if it goes as per plan?

We were hoping to get better, but

unexpectedly Red Sea issue impacted significantly both from freight point of view which is more than five times and shipping times which has doubled affecting the competitiveness of the industry. But looking forward we are positive and most of our customers were seeing an increase in the demand in short term, but considering dynamic geopolitical situation, visibility is limited and it is very difficult to predict beyond a guarter.

How has Silox India performed in FY 2023-24 and what's your expectation in FY 2024-25?

We had a good year considering the challenges during the year. We have seen a significant drop in demand for Sodium Hydrosulphite (Hydros) products which primarily gets into the denim market but it has been compensated by the robust demand for value based products. We are able to deliver for other markets like automotive and industrial segments. We were down on the top line, but we have fared better on the bottom line primarily due to efficiency improvement, commercialization of some value added products and addition of new segments.

Do you think that FY 2024-25 would be compensating for whatever losses that you made in the last fiscal?

We are positive that the demand will pick up and the situation will continue to improve unless we see any other major disruption. From the domestic market side, once the election is over, we see there is going to be continued focus on enhancing infrastructure. We are positive about being able to capture whatever the loss, not in the next quarter, but overall for the financial year.

Any numbers with respect to FY 2023-24?





Last year, we saw a double digit growth in profitability. We have seen a single digit decline in top line and that's primarily to do with the metal pricing. We don't disclose individual unit numbers, but we had one of the strongest financials in terms of the bottom line performance.

What's your cumulative production capacity of all the three plants (Silvassa, Ekalbara, and Atladra)? How do you see this capacity changing at the end of FY 2024-25?

> We completed a significant expansion of Zinc powder capacity in Silvassa. In 2023-24, we were able to fully utilize the capacity of the Silvassa

plant. We added new capacity Hydro Zinc in our Ekalbara site and expect additional capacity to be helpful in terms of meeting future growth. Overall, our capacity has increased by almost 10% with the debottlenecking and with efficiency improvement initiatives. We aim to further increase capacity for our zinc powder by 8,000MT/year, we have received the board approval and will be executed during FY 2024-25.

INDIA

What is the total capacity that you have right now?

"Silox India is an Indo-Belgian JV Company with a history of more than 5 decades. We are the largest manufacturers of Sodium Hydrosulphire (SHS) in Asia (outside China) and Sodium Formladehyde Sulphoxylate (Safolite[®]) and Zinc Formaldehyde Sulphoxylate (Safolite[®]) in the world. Other products in our portfolio include Zinc Oxide, Zinc Oxide, Kinc Mosphate, Zinc Oxide (Aktriw), Zinc Oxide (HAS) and Textile Auxiliaries. We have inbase capabilities for recevery of value added Hetai Salati from Socondary Heta through Hydroneallurgy, Silox India is a market leader in India for most of our products and has a strong global presence through exports to more than 65 countries spread across six continents of the world."

The total capacity will be close to 170,000 kilo tonnes per year. We continue to invest in expansion and will be able to enhance 5-7% of the capacity during the current financial year.

What was the investment that you made last year and what's the plan for this year?

We expanded a new line for our Silvassa facility that was 7,000 tonnes capacity expansion and also executed debottlenecking for our overall capacity. Both of them were growth Capex. In terms of overall Capex which includes operational debottlenecking and growth Capex, we invested around Rs. 30-40 crore last year and we expect to continue to do the same. We have our new site coming up near Dahej and there is going to be a significant amount of Capex that we will be spending.

Strategy for India to become a global manufacturing hub for the segments that you are in and what role does Silox India play in making it a reality?

Silox India has been a significant contributor to the overall turnover of chemicals globally and will see the highest capital investment in the next two years.

> Silov India Private Limited Indian Rootz...Global Mindset Kalali Rood, Aladara, Vadodara 390 012, India Tel: +912 265 268401. 05 E-mail: Info@siloxindia.com Website: www.silox-india.com

In terms of being global and relevant. Silox India has almost 40% of its produce being exported to more than 65 countries. We have a significant presence already in exports. Our major focus will be on enhancing our Sustainability footprint, Improving efficiency and Safety at operations and new Product Innovation. These are the three fundamental blocks on which our future investments will be based. Our major Capex is being invested in enhancing our sustainability footprint in the areas of power, water and waste reduction.

In FY 2023-24, Silox India acquired a 35 acre land parcel at Payal industrial Park? What's the Capex that you are investing and what products are you planning to manufacture?

We have successfully completed the acquisition of the land parcel in the last quarter of last year. The plan is to set up a new greenfield site for all our Sulphoxylate products and Zinc Oxide and Zinc derivatives. This will be a greenfield project and will be consolidating product line currently produced in Atladra site to the new site.

The new facility will use new technology and significant improvement in terms of overall ESG impact and will be more self-reliant including backward integration. In terms of the capacity, we are going to build almost 30% additional new capacity compared to our existing product line for these products. We expect the construction activity to start by the third or fourth guarter of this year and we expect to start commercial production and regular supplies in the second guarter of 2026.

Any numbers on the Capex, what amount of investment you are planning to do in the next two fiscal vears?

Including the land, we will be investing more than Rs. 500 crore on the new site



We have new innovation for recycling Lithium ion batteries by capturing the value and giving back to the industry for future use

over next three years. Essentially, this plant is going to be inherently safer, ESG compliant, Digitisation and Automation of critical operations, and we want it to be the factory of the future. At the same time, it is going to be much more backward integrated meaning more self-reliant.

Silox India has been focusing on innovation. What is the next product you are planning to take to the alobal level?

We are putting more and more focus in terms of delivering value-added new Zinc derivatives which will help in enhancing customers' product performance. We have quite a few new products in the pipeline which we will be commercializing soon catering to the coating industry, rubber industry, industrial application and automotive industry. In the medium term, we are going to see a lot of new products coming from Zinc derivative product pipelines. For the long term, we have new innovation for recycling Lithium ion batteries by capturing the value and giving back to the industry for future use.

This is our new piece of business where we are putting a lot of our R&D effort in terms of technology and also getting into commercial operations. We have earmarked significant investment in R&D to enhance the footprint of our processes. We have taken new initiatives based on the theme Reduce, Recycle and Reuse. Our future facilities are more focused on digital tools and it's about enhancing what we were with the current facilities.

In terms of recycling of Lithium ion batteries, we have moved from lab to pilot plant scale and are able to produce a tonne

of material. We are in the process of getting the material gualified from a third party and from our key long term customers. We are pretty much close to finalizing the technology development and expect to have a new commercial facility start operating from 2027. We are in the process of completing the acquisition new land in Paradip (Orissa) and will be making an announcement once we have the final agreement.

New technologies which you are focusing on which will deliver best quality products?

We have been focusing on reducing our energy intensity. For example: earlier when we were using Zinc powder, we now use specialized grade which will enhance efficiency of the product and reduce energy consumption by five percentage points. We have been putting a lot of R&D effort in terms of water reduction and recycling, reuse both from process and non-process areas.

At one of our sites, we are able to reduce the total water consumption, especially in the process area by 38% in the last two years. This comes from not just one initiative but a combination of almost 40 different programmes. Since water is one of the main resources, we are putting a lot of focus on that one. We are using more recyclable materials to generate less waste and also reduce the hazardous chemicals, improving the tolerances and the tightness in the control of the process.

Manpower that you are planning to add for two new plants?

We will be recruiting quite a few people to work for the design stage for the new project and for the battery recycling project. There is going to be a significant new recruitment coming up in the next two to five years. In the current year, we are going to be limited in number where we will select a few high level project management professionals. Our major recruitment is going to be in 2025 and 2026.

Silox

Silox India Private Limited

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ndo-Belgian JV Company with a history of more than 5 decades. We are the largest manufacturers of Sodium Hydrosulp 3000 filled is diffinite organity company muta instance or non-secance, recain to make the second se



Anticorrosion India Pvt Ltd (Formerly: SGL Carbon India Pvt Ltd)

E 101, MIDC Ranjangaon, Tal. Shirur, Pune 412220 – MH, India, Email: sales@resistotech.com, sales@anticorrosion.in Mob: 0091 9820429054, Web: www.anticorrosion.in, www.resistotech.in



Lining Products:

- Pipe and fittings, Strainers Basket / Y / T
- Bellows, Compensators, Valves Ball Butterfly, Dia
- Dip Pipe, Spargers, Dip Tubes

PTFE lined equipments:

- Columns, POTs,
- Vessels, Tanks,
- Shells, Customized Equipment

Lining Material: • PTFE/PFA/PVDF/PP/HDPE







Graphite:

- Heat Exchangers, Condensers, Absorbers
- Heaters / Coolers, Reboilers / Evaporators
- Silicon Carbide Heat Exchangers

Systems Package Solutions :

- HCl Synthesis Package, Dry HCl Gas package
- HCl Absorption package, H2SO4 Dilution
- Skid operated plants / Pilot Plants

Graphite material: • Vibro and Iso molded

Key Points:

- Largest processor of India for lined piping and equipment,
- Have large sizes in seamless lining upto 1600 mm (64")
- All fittings in single piece and longer length pipes upto 6 mtr to avoid joint and leakages,
- Well equipped facility for Graphite equipment with inhouse design (mechanical and process)
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Techno-commercial solutions provider with pre-engineering and case study of corrosion issues



The Borosil Group is a prominent Indian conglomerate that has made significant contributions to the glassware and laboratory products industry. Founded in 1962, the group has become one of the leading players in Scientific & Industrial glassware. Today, the emergence of Borosil Scientific Limited signifies not only a new chapter but a celebration of new beginnings. This strategic decision is underpinned by a dedicated pursuit to develop safe & quality products which are accessible to all scientific industries in India and across the globe. The move to operate autonomously stems from a commitment to refine our focus and respond dynamically to the ever-evolving landscape of scientific advancements. Borosil Scientific Limited is poised to accelerate innovation and now comprises Laboratory instrumentation, Pharmaceutical Primary packaging, Process systems, in addition to the laboratory glassware and consumables.

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Our Business Divisions

Since 1962, Borosil has offered an entire gamut of the finest quality scientific and laboratory glassware, which finds application across varied disciplines such as Quality Control in pharmaceutical industries, Food and Soil testing, Microbiology, and Biotechnology. For more than 60 years, Borosil has stood for reliability, accuracy, and dependability, and as a result, it has won the respect and steadfast allegiance of top pharmaceutical firms, R&D labs, and academic, medical, and scientific organizations.













Introducing 'LabQuest' by Borosil Scientific, a comprehensive range of laboratory equipment that surpasses expectations. LabQuest proudly offers an extensive portfolio of cutting-edge solutions in four key application categories: Nutrition and Environment, Life Sciences, Liquid Handling, and an array of essential laboratory equipment. Experience the seamless blend of advanced technology, uncompromising quality, and unbeatable value-for-money, as LabQuest redefines excellence in the laboratory landscape.



Borosil Scientific is one of India's leading manufacturers of Glass Ampoules and Tubular Glass Vials of USP Type, widely used as primary packaging materials by pharmaceutical companies for their life-saving drugs. Our premium packaging materials ensure the utmost protection and preservation of vital medications, meeting the stringent standards set by the industry.



As the country's most renowned and reliable manufacturer, our glass reactors are crafted to perfection and endowed with complete automation capabilities. They are meticulously designed to meet the demands of elite applications in pharmaceutical research and process development. They also find their place in esteemed research institutions, driving groundbreaking discoveries in the fields of cosmetics, fragrances, and fine chemicals at affordable costs.



DIVERSIFYING OUR PORTFOLIO WITH A RANGE OF VALUE-ADDED CHEMICALS

India Glycols is unique in the world to produce ethylene, ethylene oxide and several derivatives like glycols, green solvents and specialty chemicals



What are key trends impacting the Green Chemicals Space? How do you see sustainability shape the chemicals, performance chemicals and pharmaceuticals sector?

The term 'Green' has a varied interpretations as used in various contexts by different stakeholders and companies over the years. The evolving parameters and clearer definition will continue to drive awareness, consumer choices, innovation, regulation, policy as well as business strategy.

There are various aspects of a product being green and the understanding as well as expectations from various stakeholders are also evolving. One important aspect which has been conventionally considered "green" is something that is manufactured from bio-based or renewable. Another aspect is how much toxic load is generated by the product and the resulting environmental impact that it creates. Given the increased focus and awareness on green house gas emissions and the resultant climate change impact, carbon footprint has become another important aspect. It encompasses the complete emissions from cradle-to-grave including Scope 1, 2 and 3. Then, there are other

The next big step will be novel materials which are not only made from greener feedstocks but have other greener attributes like biodegradability aspects of sustainability such as land use and impact on land, food and water.

Whilst it would be ideal to meet all possible criteria, in reality, various products and processes will score differently on different criteria and the evaluation itself is complex. Therefore, for example, on one hand something may have a lower carbon footprint it may not have such a good score when some of the other dimensions are considered and vice versa. We will see evolution of systems and standards for a rigorous evaluation of 'Green'. I believe with the world being increasingly interconnected, huge data generation and processing and rapid evolution of digital technologies including Al and Quantum computing, we would be able to better assess, quantify and define.

Today sustainability is no longer merely something good-to-do that only responsible companies focus much on. It is increasing becoming a key strategic consideration for all. The sustainability challenge is indeed extremely serious and requires immediate attention at all levels. It is accordingly reflected in growing awareness and expectations from various stakeholders. The pressure of public opinion and stricter regulations are happening faster than expected in India. In some cases, the new standards are even tighter than other parts of the world.

You may observe that an Industry that has a perception having an adverse environmental impact does not receive as much focus and policy support. It is, therefore, important the chemical industry works towards correcting that perception. I believe the chemical industry, has a crucial role to play in helping the world address sustainability issues. This is not only in terms of addressing its own challenges but also by providing new products, processes and solutions to the world. That presents a huge opportunity for innovation and building great businesses which are create knowledge based and offer sustainable models for India as well as the world.

India has some great advantages that include diverse feedstock, huge market, affordable talent, lower project cost etc. Changing geo-political dynamics, thrust

Challenges for Bio-based chemicals?

The green chemical space has its own challenges. From our perspective, Ethanol is an important feedstock for chemicals but there is growing demand for blending. Since it got coupled with crude, it is no longer a cheaper feedstock. We have to compete with chemicals which are based on crude, but the cost of sourcing green material has increased due to a variety of reasons. That has posed a significant challenge.

Meanwhile, sourcing of Ethanol is important. India's Ethanol Blending

supply chains e.g. cellulosic and captured carbon are either new or yet to be established in terms of commercial viability.

What is the big opportunity in Bio-based Specialties? Where does India Glycols fit into this ecosystem?

I would like to speak more broadly on green chemicals of which biobased specialties are a part of. One of the opportunities has been the fuel blending programme. This created an opportunity to produce Ethanol through



on Make in India, India's push for green energy, green hydrogen, carbon capture technologies and a thriving startup ecosystem bode well.

We will witness disruptive changes due the sustainability requirements as well as due to new technologies including digital. Ones who respond well will have great opportunities. Others will have an extremely high pressure to either transform or get acquired or else the be out of business. Programme has some potential repercussions too. Currently sugarcane, molasses and rice are the major feedstocks. These crops are water thirsty and there is an overlap with the food chain. We are talking about corn and biomass as alternatives. Biomass will be an important feedstock but again it will compete with the energy sector and excessive use of biomass will pose another challenge because we will be taking out organic matter and nutrients from the soil. Moreover, some of the technologies/

various routes. In addition to molasses, the government also made available damaged grain as raw material. Ethanol, CNG and Methanol would be interesting green feedstock in future to produce a whole range of hydrocarbons through alternate processes and technologies.

India Glycols is unique in the world to produce ethylene, ethylene oxide and several derivatives like glycols, green solvents, and specialty chemicals that have a better environmental impact



profile. This will drive the opportunities for bio-based chemicals. However, carbon capture materials, cellulosic materials will become are potential feedstocks for green chemicals in future.

Green materials can be classified into conventional and novel materials. The first one comprises conventional materials but made from greener feedstocks such as making PTA for polyesters using biobased feedstocks like bio-based MEG. These materials have a lower carbon footprint but still have some of the issues like biodegradability and environmental impact like micro-plastic issues etc.

The next big step will be novel materials which are not only made from greener feedstocks but have other greener attributes like biodegradability and lesser adverse impact on land, water, food chain etc. For example, some work is being done on polylactic based and other novel polymers. However, while polylactic acid-based materials offers better biodegradability, it does not have the same level of heat tolerance and tensile strength. Therefore, continued innovation for improving functional performance as well affordability will be an important driver.

In the times to come, apart from regulations, wider introduction of some forms of carbon tax and/or penalties on one hand as well as wider adoption of carbon trading will be an important driver for adoption of greener materials and processes.

How has India Glycols performed during FY 2023-24 and what are the plans for FY 2024-25?

Due to Covid and other factors, the last 2 to 3 years were quite disruptive for several industries including India Glycols. Sharp increases in feedstock costs, energy costs and freight costs posed a challenge. Imported ethanol prices went up

Imported ethanol price went up from approximately Rs. 35 to Rs. 70 per litre landed at its peak. The price has seen a correction but are nowhere close to the earlier levels which had been stable by and large for many years prior to the period of sharp escalation. Secondly, many countries are looking at their own energy security due to the volatile situation in the Middle East and Russia - Ukraine issue. Thirdly, there are energy transition hiccups in many parts of the world as the energy prices went through the roof particularly in Europe thus affecting the entire energy ecosystem which also impacts the global ethanol prices.

These factors posed a significant challenge in managing our prices and position our products against crude based

We must have a sharp focus on process safety and environmental risk management as well as compliances and governance products which even became cheaper on the other hand. Now, we have taken several actions. We invested in grain-based ethanol capacities. We now have a wider range of options to manage our cost base apart from importing ethanol. In addition, Biofuels presented an additional opportunity for sales as well. The situation however is dynamic, and we are able to choose various options based on best viability.

We have three broad end use areas for our ethanol i.e. Chemicals, Biofuels and Potable Spirits. This has made the business more resilient in terms of backend feedstocks as well as frontend usage areas.

Our diversification into potable spirits has also helped to derisk the business and improve business performance. Last year i.e. FY 2023 the top line witnessed a slight decline, but it had seen a good improvement in the EBITDA of around 15%. The performance for 9M for FY 2024 has been much better with a revenue growth of \sim 17% and EBITDA growth of \sim 45%. Overall, we expect a good year.

We have been focusing on leveraging our strengths including our sustainability credentials, strong manufacturing footprint, strengths in product, process and application development and a strong relationship with good, reputed partners.

With all these, we are also looking at new value-added chemicals. We have set up a new R&D Centre and expanded our manufacturing for a range of value-added chemicals like Oil Field Chemicals, Carbon Smart Materials, Green Solvents, Speciality Esters, Biopolymers and Amines etc. This is with the aim of improving the quality of the business as well as creating new areas for growth.

What strategy should India adopt to become a global manufacturing hub for bio-based Specialties, Performance Chemicals, and Pharmaceuticals? What role does India Glycols see for itself in making India a global manufacturing hub?

We need to transform our organizations towards having a culture of learning and innovation, high standards and excellence.

The struggle to get Green Signal for Red Industries is real.



We understand that! How about having access to fast track set-up...

PIP (Payal Industrial Park) is a government-approved park developing on 3500+ acres of land in the Dahej PCPIR industrial ecosystem. It has all the environmental clearances and facilities required for red industries. Access to railways, roadways, seaports and airports makes it a strategic location for businesses.

It is the ultimate destination in Asia to set up a manufacturing plant or industry.

Key Points -

- Environmental Clearance
- Innovative Park Design
- Approved by Govt. of Gujarat
- Easy Access to Manpower, Vendors and Technology
- Great Connectivity with Railways, Roadways, Airports and Ports
- Effluent Treatment Plants, Power Distribution, Water Availability and Fire Fighting Facilities

We have come from a past where we would get a loan, licence, put up a factory, have some people and start production by getting technology from MNCs. Today licenses and capital are not the real constraint and it all about investing in great talent, excellence, and innovation. This is crucial to create a knowledge-based organization for driving innovation to meet unique and arising needs for the India as well as the world and deliver sustainable products. This will continue to be an important area for the Indian speciality chemicals industry.

We also need to strategize in a way that can address India's challenges, encash opportunities and leverage India's advantages in terms of talent, raw material, feedstocks and capital cost. Another area that needs attention is the availability of feedstock for base materials which are either not produced or not competitively produced. For the pharmaceutical and agrochemical industry, the majority of API (key starting materials) are still being imported from China. This is a concern as well as an opportunity.

There is also a need to build a good manufacturing ecosystem. I have wondered why India has not created parks like Jurong Island, Singapore. If you look at it, India is in a much better position in almost every respect to create several manufacturing set ups like or better than Jurong and make them much more successful. India is better placed in many respects be it access to feedstocks, access to markets, quality of talent, cost of talent, cost of doing projects, availability of land, water and other resources. Yet many consider Jurong as a preferred manufacturing destination due to several factors. These include work culture, standards (EHS and quality), better facilitation by the government and better collaborative working by the industry.

Another very important aspect is proactive risk management and the perception around managing the EHS risks. In my view, this is one of the reasons why the chemical industry does not get as much policy support as it should probably get.

We must have a sharp focus on process safety and environmental risk management as well as compliances and governance. It is becoming increasingly critical from the view of stakeholders. These include society, regulators, consumers, NGOs, governments, and policy makers as well as investors. Without that we will not attract talent, get necessary policy support, or attract investments which are key for the industry to realize its true potential. It must not be seen as a cost but a very important investment for building great businesses.

In the end, it is not about individual companies as much as it is about create winning ecosystems. The electronics ecosystem of Japan or the automobile ecosystem of Germany or several others are good examples. Lastly, particularly, in today's world it is about outstanding collaboration and creating reliable, trustworthy, and lasting partnerships.

Initiatives taken by India Glycols for enhancing process safety across all facilities/processes to make operation intrinsically safe?

Conventionally, safety was thought about as taking some extra care, following some procedures, and providing personal protective equipment etc. That is a very limited way of looking at safety. Process safety is a very advanced science. It is about adopting leading edge practices, leading edge science, technology, design and most importantly a strong culture throughout the organisation.

Process safety for example is about examining the impact of all layers together and quantifying the risk. It is a very rigorous approach which helps improve in a multiple dimensional way. With emerging technologies like digital and AI, this will advance even faster. Good companies will progress to convert their ability to manage Process Safety and Environmental risks into a distinct competitive advantage. It is also crucial to attract good talent which is at the heart of creating successful chemical companies.

Similarly, we can expect the world to be far less tolerant of companies that continue to not address these risks. The expectations of stakeholders and regulations will continue to become more stringent. Even a few major incidents can have a detrimental impact not only on specific companies but the industry as a whole. I therefore consider investment in safety and environmental risk management not a cost but a long-term strategic imperative.

How are Indian companies driving innovation?

Driving innovation foremost is about creating a strong culture of learning and innovation. That needs time, investment, a strong belief, motivation and commitment. The fruits of this often-longer term but much larger and much longer lasting. You can beat one technology which another company may have acquired but you can't beat a strong culture of innovation. It is about not about doing it all along but building a strong culture of collaboration within and outside the organisation, a culture where people are given space to think, space to try and to learn from mistakes. It is about creating a fertile ground for sprouting of ideas, evaluation of ideas, weeding out and shortlisting of ideas and then executing them and scaling them up with perseverance.

It is also about focusing on identifying problems or needs and creating value for customers, consumers and society. In the times to come sustainability will remain at the heart of innovation and it will drive the most innovation in the industry. We, as a country, are making progress, but we need to keep pushing as there is a lot more that needs to be done and eventually about not only about catching up but getting ahead in an ever increasing competition in the world.









SET TO BECOME INDIA'S ONE OF THE BEST PORT-INTEGRATED INDUSTRIAL ZONES

Offers world class infrastructure, multi-modal connectivity and a tax free environment

Ram Reddy Ojilli

Managing Director & CEO Kakinada SEZ and KGPI



K. Muralidharan

Director, Kakinada SEZ & Executive Director KGPL Gateway Port



What is the total area and unique features of Kakinada SEZ Ltd?

Auro Industrial City (AIC), situated near Kakinada, Andhra Pradesh, is an expansive port-based industrial park under development by Kakinada SEZ. Covering approximately 5,600 acres, it will be complemented by the Kakinada Gateway Port, which includes a port backup area spanning 1,650 acres. Offering land options within SEZ and DTA formats, the park is designed to accommodate industrial units with a Plug and Play model approach.

What is the current status of development of Kakinada SEZ?

The industrial park has already received approvals for its operation including

Environmental clearance from Ministry of Environment, Forest and Climate Change, Govt. of India and Consent for Establishment (CFE) from Andhra Pradesh Pollution Control Board (APPCB). The basic infrastructure such as power, desalination water and construction roads are being developed. The development of specialized infrastructure such as Common Effluent Treatment plants, desalination plants is under process, 400/220/132 KVA substation and black

An upcoming port of Kakinada Gateway Port Limited (KGPL) will add additional advantages to the SEZ industries topping of roads are in progress.

What are the main strategic priorities for the company in the next five years?

We aim to develop AIC, a port based industrial park with the advantage of being exports and imports, as a global destination by focusing on attracting domestic and international investments across various sectors by promoting the advantages of locating within the industrial park, such as favorable policies, logistical benefits and access to markets.

How do you plan to attract and retain investors in Kakinada SEZ Ltd?

Kakinada SEZ (KSEZ) comes under the



PCPIR region. It is located on the central east coast and has a plug and play model. With all these advantages, KSEZ team is vigorously marketing the project in respective state, central and global level by attending conferences, associations and trade

An upcoming port of Kakinada Gateway Port Limited (KGPL) will add additional advantages to the SEZ industries and will ease export and import business to enjoy long term logistical advantage. Hence, every industry will prefer KSEZ.

What facilities are provided at Kakinada SEZ?

The Industrial Park is in the process of development and will feature essential utilities, including a Common Effluent Treatment Plant with a capacity of 80 MLD and the capability to treat 25 MLD of HTDS, a Common marine discharge system, water sourced from a 150 MLD desalination plant, and power provided by

AURO INDUSTRIAL CITY

a 400/220/132/33 KVA substation located within the industrial park. These utilities are complemented by other amenities and shared social infrastructure. The Park offers seamless connectivity to hinterland of India as well as global locations as deliberated below:

- Bharatmala Road (4 lane accesscontrolled highway - NH 516F) passes through the industrial park, creating seamless connectivity from NH16 at Annavaram to Auro Industrial City.
- A railway line from Annaravaram station to Kakinada Gateway Port is being developed to cater to the requirements of transporting cargo through railway. Kakinada Gateway Port is 3-4 km and Kakinada Seaport is about 25 km from the industrial park which shall ease the access of imports and exports. Visakhapatnam airport is 135 km away, providing international air travel access. Rajahmundry airport is 78 km away, allowing additional domestic air travel.

What are the USPs for Kakinada SEZ?

Strategic Location: Positioned near Kakinada, Andhra Pradesh, with proximity to major transportation routes i.e. National Highways, Railway network and the Kakinada Gateway Port, facilitating efficient logistics and access to both domestic and international markets.

Integrated Infrastructure: The industrial park is well planned with specialized infrastructure such as Common Effluent Treatment plant, Cogeneration plant, Desalination plant and marine outfall apart from the basic infrastructure.

SEZ and DTA Options: Providing flexibility with land options in both Special Economic Zone (SEZ) and Domestic Tariff Area (DTA) formats, catering to diverse business needs and preferences.

Plug and Play Model: The industrial plots earmarked are planned to enable businesses to quickly commence

Auro Industrial City is a one-stop destination for all industrial essentials. It is a leading hub for setting up red category industries with Environmental Clearance approval in place.



operations.

Government Support and Incentives: Incentives such as tax benefits and single desk clearance by the government supports us to attract and encourage investment within the industrial park.

What steps are being taken to ensure sustainable development and environmental responsibility within the SEZ?

AIC is planned by incorporating sustainable practices and environmental considerations into development plans to ensure long-term viability and minimize ecological impact.

How are you engaging with the local community to foster economic growth and job creation?

AIC has taken responsibility for regional growth and development and the CSR team is working towards development of the local community by identifying the needs and strengths of the local community. Special Action Plan is made for the development such as skill development center, training center, etc. Moreover, job opportunities will be available in Industries located in KSEZ and eligible personnel will get jobs in the related fields.

Can you please share some examples of successful projects and partnerships that Kakinada SEZ Ltd has undertaken?

KSEZ is becoming a hub for multiple industries with its advantages, around 10 Aqua processing units operating out of KSEZ and few more adding soon. With this KSEZ has become the largest aqua processing zone in the region/state. The park is set to host Asia's Largest Penicillin- G manufacturing unit. Apart, few other pharma-based companies have initiated construction and shall be operational in next 12-18 months.

How do you envision Kakinada SEZ Ltd contributing to the

Kakinada SEZ Limited

Kakinada SEZ Ltd plays a pivotal role in shaping the economic landscape of the region by fostering industrialization, facilitating trade and promoting innovation overall economic growth of the region?

Kakinada SEZ Ltd has the potential to significantly contribute to the overall economic growth of the region in several ways. Firstly, it serves as a catalyst for industrial development by providing stateof-the-art infrastructure and a conducive business environment for various industries to thrive. This attracts both domestic and foreign investments, leading to job creation and income generation for the local population.

Overall, Kakinada SEZ Ltd plays a pivotal role in shaping the economic landscape of the region by fostering industrialization, facilitating trade and promoting innovation, ultimately driving sustainable and inclusive growth for the benefit of all stakeholders.

How do you promote innovation and technological advancements within Kakinada SEZ Ltd?

Collaboration with Research Institutions: KSEZ fosters partnerships with leading research institutions and universities to leverage their expertise and resources. Collaborative research projects enable knowledge exchange, technology transfer, and the development of innovative solutions tailored to the needs of industries within the industrial park. Example: Indian Institute of Foreign Trade and Indian Institute of Packaging are establishing campuses next to the industrial park.

Open Innovation Platforms: We facilitate open innovation platforms and collaborative networks within the SEZ, bringing together industry players, startups, academia, and government agencies to share knowledge, resources, and best practices. These platforms promote cross-pollination of ideas, facilitate technology scouting and accelerate the pace of innovation.

How do you prioritize corporate social responsibility within Kakinada SEZ?

Prioritizing corporate social responsibility (CSR) within Kakinada SEZ Ltd is integral to our business ethos and strategic vision.

Stakeholder Engagement: We actively engage with stakeholders, including local communities, government authorities, NGOs, and industry partners, to understand their needs, concerns, and aspirations. This engagement informs our CSR initiatives, ensuring they address relevant social, environmental, and economic challenges faced by the community.

Community Development Programs: We design and implement community development programs that focus on areas such as education, healthcare, skill development, and infrastructure enhancement. These programs aim to improve the quality of life and socioeconomic well-being of communities residing in and around the SEZ.

Environmental Sustainability: We prioritize environmental sustainability by implementing measures to minimize our ecological footprint and promote conservation. This includes adopting green technologies, implementing waste



management practices, and undertaking afforestation and biodiversity conservation initiatives.

CSR activities are being carried out in the form of providing breakfast to the government school students, skill development training, and rejuvenation of govt schools.

What initiatives are being undertaken to enhance the skill development and employability of local residents?

Skill Development Centers: Establish skill development centers within the Industrial Park premises or in collaboration with local educational institutions to offer training programs in sectors relevant to the industries located within the industrial park, such as manufacturing, logistics and technology.

Industry-Academia Partnerships: Forge partnerships with nearby universities, technical colleges, and vocational training institutes to design curriculum modules tailored to the skill requirements of companies operating within the SEZ. These partnerships can include internships, apprenticeships, and industry-sponsored projects to provide hands-on experience to students.

Vocational Training Programs: Offer vocational training programs in collaboration with government agencies, industry associations and NGOs. These programs can focus on specific trades or skills needed in industries within the SEZ, such as welding, electrical work, machine operation, and quality control, etc.

Can you please outline the company's plans for expansion and diversification in the future?

KSEZ may plan to expand its infrastructure to accommodate more industries and businesses. This could involve acquiring additional land, developing new industrial zones or parks, and upgrading existing facilities to attract a wider range of companies.

However, KSEZ's group company Auro Infra Pvt Ltd is well diversified into various businesses, including EPC, construction, realty, port development, mining, manufacturing of chemicals, etc.

Join as a part of AIC's 5600 acres Port based Industrial Park with Environmental Clearance ideal for establishing industries across 19 sectors.

SAURADIP SETS A GREEN BENCHMARK IN SUPPLY CHAIN

Sauradip Chemical Industries is in its 50th year of operation and today exporting products to more than 40 countries. The company has a sustainability focused supply chain ecosystem. Sauradip manufactures with zero discharge and zero waste

Dr. Kishore Shah Chairman Sauradip Chemical Industries

By Vedika R. Shah



Rajive Shah Managing Director Sauradip Chemical Industries



Jaideep Shah Executive Director Sauradip Chemical Industries

S auradip Chemical Industries was founded in 1974 with a philosophy of Care, Trust, and Bold Creativity, which have now become our core values. In the last 50 years, we have built unparalleled goodwill with our customers, suppliers, and our team.

We are constantly raising the bar in the industry by developing highly customized green products in consultations with customers. Our efforts have been to make available green products to customers at an affordable price and we have been touching the lives of people across the globe. Today, we have a strong presence in India and are relatively exporting to five continents across 40 different countries. Our dedicated sales and marketing team is in constant touch with customers. They deliver high performance solutions and solve challenges across various industrial segments.

Sauradip's knowledge based and solution driven approach continues to improve and change the quality of life of Indians. We have been well recognized in the industry with many accolades.

We do not use any chemicals which are hazardous and damage the environment and the safety of our people

Dr. Kishore Shah, Chairman, Sauradip Chemical Industries, was President of the Indian Specialty Chemical Manufactures' Association from 2007 to 2012. For the first time in 60 years, the Indian Specialty Chemicals Manufactures' Association awarded the Life (ISCMA) Time Achievement Award to Dr. Kishore Shah on the occasion of their annual function in 2013. The award was bestowed to him by Rajubhai Shroff, Chairman of United Prosperous Ltd, for meritorious service rendered to Indian Specialty Chemicals Manufactures's Association. Dr. Kishore Shah wrote world class books (1) Handbook Synthetic Dyes & Pigments-5 editions (2) Handbook of Industrial chemicals - 4 editions which are used

as reference book throughout the world. Sauradip is a manufacturer of customized performance chemicals and works closely with customers to offer them Tailor-made cost-effective solutions. We believe in the philosophy of "Sustainable Solutions for a greener planet so that we can make a positive impact in the lives of people globally".

We cater to customers for Water Treatment Chemicals, Paint & Coating Additives, Fiber Finish for Synthetic yarn, Additives for construction chemicals. Metalworking additives, Performance chemicals for Oil Exploration & Refining, Green surfactants for Home & Personal Care, Antistatic Agents for plastics & Coatings, High-performance Disinfectants for Industrial cleaning, Specialty chemicals for mining. Sauradip plays an important role in the demanding and highly competitive industries of upstream oil exploration and downstream oil refining. Homeowners experience a better finish with the addition of Sauradip's defoamers, wetting agents, surfactants, buffering agents, humectants, and dispersants in the paints they used to cover their walls.

How has the supply chain evolved in the last 50 years for the industry and Sauradip Chemicals?

The supply chain is the most critical part for us as we work closely with the customers to provide them timely delivery. We try to ensure that the raw materials have to be sustainable as far as possible and we also work on procurement, planning, manufacturing and then logistics, the five parameters for the supply chain. Our processes are zero discharge and zero wastage. Once the production is completed, the supply chain becomes responsible for safe transportation of products to the customers. Our vision is to have human and environmental safety and save our resources such as energy, water and time. These are the top criteria for our supply

chain. We also work on digitalization to create a sustainable competitive edge. We believe in quality assurance and have ISO 9001, ISO 40,001 and ISO 45,001 for health and safety.

How did Sauradip ensure to mitigate risk associated with the transportation and distribution of chemicals during the pandemic? What is your suggestion for the industry?

We have been pioneering green thinking. Hence, we use only nonhazardous products. We do not use any chemicals which are hazardous and damage the environment and the safety of our people. In terms of avoiding accidents, one should always first read the MSDS (material safety data sheet) to understand the handling of the material. Each chemical has a different property and needs proper handling. If we follow the prescribed handling guidelines, we can easily avoid any untoward incident.

From Sauradip's perspective, can you cite some examples of successful strategies implemented to optimize the inventory management?

We work very closely with all of our suppliers as inventory management can only happen with collaboration. No company can manage it alone. We focus on our own plan and forecast for our suppliers and work accordingly in collaboration with them. We believe that loyalty and long-term partnerships with suppliers are very important. We don't change our loyal suppliers just because we get cheaper alternatives. We believe in long-term relationships and tell our vendors to provide the best competitive pricing. We also make payments on time so that they can timely source the materials. All this is very much interlinked and the mindset should be that supplier is



as important as customer and should not be taken for granted.

Do you think that price is also a major factor in the functioning of the supply chain for the Indian chemicals market?

Pricing is a very volatile factor due to various factors which are beyond our control. You may hedge your material for a quarter and manage pricing, but sometimes disruption happens overnight. Here, one needs to explain the prevailing scenario to customers in order to convince them. Once we are on the same thought process, then the supply chain is not a problem. But, if somebody says there is a 20% rise in price and customers still want material at the old price, the supply chain has a problem.





ISO 9001:2015, ISO 45001:2018, ISO 14001:2015 CERTIFIED COMPANY Tel:- 022-61140999 | Email:- info@sauradip.com | Web:- www.sauradip.com



Can you explain whether green is also part of your supply chain ecosystem?

We have a very sustainability focused supply chain ecosystem. As told earlier, we don't use any hazardous material and our processes are designed in that way. We manufacture with zero discharge and zero waste. We handle all material in bulk via tankers to reduce energy consumption. So, we try to integrate the whole system by which it becomes very simple and lower the carbon footprint.

How would you explain the emerging scenario for the digitalization of the supply chain in India and how it is going to benefit the chemical industry at large?

Digitalization is good but it is taking its own pace as every change faces resistance at the initial stage. But, digitalization will prevail over a period of 10 years and benefit the industry. It will also supply a talent pool to industry by taking workload and will help the world become much smoother and transparent. Transparency will be there because everything is communicated through digital means without ambiguity. Each company may have different priorities in different times but I think they will go for digitalization as it helps in reducing carbon footprint as well. As the carbon credits are picking up globally, the pace of implementation of digitalization will get faster.

Environmental standards in the supply chain are necessary but regulations sometimes create obstacles as well. How do you look at environmental regulations as a company and industry? Regulations are very important and are going to benefit the industry in the long run.

Even, globally, we have to deal with the regulations in the chemical industry. Be it Germany or China which are chemical hubs, each country has its own regulation and I think it is good for the environment and people around. Compliance is the important parameter because if we comply with the regulations then we can comply with everything. The regulations are brought after proper studies and to address the specific problems.



SAURADIP CHEMICAL INDUSTRIES PVT LTD

What are the challenges that the Indian chemical supply chain sector is facing and how to address them?

The innovation has become very significant globally as the customer needs keep changing. Therefore, there has to be very strong research and development initiatives to address new demands in the chemical industry. Today, most of the customers are looking for greener or ecofriendly products, while 10 years back that was not the norm. Industry needs to become innovative and develop the products that are easy to use and handle. For example, there are liquid products that are difficult to handle at low temperatures as they turn into a solid. So how does one develop a product which can remain liquid to temperatures? If one works in these directions, there will be a lot of challenges but at the end of the day, it is about helping and delighting the customer.

The Government of India has come out with the National Logistics Policy (NLP) and is working very hard to implement it. How is it going to benefit the overall logistics?

The government is doing a phenomenal job by launching the NLP. The way they are developing the infrastructure, ports, roads, international logistics, it will certainly help the whole chemical industry. Travel time will reduce and cost pressures will ease. Everybody will benefit and they will pass on the cost benefit to the end consumers. It is going to be a win-win situation for the entire industry. India will benefit from the logistics policy as manufacturers,

Our vision is to have human and environmental safety and save our resources such as energy, water and time

suppliers, and customers will reap the benefits.

Since you are exporting to 40 countries, what is the volume of the exports? Which countries are your main export destinations and which products are exported?

50 per cent of our volumes are exports. The regions where we are focusing mainly are Southeast Asia, Africa, Middle



SAURADIP CHEMICAL INDUSTRIES PVT LTD

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EXCELLENCE AWARD

This Certificate of Excellence in Productivity is awarded to M/s. Sauradip Chemical Industries Pot. Ltd. by the INSTITUTE OF ECONOMIC STUDIES at the time of the "All India Conference on Economic Development" held in New Delhi on February 13th, 14th & 15th 1991.



Lubricants and a basket of products which we are exporting to different industries. We are basically into performance chemicals. so wherever the customer has an issue we work closely with them and develop products for those particular applications.

Executive Direc

Sauradip spends 6 to 7 per cent of its Budget on R&D. Which new products and innovations are vou working on?

We work closely with the customers and based on the requirements we do a lot of new developments. This is an ongoing process and we have a strong R&D focus. We work with the end consumers and develop products such as shampoos, dish wash, laundry, liquid etc. Customers these days want eco-friendly green chemicals. People are ready to pay a premium and in fact you see premium products are doing well here in India. India is in a sweet spot and we believe India's story will remain intact for the next 10 years.

For the last 5 years, the company has retained about 30 percent growth rate. What is the expectation?

Things are looking very positive and encouraging and we are confident of maintaining the same momentum.



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AIMING EXPANSION AND VALUE CREATION TO BECOME LEADER IN PIGMENT INDUSTRY

VOXCO is committing a significant Capex of approximately Rs. 60 crore towards this expansion endeavour



What are the key trends/ challenges in organic and inorganic pigments in 2024?

Over the past 150 years, the manufacturing landscape for pigments, both organic and inorganic has undergone significant shifts. Originally concentrated in Europe, the US and Japan, production has progressively moved to countries like China and India over the last many decades. This trend is expected to continue for the foreseeable future. Simultaneously, there's a growing emphasis on sustainability in pigment manufacturing, with India emerging as a key player in incorporating eco-friendly practices, such as utilizing sustainable materials and promoting energy efficiency.

However, manufacturers are

encountering several challenges in this evolving market. Intense competition has led to pigments being commoditized due to large-scale production and vertical integration. Moreover, the presence of unregulated and disorganized markets adds complexity, although this is expected to change, particularly in India, following in the footsteps of China's regulatory adjustments.

The industry is witnessing a shift towards environmentally friendly and

The company sets its sights on achieving a revenue range of US\$ 36-38 million in the fiscal year 2024-25 high-performance pigment chemistries, with functional innovations extending beyond traditional color and aesthetics. Functional advancements are gaining traction, particularly in coatings and plastics, where pigments are required to meet stringent performance criteria. These include attributes like durability. industrial resilience, decorative appeal, as well as temperature and weather resistance. Given the diverse applications and extreme competitiveness, a onesize-fits-all approach is no longer viable, necessitating a multifaceted application structure to meet varving industry and end consumer needs.

What strategies India should adopt to become a global manufacturing hub for organic and inorganic pigments? What role do you see for VOXCO in contributing to this goal?

The 'Make in India' and "China plus One" policy has emerged as a catalyst for various industries, bolstering India's position as a manufacturing hub. The government's initiatives have spurred robust growth, with an impact on sectors like chemicals, intermediates and pigments. As a result, India has positioned itself as a key player for these products in both domestic and global markets.

To capitalize on this momentum, certain key areas demand attention from the Indian industry. Firstly, there's a pressing need for backward integration to ensure a stable supply of raw materials and intermediates. This strategic move can enhance self-sufficiency and reduce dependency on external sources.

Secondly, enhancing production efficiency is crucial for sustainable growth. By adopting world-class production parameters and technologies, companies can optimize their operations and meet global standards. This not only improves competitiveness but also drives value for customers.

VOXCO is pursuing a comprehensive growth strategy. This includes four major stages:

Scaling up Production: Recognizing the need for large-scale production to cater to global demand over the next decade, VOXCO is investing in technologies and infrastructure to establish itself as a leading manufacturer.

Building Expertise: With human resources being a critical factor, VOXCO emphasizes team building based on knowledge and expertise, especially in the specialized field of pigment chemistry. Developing an in-house talent pool ensures the company's capability to innovate and adapt to evolving market trends.

Strengthening Brand Image: VOXCO understands the significance of brand reputation and market presence. By forging strategic partnerships and penetrating key domestic and international markets, the company aims to solidify its brand identity built on values and commitment.

Backward Integration and Sustainability: Recognizing the importance of self-reliance and sustainability, VOXCO is exploring opportunities for backward integration into intermediates and sustainable raw materials. This strategic focus aligns with the company's growth trajectory and ensures long-term viability.

By executing these strategic initiatives, VOXCO is poised to further enhance its position as a leader in the global pigment and chemical industry, leveraging the opportunities presented by India's evolving manufacturing landscape.





Company's total manufacturing capacity? What's your plan for the next two years?

VOXCO commenced its journey in 2003 under an exclusive manufacturing partnership with CIBA, a world renowned pigment manufacturing entity. By 2009, the company transitioned to direct sales, marking the beginning of a remarkable trajectory marked by significant achievements.

Currently, VOXCO boasts substantial production capacities across certain pigment categories. lts inorganic production capacity, notably for chrome vellow and molybdate orange, stands impressively at 6,000 tonnes per annum, making it one of the largest in India. Additionally, the company's capacity for anti-corrosive pigments reaches 1,200 tonnes per annum, while organic pigments contribute around 1,500 tonnes. Presently, the inorganic segment dominates, accounting for 70-75% of total sales, with production averaging total capacity utilization of 80-85%.

Looking ahead, VOXCO is poised for further expansion and long-term value creation. The company's strategic roadmap includes the establishment of new manufacturing facilities every two to





three years over the next decade. With its existing manufacturing presence spanning across four production sites in Vapi and Sarigam, VOXCO is strategically advancing its growth trajectory by pursuing both organic and inorganic routes.

The inorganic growth bluow entail acquiring middle-level pigment manufacturing companies within the next three to five years, as a strategic move aimed at unlocking synergies and capturing strategic value propositions within the industry landscape. Through these endeavours, VOXCO is poised to consolidate its position as a formidable player in the pigment manufacturing sector, leveraging strategic acquisitions and organic growth initiatives to drive sustained success.

VOXCO has acquired land in Saykha. Capex investment in the plant and when are you planning to commission it?

VOXCO's plans for production expansion have been in motion for nearly a decade, with land acquisition in Saykha – Dahej occurring approximately 7 to 8 years ago. The original timeline aimed to commence production at Dahej was FY 2022-23; however, unforeseen circumstances, including the impact of



COVID-19 and fluctuations in the market, led to delays.

Nevertheless, VOXCO has in recent years invested and expanded its capacities both in Vapi and Sarigam production sites. The company anticipates launching the first phase of production, featuring a capacity of 2,500 tonnes for specific organic pigment chemistries in the coming year. Following this initial phase, VOXCO plans to progressively expand its capacity over the subsequent three years, adding another 2,500 tonnes. The total production capacity upon completion will reach 5,000 tonnes, leveraging the 25,000 square meter property to its full potential.

In terms of investment, VOXCO is committing a significant Capex of approximately Rs. 60 crore towards this expansion endeavour. Phase 1 will absorb an investment of Rs. 40 crore, with the remaining funds allocated to Phase 2. This strategic investment accentuates VOXCO's commitment to growth and its confidence in the future opportunities in the coloured pigment market.

VOXCO is an exclusive distributor of multiple international companies. Please elaborate?

VOXCO has forged strategic partnerships with five companies, each serving as an exclusive distributor for the Indian market. One such partner is CINIC- China, a renowned manufacturing company for its high-performance organic pigments catering to high-value applications in coatings and plastic masterbatches.

Additionally, VOXCO collaborates with SNCZ - France, a leading global French company specializing in anticorrosive pigments and environmentally friendly pigments, particularly in the realm of functional chemistry for anti-corrosion applications.

Further bolstering its portfolio, VOXCO has partnered with HABICH - Austria, leveraging its strong manufacturing capabilities for their high-performance inorganic chemistries along with heavy metal free hybrid pigments to offer innovative solutions to its clientele.

Another significant collaboration is with PROMINDSA -Spain a world market leader specializing for Inorganic pigments in protective and marine coatings. This partnership enables VOXCO to offer a comprehensive range of coating solutions tailored to the specific needs of its protective and marine strategic customers.

Lastly, VOXCO is associated with CHTI - China, the second-largest manufacturing company for Titanium Dioxide in China, focusing its sales in the western region of India. This partnership aims to deliver enhanced value to customers through a synergistic approach, leveraging CHTI's products with VOXCO's domestic market presence.

Financial performance in FY 2023-24 and what's your plan for FY 2024-25?

VOXCO's growth trajectory remains robust, with an annual expansion rate ranging between 10-12%. Notably, in the fiscal year 2023-24, the company achieved a growth of 10% by value and an impressive 20% by volume. This uptick in volume growth was facilitated by a decrease in raw material prices during the same period. However, despite the volume growth, the increase in value was limited to 10% due to the same reason.

Looking ahead, VOXCO anticipates sustained growth momentum. In the coming fiscal year, the company forecasts a value growth of 15%, complemented by a volume growth of 20%. This optimistic outlook is buoyed by the strengthening of new production capacities, particularly in the organic segment.

In terms of revenue, VOXCO recorded approximately US \$30 million in the fiscal year 2023-24. Building upon this foundation, the company sets its sights on achieving a revenue range of US \$36-38 The total production capacity upon completion will reach 5,000 tonnes, leveraging the 25,000 square meter property to its full potential

million in the fiscal year 2024-25.

Central to VOXCO's growth strategy is a steadfast commitment to the 'Make in India' initiative, reflecting the company's dedication to bolstering domestic manufacturing capabilities. This commitment is further underscored by VOXCO's expansive global footprint, with products being sold in over 52 countries.

In terms of market distribution, VOXCO has witnessed robust growth in both domestic and international markets over a period of time. The company is extremely optimistic for its sales in the domestic markets with current 65% revenue from the domestic sales and 35% revenue from the international market.

The company anticipates a gradual shift in this ratio, projecting a 60:40 distribution between domestic and international revenues as it continues to sustainably grow in near future.

International markets that you are planning to target to sell your products and how are you planning to target these countries?

VOXCO's foremost objective is to cater to the evolving needs and delivering value to its strategic Indian customers. This commitment is underscored by the company's strategic expansion plan, which entails increasing production capacities every two years. With domestic customers experiencing steady growth rates of 8-10% annually, VOXCO remains dedicated to meeting their demands and exceeding their expectations.

Looking ahead, VOXCO is poised to



extend its footprint beyond Indian shores, targeting key markets in the USA, Mexico, South America and Europe over the next two years. This strategic initiative aligns with the company's vision to grow its brand image and establish a stronger global presence.

What new products are you developing at Vapi R&D centre?

R&D stands as a cornerstone of VOXCO's operations, embodying our commitment to delivering enhanced value to our customers. We keenly observe the

this domain include the development of environment-friendly pigments and easily dispersible variants, designed to optimize production processes, reduce energy consumption and enhance production efficiency. By prioritizing innovation and sustainability, VOXCO would like to remain at the forefront of value creation, continually striving to exceed customer expectations and drive positive change in the industry.

Initiatives that you have started for enhancing process safety across all facilities and processes to



evolving landscape of infrastructure and road construction in India, recognizing the growing demand for innovative solutions. Recently, we encountered a challenge in the realm of hot melt road marking products, historically

sourced from Canada.

Moreover, our focus "Values and Commitment" extends to mobility PIGMENTS applications, where we have

invested significantly in developing highperformance products tailored to meet the stringent demands of this sector. By leveraging and working on technology, we aim to address emerging challenges and capitalize on evolving market trends, positioning ourselves as a trusted partner for mobility solutions.

Additionally, VOXCO places a strong emphasis on functional pigments, recognizing their potential to drive sustainable innovation. Our efforts in make an operation intrinsically safe?

VOXCO is dedicated to enhancing value and fostering commitment not just for our esteemed customers but also



eemed customers but also for our internal team and shareholders. Over the years, we have diligently pursued a comprehensive framework aimed at securing ISO 9000.

ISO 14001, and ISO 45000 certifications. Our integrated management systems, coupled with a meticulously structured environment and safety policy, underscore our unwavering focus on safety, health and environmental concerns.

Rigorous attention to regulatory compliance further underscores our commitment. We continually prioritize safety, health and environmental considerations, exemplified by our ongoing coordination of numerous projects across our manufacturing sites.

Sustainability road map and status of Ecovadis certification in FY23?

As a Silver Ecovardis certified company, we are committed to advancing our sustainability initiatives. Our goal is to continuously improve our certification grades, striving for higher point scores in the years ahead.

Operating within the realm of sustainability, we diligently coordinate various process parameters to enhance efficiency within our production systems, thereby reducing manufacturing costs through bringing efficiency in our production and focusing on utilization of renewable resources.

Environmental sustainability should be important to every human being and in our areas of production we establish annual benchmarks to guide our progress and work towards sustainable practices.

CSR plans with respect to betterment of rural livelihood and education? Projects implemented in FY 2023-24 and plans for FY 2024-25?

Our core ethos at VOXCO revolves around enriching lives and fostering unwavering commitment to all stakeholders. In line with this vision, we've established the LRC Trust, generously funded by VOXCO and like-minded individuals. This trust is dedicated to promoting empowerment, sustainable development and social justice. Our primary focus areas encompass providing access to education, healthcare and livelihood opportunities.

Notably, we've been deeply involved in advancing girl child education in rural areas of South Gujarat region, striving to break barriers and create avenues for empowerment. Additionally, our efforts extend to healthcare, exemplified by our cataract operation camp last month, which have positively impacted more than 500 individuals, underscoring our dedication to tangible, impactful initiatives within our communities.

CLOCKED REVENUE OF RS. 316 CRORE IN FY 2023-24

Planning to set up one more manufacturing facility for precision manufacturing of rotary valves, diverter valves and other powder handling equipment



How is RIECO Industries preparing for its 50th year celebration in 2025? Are you looking at any change in vision and mission statement in the 50th year?

We will start celebrating our golden jubilee year in a few months. Lot of activities are being planned in 2025. This includes recognizing the Top 50 customers who have contributed to RIECO's journey. We will also remember long forgotten employees who have been instrumental in making the company stronger and better. The vision of the company as it steps into its 50th Anniversary is to become the global leader in powder & bulk solids processing and handling technology.

RIECO Industries specializes in

delivering innovative and sustainable solutions in powder and bulk solids processing and handling? How has the company performed and orders bagged in FY 2023-24?

We had a mixed year in FY24. There was some slowdown in order intake, however, our execution has surpassed all records and our sales have grown by 29% YoY. In FY25, we expect a strong growth in order intake as our funnel is very strong. Due to the ongoing elections, some of the decisions are pending but June 2024 onwards we expect a strong momentum.

The company is planning to be a leading global player in the field of powder and bulk solid technologies. What's your strategy to capture global orders in different regions?

Building a global presence is a slow process. First and foremost is to create visibility and connection with the customer base in these geographies. We are up on creating our visibility through online and offline marketing strategies. Offline includes participating in trade shows of interest other than that having local channel partners is what we are pursuing in different regions.

The company also provides comprehensive solutions with respect to pneumatic conveying, grinding and air pollution control processes. How has RIECO Industries performed and orders bagged in FY 2023-24?

Other than the grinding portfolio, all our offerings have performed well in the current year. The grinding portfolio was slower due to delayed finalization of orders. We are confident that in the coming year, the order intake will be significantly larger than the previous year. We are expecting some good breakthroughs in air pollution control equipment. Similarly, we are bidding for several large size orders for powder handling through pneumatic and mechanical handling packages and are optimistic to make huge inroads in this area.

We are expecting some good breakthroughs in air pollution control equipment

Global Leaders In Powder Handling & Processing Technology



INNOVATE CREATE DELIVER CREATE CREATE





Bag Slitting Machine

The company has been adapting and meeting quality standards like ISO, GMP, ATEX and CE. What's the progress on this front? Are you chasing any new standards in 2024?

The progress has been good and we have catered to many requirements with CE/ATEX specifications. In 2025, we will be additionally covering EAC/EN standards in our equipment and systems.

Revenue and profit at the end of FY 2023-24? Order in hand at the end of 31st March, 2024?

We have clocked a revenue of Rs. 316 crore with a 6.5% EBITDA.

The company has three manufacturing facilities equipped with cutting-edge machining facilities with the highest level of precision and efficiency. Are you planning to add any additional manufacturing facilities in the next two years?

Yes, there are plans to put one more manufacturing facility for precision manufacturing of rotary valves, diverter valves and other powder handling equipment like automated bag emptying stations/ machines, telescopic discharge chutes,

Powder Experts

Our World Class Powder Characterization Lab helps decode

the uniqueness in each powder to design optimal systems

We're the

plough shear mixers etc. We should be finalizing the facility by Q2 FY25.

How is Material Trial Lab helping RIECO Industries simulate various conditions for its clients to understand the behaviours of different powder materials thereby providing high quality solutions? Are

you adding new machinery

in the Material Trial Lab?



A few more equipment are planned including Particle Size Distribution Analyzer. The Material Testing and Trial Lab gives a very well calibrated design meeting the powder characteristics and its expected behaviour.

RIECO is planning to embrace Industry 4.0 to deliver digital and automated benefits to its clients for a competitive edge. How will this help your clients in the long run?

We expect to hire a total of 200 personnel to fuel our growth and add new capabilities in the bioenergy space



Skid Amounted ACM

It certainly will help in projecting RIECO as a one stop shop for having process capabilities with automation and instrumentation.

How are you placed on the manpower front? How many people are you planning to recruit in the next two years to meet greenfield and brownfield expansion?

We have around 50 positions open currently and we expect to hire a total of 200 personnel to fuel our growth and add new capabilities in the bioenergy space.

What are the new innovations you are planning in 2024? How will these innovations help in maintaining RIECO's leadership position in different segments?

Apart from additions to the vast portfolio of powder handling and processing equipment, our foray into the bioenergy space will be the most interesting development for the organization. This includes the ability to execute turnkey Solid Bio Mass Boilers, Waste Heat Recovery Boilers (WHRB), Compressed Biogas Plants (CBG) and Bio-Charcoal conversion plants. We are working with various research institutes and consulting agencies to create our solution footprint in this space.

Rieco Powder Characterization Lab

 Testing Offerings
 Ge

 • Physical Characterization
 Pot

 • Particle Size Distribution Test
 Filow Properties Test

 • Flow Function Test & many more
 Test



AIMING TO BECOME LEADER IN ENGINEERING AND CONSTRUCTION SECTORS

Secured orders of a planned Capex exceeding over Rs. 2,000 crore and projects are progressing as per schedule



An overview of the core services offered by Shiva Engineering Services?

Shiva Engineering Services (SES) is proud to be recognized as one of India's premier engineering and construction service providers. Our core focus lies in delivering end-to-end solutions across a diverse range of industries, including chemicals, specialty chemicals, agrochemicals, inks & adhesives, paints, pigments, food processing, FMCG, polymers, biofuels, and more.

From the conceptual stage till the plant commissioning, we offer a full spectrum of services, encompassing engineering, procurement and construction. Our expertise begins with providing support for Front-End Engineering Design (FEED), cost estimation, basic and detailed engineering, procurement, and fabrication, construction and installation and extends till commissioning of the plant.

At SES, we differentiate ourselves by integrating cutting-edge solutions such as Laser Scanning and Drone Surveys into our projects. These technologies enable us to achieve unparalleled levels of accuracy while significantly reducing project timelines and costs. Our commitment to innovation ensures that we consistently meet and exceed the evolving needs of our clients.

We remain fully committed to delivering on our promises and meeting our clients' expectations

How has the overall performance been for Shiva Engineering Services in 2023 -24 and what is the expectation from 2024-25?

In FY 2023-24, Shiva Engineering Services (SES) experienced robust performance across various metrics, reflecting our commitment to excellence and client satisfaction. Despite the challenges posed by the global economic landscape, we maintained steady growth and delivered outstanding results in terms of project execution, client engagement and financial performance.

Additionally, SES's international presence was strengthened as we were awarded multiple projects by leading conglomerates for their expansions outside of India. These achievements highlight our growing reputation as a trusted partner for global engineering and construction solutions.

Looking ahead to FY 2024-25, we are poised for even greater success. Building upon the momentum of the previous year, our strategic priorities include further expansion into emerging markets, diversification of our service offerings and continued investment in technology and talent. We aim to capitalize on new opportunities, enhance operational efficiency and strengthen our position as a leader in the engineering and construction sector.

Furthermore, SES remains committed to sustainability and environmental stewardship, integrating eco-friendly practices into our operations and supporting our clients' sustainability goals. By embracing innovation, fostering strategic partnerships and staying attuned to market dynamics, we are confident in our ability to achieve sustained growth and deliver exceptional value in the upcoming fiscal year and beyond.

What is the total number of orders received bv Shiva Engineering Services in 2023 and what is the worth of these orders? What is the execution status of these orders?

In 2023, Shiva Engineering Services achieved remarkable success by securing a substantial number of orders, which reflects the trust and confidence placed in our capabilities by our valued clients. Our efforts resulted in securing orders with a planned Capex exceeding 2,000+ crores, encompassing both repeated and new customer bases, where we provide EPCM services to clients, within India and internationally. These achievements underscore SES's commitment to expanding our global footprint and penetrating new markets. By enhancing our capabilities and increasing our global reach, we were able to capitalize on emerging opportunities and solidify our position as a preferred partner for engineering and construction solutions. These orders signify a significant mutual

trust and commitment between ourselves and our clients towards successful project execution. delivering excellence that exceeds expectations.

Regarding the execution status of these orders, we are pleased to report that a substantial portion of these projects has been successfully initiated and is progressing according to schedule. Our dedicated project management teams, skilled workforce, and robust infrastructure have played pivotal roles in ensuring the



timely and efficient execution of these projects. While some projects are still in the early stages, we remain fully committed to delivering on our promises and meeting our clients' expectations. SES's track record of on-time delivery and adherence to project timelines continues to be a hallmark of our service excellence.

Moving forward, we are determined to build upon this success and further strengthen our position as a leader in the engineering and construction industry, both domestically and internationally.

throughout every stage of the project. ensuring optimal results and client success. SES's commitment to technology-driven decision-making sets us apart.

We leverage world-class software and tools for process simulation, engineering calculations, 3D modelling, and more, to achieve greater levels of accuracy in shorter timeframes. Integration of cutting-edge technologies such as Laser Scanning further enhances our capabilities, allowing us to achieve unparalleled levels of accuracy while significantly



How does Shiva Engineering Services differentiate itself from competitors in the industry?

At SES, we differentiate ourselves in the industry through a combination of

SHIVA ENGINEERING SERVICES

comprehensive services, technical expertise, diverse field experience and a commitment to innovation and client satisfaction.

As a one-stop-solution engineering and construction services company, SES offers holistic approach to the project, providing seamless experience to the client. Our multidisciplinary in-house team of over 200+ engineers across Process, Mechanical, Civil Structural & Architectural, Electrical, Instrumentation and Control, Project Management collaborate closely

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reducing project timelines and costs. Our commitment to innovation ensures that we consistently meet and exceed the evolving needs of our clients.

Are there any plans for expansion. either in terms of geographical reach or service offerings, in the near future?

Yes. indeed. We are currently strategizing expansion initiatives both in terms of geographical reach and service offerings. Soon, we plan to increase our manpower to enhance our capacity for serving a wider range of clients and projects. Additionally, we aim to expand our geographical footprint beyond India to cater to international markets.

While we already have a strong presence and working experience in over 20 states



in India, we are also looking to leverage our expertise and experience to enter new markets abroad. With a successful track record in over 10 countries across the globe, we are confident in our ability to adapt and thrive in diverse international environments.

Expanding our reach both domestically and internationally aligns with our vision of becoming a leader in engineering and construction services. By broadening our horizons and diversifying our client base, we aim to strengthen our position as a trusted partner for delivering excellence in projects worldwide. We aim to expand our geographical footprint beyond India to cater to international markets

relationships?

We are 100% dedicated to our customers' success. We believe in prioritizing customer satisfaction and maintaining strong client relationships at the core ethos of our business. We achieve this by placing constant communication



What sort of investment have you planned for the expansion?

As part of our expansion plans, we are committed to making necessary investments to support our growth trajectory. Our focus is on strategic investments aimed at expanding our operations, enhancing capabilities, and better serving our clients. These investments will enable us to grow exponentially in terms of both geographical reach and service offerings, positioning us for long-term success.

How does Shiva Engineering Services prioritize customer satisfaction and maintain strong client

and responsiveness, ensuring that we are always available to our client to answer their concerns promptly. Furthermore, we tailor our solutions to meet the unique requirements of each client, offering personalized attention and customized strategies to deliver results that align with their goals and objectives. We tailor our solutions to meet the unique requirements of each client, offering personalized attention and customized strategies to deliver results that align with their goals and objectives.

Can you discuss any specific initiatives or programs implemented by the company to

emphasize sustainability and minimize environmental impact?

At SES, we are committed to sustainability and minimizing our environmental impact through concrete initiatives and programs. We have started several awareness programmes for our employees to reduce the use of plastics and paper in day-to-day operations.

To achieve our goal of Zero-Use plastic, we have implemented measures such as replacing single-use plastic with sustainable alternatives. Additionally, we are actively exploring solutions to further eliminate plastic from our operations and supply chain. In parallel to reduce the use of papers we are implementing digitalization strategies across our organization includina transitioning electronic documentation to and communication systems. By proactively addressing environmental challenges and embracing eco-friendly practices, we are working towards a greener, more sustainable future.

Where do you see Shiva Engineering Services five years down the line?

In five years, we aim to envision SES as one of global engineering and construction services partner from India, renowned for its innovation, excellence, and commitment to sustainability. Our strategic roadmap includes expanding our geographical reach, diversifying our service offerings, and further enhancing our technological capabilities.

We look forward to solidifying our position as a preferred partner for clients across various industries, both domestically and internationally. Through strategic investments in talent acquisition, technology and infrastructure, we seek to strengthen our competitive edge and deliver even greater success stories to our clients.



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CONTINUE INVESTMENT IN R&D TO DRIVE INNOVATION AND DEVELOP NEW PRODUCTS

Ion Exchange has contributed in shaping the water industry's response by providing innovative, cost-effective and sustainable solutions for water and waste water management



Ion Exchange (India) Ltd. has completed 60 years of operations. How has the journey been so far?

Ion Exchange completed 60 years of incorporation on March 6, 2024. We are pioneers of water treatment in India and over the years, have developed innovative solutions to address water-related challenges, contributing significantly to the industry's growth and development.

Through our 60 years' journey, we have also expanded our reach and product offerings to newer markets while serving every sector. We entered new markets with concepts like desalination, recycling, zero liquid discharge and affordable solutions for rural water treatment. Thus, we have created impressive global water references for total water and environment management solutions for industries, homes and communities.

Throughout our 60-year journey, Ion Exchange has continually invested in research and development to stay at the forefront of technological advancements in water treatment. This includes development of new products, processes and solutions to meet evolving customer needs and



Considering good backlog of orders, we predict our growth in FY 2024-25 and the foreseeable future to be good regulatory requirements.

In 1976, Ion Exchange set up the first international plant in Malaysia. Since then, we have continued to successfully execute large number of projects globally meeting the exacting needs of our international customers. Last year, Ion Exchange acquired Portugal based company MAPRIL for penetrating the European market as part of our sustainable growth strategy.

Exports now account to 30% of our sales. For nearly three decades, we have built a favourable position as a reliable exporter of quality lon Exchange resins, water treatment plants, chemicals and services.

Over the past decade, we have added many milestones to our legacy. Notably, our consolidated revenue crossed the milestone of Rs. 2,000 crore in FY 2022-23. We continued to invest in EESG practices as fundamental building blocks for our sustainable growth. We have committed ourselves to 14 of the 17 Sustainable development Goals and are on track to achieve new zero target by 2023.

We have also strengthened our CSR program aimed at addressing water scarcity, promoting water conservation and supporting community development initiatives.

As a six-decade old company operating in volatile, uncertain environments, we have faced challenges while we maintained our leadership position. Successfully navigating these challenges has been the key attribute to our long-term success.

How has the overall performance been for lon Exchange (India) Ltd. in FY 2023-24 and what is the expectation from FY 2024-25?

For 9 months of FY 2023-24, on a consolidated basis, our operating income increased 8% YoY. Profit after tax increased 8% on a YoY basis. We expect this trend to continue in subsequent years while treading with caution against global geo political, economic headwinds. However, considering good backlog of orders and increasing awareness on water security, we predict our growth in 2024-25 and the foreseeable future to be good.

What are the key factors that have contributed to lon Exchange India's success and growth in the industry?

As trailblazers in the water and environment management sector, we continuously seek innovative solutions, whether originating from our internal research or global strategic partnerships with experts.

Amidst escalating competition, our strategy remains resolute: embracing innovation to enhance our performance. This ensures our ability to expertly address evolving customer needs. By consistently integrating new technologies, we not only maintain relevance but also lead as a premier global provider of water treatment solutions. We have honed expertise in delivering tailored water solutions for homes, communities, industries and institutions alike.

In addition, Ion Exchange has continued to diversify its offerings beyond traditional water treatment solutions. This includes the development of engineered products and process solutions for separation, purification, concentration and recovery using advance ion exchange resins, adsorbents and membrane technologies.



Our recycle solutions integrate physicochemical, biological and membrane separation processes for optimum water recovery. They include advanced effluent treatment processes, micro filtration, ultra filtration, nano filtration and reverse osmosis systems, membrane bioreactors and advanced photochemical oxidation.

What are the key revenue growth drivers for the company and how are you planning to grow your business in the coming years?

Some of our key growth drivers are:

- Innovative Product Development: Continuously innovating and developing new products and solutions to meet evolving customer needs and regulatory requirements drives revenue growth.
- Expansion into New Markets: Expanding into new geographic markets and industries increases the company's customer base and revenue streams.
- Strategic, sustained investments in manufacturing - capacity building to meet growing market demands for our products, solutions and services.
- Focus on Sustainability: Offering sustainable and eco-friendly

solutions aligns with increasing customer demand for environmentally responsible products and services, driving revenue growth

Digital Transformation: Our IonSite digital solutions leverage digital technologies and data analytics to monitor real time performance of water assets, enhance operational efficiencies and ensure continuity of operations without unplanned breakdowns.

How do you optimize capacity utilization of your plants? What steps do you take to minimize downtime and ensure that the facilities are operating efficiently?

Ion Exchange optimizes capacity utilization of not only plants within our fence but also at our customer's site through





CON EXCHANGE Refreshing the Planet our digital 24X7 services to ensure that facilities operate efficiently with minimal downtime.

- **Predictive Maintenance:** Implementing predictive maintenance techniques allows us to detect potential equipment failures before they occur. This minimizes unplanned downtime and maximizes equipment uptime.
- Scheduled Maintenance: Developing comprehensive maintenance schedules helps ensure regular maintenance tasks are performed at optimal intervals, reducing the risk of unexpected breakdowns.
- Al-based Continuous Monitoring: IonSite Digital Twin is a cloud based solution that leverages Artificial Intelligence (AI) and wastewater modeling technology to predict and avoid water quality issues, identify cost savings and provide real-time performance advice. This allows for early detection of abnormalities and proactive intervention to prevent issues from escalating.
- Training and Skill Development: Providing ongoing training and skill development programs for plant operators and maintenance personnel ensures they have the necessary knowledge and skills to operate equipment efficiently and troubleshoot issues effectively.
- Process Optimization: Continuously monitoring and analyzing process performance data allows for identification of opportunities for process optimization and efficiency improvements, leading to increased throughput and capacity utilization.

With increasing concerns about water scarcity and pollution, how does Ion Exchange (India) address these challenges and provide sustainable solutions?

lon Exchange's strongest asset is its unique capability to provide 360°

sustainable solutions for water & waste water treatment across industries, institutions, homes and communities both urban and rural, to customers globally for six decades.

Ion Exchange has contributed in shaping the water industry's response by providing the most innovative, cost-effective and sustainable solutions for water and waste water management. And we shall continue to channel all our strengths and efforts into doing this. I see Ion Exchange playing a dominant role particularly in bringing costeffective, user-friendly solutions for waste water treatment and reuse, introducing technologies that require less energy & less use of chemicals.

The impressive countrywide and global infrastructure Ion Exchange has built - seven manufacturing facilities across the country, an assembly centre in Hamriyah Free Trade zone, Sharjah, UAE and a chemical blending unit in Bahrain, warehouse & assembly centre in Indonesia, the new acquisition in Portugal and sales and branch offices both in India and overseas backed a strong network of dealers and stockists have enabled our customers and prospects to benefit by our innovative, quality offerings to meet their ever increasing demand for water and meeting their sustainability goals.

Supported by an extensive 24X7 Digital Service infrastructure, we are well placed to meet challenges faced due to scarce water availability, stringent discharge norms, increasing costs and demands for this limited and scarce resource - viz water.

How does lon Exchange (India) Ltd. differentiate itself from its competitors in terms of product offerings, customer service, and overall value proposition?

lon Exchange (India) Ltd. distinguishes itself from competitors through several key factors in its product offerings, customer service and overall value proposition:

• Innovative Solutions: Ion Exchange

is known for its continuous innovation in developing cuttingedge water treatment solutions. We invest significantly in research and development to introduce new products and technologies that address evolving customer needs and regulatory requirements.

- **Customization:** Ion Exchange offers customized solutions tailored to the specific requirements of each customer. By understanding the unique challenges faced by different industries and applications, we deliver solutions that optimize performance and efficiency.
- Comprehensive Product Portfolio: Ion Exchange provides a comprehensive portfolio of water treatment products and services, including ion exchange resins, membranes, specialty chemicals and engineering solutions. This breadth of offerings allows customers to source all their water treatment needs from a single, trusted provider.
- Quality and Reliability:. We adhere to stringent quality control measures throughout the manufacturing process to ensure consistent performance and customer satisfaction.
- Technical Expertise: We boast a team of highly skilled engineers, scientists and technical experts who provide comprehensive support to customers. From system design and installation to troubleshooting and maintenance, we offer unparalleled technical expertise and assistance.
- Digital 24X7 Service: We are committed to providing exceptional after-sales service and support. We offer maintenance contracts, spare parts availability and prompt response to customer inquiries and service requests, ensuring minimal downtime and maximum uptime for customers' systems.

Could you elaborate on some of




the major projects or partnerships that Ion Exchange (India) has undertaken, highlighting the impact created?

Our acquisition of Portugal based company MAPRIL last year has strengthened penetration into the European market in line with our sustainable growth strategy.

We have witnessed a steady order flow, both in the domestic and international market for engineering, chemicals & services. This includes a 40 MLD Seawater Desalination project for a leading EPC company in North Africa followed by repeat orders for even larger capacities following the timely and quality completion of contract within stringent time lines for the 40 MLD Sea Water Desalination Project. We also received EPC contracts for Desalination and Complex Waste treatment from one of India's largest offshore oil exploration unit.

Other significant orders include a complete Zero Liquid Discharge plant and a turnkey contract for capacity expansion at Indian Oil Corporation, Panipat Refinery.

We have also received several EPC contracts for Water Treatment Recycle and Complete Zero Liquid Discharge plants from leading companies in paint, food & beverages, steel, textiles, to name a few.

As a leader in the industry, how important is environmental sustainability for Ion Exchange (India) Ltd., and how do you ensure it is incorporated into all aspects of

your operations?

The key aspects of Ion Exchange's sustainability strategy are based on the purpose of our business i.e. to conserve the planet's most precious resources through total water and environment management solutions.

Our factories make all efforts to reduce the water footprint by efficient water usage in non-product applications such as cleaning activities, gardening, and for domestic purposes Certification under ISO 14001 ensures system adherence to environment protection guidelines and periodic reporting of compliance to senior management. Emissions generated are within the permissible limits given by CPCB.

An example is the green manufacturing practice followed at our resins manufacturing plant at Ankleshwar. This is the largest resins manufacturing unit in India. Ankleshwar being an industrial area having a cluster of chemical units with inadequate treatment of chemical waste generated by them; the water table and

Expanding into new geographic markets and industries through market diversification and international expansion will continue to be important for us natural water source is heavily polluted. Our facility has an effluent treatment system treating waste streams to acceptable levels for discharge. Our commitment to recover water from the effluent and reduce the load on the environment led us to initiate a firstof-its-kind project to extend the treatment of effluents by a series of state-of-the-art and sophisticated membrane systems.

Ion Exchange has an extensive protocol/ mechanism to test our products for their impact on the customers and the environment. Measuring, monitoring and improving impact across the lifecycle of products and operations will continue to be another key factor of the strategy to achieve our goal to create a positive impact on nature and people's lives and transform Ion Exchange into a water positive operation.

Besides this, an important part of our sustainability strategy is to ensure the well-being of our employees as well as the communities whom we serve.

What are the future growth strategies and areas of focus for lon Exchange (India) in the coming years?

Ion Exchange (India) will continue investment in research and development to drive innovation and develop new products and solutions that address emerging market needs and technological advancements. Expanding into new geographic markets and industries through market diversification and international expansion will continue to be important for us. Leveraging digital technologies and data analytics, will result in improving decisionmaking, enhance operational efficiency and deliver value-added services to customers.

We will continue to increase focus on sustainability initiatives, including offering eco-friendly products and solutions, promoting water conservation and supporting environmental stewardship through corporate social responsibility programs.

Finally, investing in talent development and skill enhancement programs are key for us to ensure the company has the necessary expertise and capabilities to drive innovation, deliver exceptional service and execute growth strategies effectively.

DESIGN ENGINEERING & PROJECT MANAGEMENT FOR CHEMICAL MANUFACTURING PLANTS

Promote lean and modular designs which offer flexibility and also the facilities with lowest cost of ownership with optimum Capex and Opex



Tell us briefly about Triplan India and the services offered by the company?

Triplan in India offers design engineering and project management services for chemical and pharmaceutical manufacturing facility projects, R&D facilities, warehouses etc. The company is based out of Pune in Maharashtra and has presence in India since last 10 years and has an office at prime location.

Can you explain to us about your global presence and German connection and how is this benefiting **India operations?**

Triplan in India is a 100% subsidiary of TTP Group in Germany. TTP Group owns two well-known brands Triplan & Pharmaplan. Both have a legacy of more than 50 years of existence in Europe. Triplan offers design engineering & project management for both

chemical and pharmaceutical projects while Pharmaplan is focused on pharma

We have designed projects for many reputed clients in India like Bayer, Lanxess, Ineos, Reichhold, DCM Shriram, Alkyl Amines, Castrol, Aditya Birla (ABIL), GFL, Atul and Aarti to name a few

lan

(Passion for engineering)

subject matter experts (SMEs) only when it is insisted by the client as a value addition. Otherwise, our engineers have experience in international

projects working alongside their counterparts from different

European offices and have significant expertise on many latest software.

Who are your clients in India and abroad? What are your ongoing projects?

Bayer is our key client both in Europe and India. We have designed projects for many reputed clients in India like Bayer, Lanxess, Ineos, Reichhold, DCM Shriram, Alkyl Amines, Castrol, Aditya Birla (ABIL), GFL, Atul and Aarti to name a few. We have many ongoing projects which we can't disclose as it is confidential in nature.

and biotech projects. Between these two group companies, we have more than 27 offices in Germany, France, Switzerland, Belgium, Austria and India with 1,000+ resources globally.

Company's area of expertise and how do you plan to leverage your global footprint?

We have good process engineering capabilities which is the heart of any manufacturing facility whether it is a chemical or pharmaceutical project. We have all the engineering disciplines inhouse and take support of our

Are you selective on the choice of clients and business verticals that you focus on?

We have a very wide bandwidth when it comes to our project portfolio. We execute both greenfield and brownfield projects and small & large projects for Indian and multinational clients in India and abroad. It all depends on who the client is and also on our business strategies.

What is your USP as a design engineering and project management firm?

We offer our services for all phases of projects like feasibility studies, concept and basic design, detailed engineering, procurement assistance, construction management and commissioning assistance. We do the complete handholding throughout the lifecycle of the project. We take into consideration the safety and sustainable design aspects at the concept stage of the project itself.

We promote lean and modular designs which offer flexibility and also the facilities with lowest cost of ownership with optimum Capex and Opex. We are a very flexible collaborative partner with a business model to suit our clients' interests and we are easily accessible to our customers for any escalations.

We document the lessons learnt from each project and brainstorm on them to improve ourselves for the future projects. We also maintain German quality and precision in our design and project deliveries.

What portion of your revenue comes from international markets? What is your preferred business model?

Normally many of the multinational consultants like us work as low cost engineering centres for their parent company and dedicate 100% or around



We would like to work more closely with our clients at the conceptual stage of the project

50% for them. But we do the majority of work, say more than 80% for the domestic market in India as our employees would like to work more on Indian projects as each and every project is unique and more challenging.

Can you tell us about the challenges faced by you from the clients in the Indian market?

Indian clients have great expectations of quick project deliveries at exceptionally less cost. However many times it so happens that we get delayed inputs from clients and hence the project doesn't move at the expected pace. We have pricing pressures because of competition from Indian consultants and also delayed decisions from clients regarding the project take off. Many of the times their decisions are influenced by the Chinese competition in India and their export markets.

What are your expectations from your clients?

We expect our clients to appreciate the value additions a design engineering firm like us brings to the project. Many of the times projects are designed and executed in a more conventional and unscientific manner from in-house team and from contractors which they end up spending more money and time with high operational costs which would be a recurring loss.

How do you address the challenges? Going forward, what are your future plans?

We are a progressive company with only 10 years of existence in India. We have plans to be more aggressive in the market targeting larger projects and diversified sub sectors. We will be also looking at some international projects but we don't want to increase our share of business with our parent company. We also would like to work more closely with our clients at the conceptual stage of the project so that we can leverage our experience and expertise to add value and be part of a successful project.



PROTECTON BUSINESS WILL CROSS TURNOVER OF OVER RS. 2,000 CRORE BY FY 26-27

Protecton market in India, particularly for heavy duty protective coating, is around Rs. 5,500 - 6,000 crore in India. Berger Paints market share is approximately 25 per cent



Vice President &

Business Head - Protecton Berger Paints India

Competitive landscape of the Indian paints and coatings industry?

There is a paradigm shift in the paint industry, prompting a lot of companies to jump into the fray. The scope and scale for paints and coatings business in India is huge as per capita consumption is at 3-4 kg per annum as compared to 15 kg in developed countries. Moreover, there are four stages of transformation that have happened in the Indian economy. These are digitalization, formulation, structural change and sustainability. ESG or SDG. Within these four structures, there is a huge amount of indigenization happening along with increasing usage of digital platforms at all levels. People are aware of the situation across the world. There is transparency and clarity with respect to the consumers' mind making the paint company more agile & Flexible. Market is extremely volatile and uncertain, complex and ambiguous. In this particular scenario, if one needs to survive then one's mindset needs to match with the industrial mindset. Organizations need to develop a situation based strategy to combat the uncertainty and should be based on flexibility & adaptability.

Strategy India should adopt to become a global manufacturing hub for paints and coatings? What role Berger sees for itself in making India a global hub?

People are already thinking of India as a

55 percent of our business comes from dealer network and it is helping us to grow

global hub due to transformation. We are third in unicorn in the world after the USA and China. India has huge intellectual capital and talents are available at a much cheaper rate. There is a thrust from the government on Atma Nirbhar Bharat, Make in India and Vocal for Local initiatives. We have self-belief and mindset that we can do this The 'can do attitude' and the 'never say die spirit' is making India more vibrant, tolerant and progressive. Similar factors are applicable for the paint as Indian infrastructure, defence and many other sectors are preferring Made in India products. There is a need to develop innovative technology or tie up with someone who is having technology to get it produced in India. In this process, we will also learn and hence the knowledge base will increase in terms of technology and manufacturing facilities.

What is India's current status in the global paints and coatings market and where do you see it going forward?

It is very good to see Indian companies already in the Global Top 20 list. We are Number 14 in the world and there are other giants also there in the Top 20 global list. We are number two in the country, fourth in Asia and in Protecton (Heavy Duty Protective Coating), we are by far the market leader. In December 2023, we crossed 100 years of our existence and celebrating the Centenary year and Berger is the fastest growing paint company in the country. Our major thrust is on value innovation and ease of usage of our paint to the customer. We believe in quality, reliability and delivery. It is not only product innovation but also innovation in process and marketing tools. Innovation is our basic theme in the whole scheme of thoughts.

What's the total size of Protecton business globally and in India? What's the market share of Protecton?

It is very difficult to share exact market size of Protecton because any surface which is prone to corrosion be it concrete or steel, needs protection. Protecton market in India, particularly for heavy duty protective coating, is around Rs. 5,500 - 6,000 crore in India. Berger Paints market share is approximately 25 percent.

How has Berger Paints and Protecton business performed in FY 2023-24?

All the major paint companies which

were not there earlier and also the existing companies that are not focusing on Protecton have increased their focus because they realized the growth potential. Even the Government of India is spending a huge amount of money in terms of infrastructure, especially the Gati Shakti initiative and huge expansion on railways, ports, airports etc. There is a 5% increase in the Railway Budget and there is a huge amount of focus in the airport sector. Wherever infrastructure is there, be it roads,

factories, boats, shipbuilding, airports and railways, the construction and protection chemicals are used. Railway itself is a huge investor; there is a huge amount of investment in designing the bullet train, bullet train stations and lots of other activities. Opportunity for Protecton is extremely huge and everybody can have some pie. We have prepared very well to catch the bus. Hopefully, we will achieve a good number in 2024-25 and last FY we crossed Rs. 1,000 crore.

Overall, the paint industry market was not

so flamboyant because flow of money is little problematic despite opportunities. There were huge problems in the working capital flow and that's why the business was sluggish in the initial stage. There is a tremendous amount of innovation required to protect margin. Hence, the past two quarters were not that good and hopefully we will be covering up in the third and fourth quarter.

Orders bagged by Protecton business in FY 2023-24? What portion of it comes from overseas? Any plans of expanding business outside India?

We have bagged huge orders and among all such orders, we are basically focusing on non-conventional energy. We have received big orders from Reliance Industries through the PV, like Kilby and others. We are very much focused on railway sectors and have got the



first two orders of bullet train stations. We are also going to get more orders for bullet train stations as well as bridges. Again, we expect orders coming from marine segments through our partners. There is also business coming from new sectors. We got good business from Indian Oil. We have done our first venture in ONGC also. Moreover, we have done well in the power sector, be it nuclear power, thermal power, hydel power and non-conventional like solar power and now focusing on wind power as well. As far as the chemical sector is concerned, we are working very closely in segments wherever there is a high level of corrosion. We are focusing on construction chemicals like floor coating, admixtures, grout and sealant. These sectors are equally important and growing in the same way as infrastructure. Having a leadership and good relation with the customers, we are also trying to push these segments as well and that will be another good driver for us in years to come.

Countries that Protecton is focusing on currently and countries where you are planning to expand?

We are already present in Nigeria and have executed business in Kenya and Mauritius. We have our own plant in Russia. Also, we are having a presence through our subsidiary in Europe. We are present in Bangladesh and Nepal. While we are already there in a number of countries, we are now looking at

> taking our business to other countries in Southeast Asia, Saudi Arabia and African countries and further explore Europe. There is a huge amount of scope and we are exploring it.

What's Protecton business plan for FY 2024-25 and how are you planning to execute it?

We are growing at a CAGR of 17% since 2017. From a turnover of Rs. 349 crore, we will be closing FY 2023-24 at Rs. 1,100 crore and by FY2026-27, will be definitely crossing Rs. 2,000 crore.

We have a strong focus on the dealer segment and we have to focus on the infrastructure segment. Third one is the new margin sectors like construction chemicals, admixtures, and flow coating. Export is the fourth pillar among key drivers to take our business to the next level.

55 percent of our business comes from the dealer network and it is helping us to grow. This is not a normal dealer network as they are acting as a partner to us. All business is routed through them so that

Scientific



Laboratory instrumentation barma Primary Packaging Kess Equipment ENABLING THE

our reach can be enhanced further. Our money is safe because the dealer is paying us much faster than the customer, hence, it is a joint growth as the business will grow while customers are better serviced. One has to take care because our business is not about just selling the product but offering solutions to customers through a very close collaborative approach. I strongly believe in 3Cs - Collaboration, Communication and Commitment to customers. Our customers are always looking for affordable and guality solutions and they are aware that Berger can deliver. Customers prefer us because we work with them at the ground level and this has helped us to maintain a leadership position year after year.

Number of plants catering to Protecton business and what's the total production capacity? Are you planning to enhance your production capacity this year?

We are currently catering our business through five plants. In total, we have 17 plants in the country and out of that five plants are dedicated to Protecton. We have set up a Shandilya plant in March 2023 and we are also planning to put more plants in West Bengal. We have acquired 30 acres land in Banagher in Orissa to set up another plant dedicated to the industrial business. This state-of-the-art plant is not just for the decorative paints but also dedicated to construction chemicals as well. We are also enhancing the capacity of our existing plant to cover the increased demand in the market.

What are the new innovations you are planning within Protecton R&D facilities? How will these innovations help in maintaining leadership positions?

We always do something which is not in the market. For example, we have come with water based asphalt coating which has been supplied to the pipe coating segment in the USA. It is a very unique product and no one



could make it in India. And for this reason, the plant itself shifted their base from China to India to get the material cost drastically reduced. The product quality is fabulous and we are creating new opportunities for the company by providing the best product. We have got an award from the railway division for upgrading the product and service through a new innovation called process innovation. We are closely working with the Railway Board and RTSO. Major focus in our whole journey and years to come are railways, airports, army, navy, ports and airports.

We have come with water based asphalt coating which has been supplied to the pipe coating segment in the USA

How does Protecton Consultancy division help businesses in providing complete solutions? What is its USP?

Our consultancy team which is now called the business development team works with the customer to find an exact solution at an affordable price. They do the corrosion audit to find out which plant requires what type of solutions. They make a full-fledged report and provide a unique solution to them. Our team analyses whether there is a lag in the process and application or there is a lack in recommending the painting system. We address the both and recommend AMC and maintenance contracts to customers. We assure them about taking care of issues while they focus on the process or production. It actually gives a really strong mileage to us over others. We are also part of a joint effort along with the CII team to save national assets. 4% of which are being wasted for non-mitigation of corrosion damage.

As far as application is concerned, the

company is using artificial intelligence (AI) to produce a unique product, Skill Berry in collaboration with IIT Madras. This patented product has been tested by our Prime Minister. This initiative helps in training unskilled painters and turning them into skilled painters which is ultimately helping us to give a long time durability of the existing painting system which in turn helps drive sustainability. If you need to have a long term sustainability goal, SDGs 17-point score, corrosion covers 12 points out of 17. These are being covered here and ultimately helps us to address Sustainable Development Goal 2020 through long term solutions.

How does Protecton technology collaboration help industries and tie-ups that you have made till date?

We have tied up with Chugoku Marine Paints for marine paints because of their global expertise. We have come with a new product called Polyurea which is extremely new, unheard of in India and comes from VIP Coatings, Germany. And, we are having tie up with PROMAT, Belgium in terms of firecoating paint to save the structures from the fire through luminescent paint and refinery through Vermiculite paint. We are going to make a lot of other tie ups as the talks are going on with various organizations in innovative areas of application which are not there in the country.

How do you incorporate ESG in your operations and business?

We are incorporating ESG at every stage and have got so many awards by taking these initiatives. The important thing is that we don't need to discharge anything outside our premises. We are having a lot of innovative ways of making waste to wealth and in this regard we are working with IIT Kharagpur and going to have tie up with IIT Kanpur. We are working to save the mother earth and meet sustainability as well as ESG goals.

Industrial pumps for demanding requirements



KEEPING THE MOMENTUM WITH AN ORDER BOOKING WORTH RS. 2,000 CRORE

The company is directing its focus towards green energy and hydrogen technologies in line with emerging trends



What is the global and Indian EPC market size with respect to chemical and petrochemical? Where does Nuberg stand?

The global chemical and petrochemical EPC market is projected to be valued at US\$ 456.91 billion in 2024, with an anticipated growth to US\$ 576.52 billion by 2029, representing a CAGR of 4.76%. Within the Indian context, this market segment is estimated at US\$ 178 billion, expected to reach US\$ 300 billion by 2025. Nuberg maintains a strong presence in the Indian

We have recently finalized the commissioning of Hydrogen Peroxide plants in Uzbekistan and Egypt market, focusing on the chemical, steel, hydrocarbon, green hydrogen and fertilizer sectors. The company plays a significant role and actively participates in these industry verticals.

Nuberg's focus in the last fiscal and what's your focus in the coming fiscal?

We focus on chemical process plants and have been working on different types of chemical process plant technologies like Chlor-Alkali, Sulphuric Acid and Hydrogen Peroxide. Likewise, we are currently undertaking several projects in the hydrocarbon sector. For instance, we are executing projects such as the Sulphur Recovery Unit (SRU) and the Propylene Purification Unit (PPU) for Indian Oil Corporation Limited (IOCL), along with the NPK Fertilizer project for FACT. Again, there are projects in upcoming fields that we have segmented, such as green energy, which includes projects like Bio-Ethanol and making green hydrogen.

We have successfully delivered India's First Hydrogen Fuelling Station in Vadodara for IOCL, a project that has been fully commissioned. In line with emerging trends, the company is directing its focus towards green energy and hydrogen technologies.

Leveraging our extensive experience of over 28 years in hydrogen management, including the successful delivery of Hydrogen Plants, Nuberg is now embarking on various projects centred around green hydrogen. Our ongoing initiatives include the exploration and development of cuttingedge technologies, such as electrolyzers for hydrogen production.

Nuberg has its own manufacturing unit called Indian Peroxide Limited (IPL). Performance of IPL and any expansion that you are planning?

Indian Peroxide Limited (IPL) diversified from Nuberg, which started its first plant for Hydrogen Peroxide. It was commissioned in mid-2018 and after that, the company expanded and doubled its capacity. The initial plant capacity was around 125 TPD and post-expansion, the present capacity is around 300 TPD.

IPL is an emerging company of Nuberg Group with huge growth potential. We will be investing in upcoming projects that are in the pipeline and will soon be declaring the



next project for IPL.

In terms of revenue, how has the company performed in FY 2023–24?

In the fiscal year 2023–24, the Nuberg Group, encompassing both the EPC business and equipment manufacturing, is projected to achieve a turnover of approximately Rs. 1,000 crore. This figure excludes the revenue generated by Indian Peroxide, as it operates as a separate legal entity. Notably, we have recently completed expansion projects, and the initial plant in operation is anticipated to yield a turnover of roughly Rs. 120 crore in the same fiscal year. Looking ahead to 2024-25, our objective is to double the turnover.

Most of the players in chemical and petrochemical are talking about expansion, either brownfield or Greenfield. How are you looking at the current fiscal situation?

There are a lot of expansions, with many new projects coming up. We are quite well

placed and would have an order booking worth Rs. 2,000 crore as of today. We have been growing at a very good pace and we are confident of continuing at the same pace.

Nuberg is expecting good revenue growth, so are you looking at increasing your manpower?

As a company on a growth trajectory, Nuberg recognizes the pivotal role of manpower in our line of business. Over

the past several years, we have consistently expanded our workforce. Presently, we employ over 460 engineers, contributing to a total of 400,000 engineering man-hours. While it is challenging to predict the exact

number of hires for the upcoming year, we anticipate recruiting additional personnel across various fields and disciplines to meet our evolving needs.

How has been FY 2023-24 for Nuberg?

This year has been exceptionally fruitful for the company, with revenues reaching approximately Rs. 1,000 crore. We successfully commissioned several noteworthy projects and embarked on initiatives involving cutting-edge technologies. Notably, we have recently finalized the commissioning of Hydrogen Peroxide plants in Uzbekistan and Egypt, each with a daily capacity of 85 and 70 tons, respectively.

Regarding new projects awarded domestically, Nuberg is actively engaged in



several significant endeavours. We are currently involved in the construction of a sulphur recovery unit for IOCL Vadodara, as well as the execution of an NPK fertilizer plant in Kochi for FACT. Additionally, we have

been entrusted with the construction of a PPU unit by IOCL Panipat. In the chemical sector, we have secured the contract for India's largest Chlor-Alkali Project with a capacity of 2,200 TPD, awarded by Adani Group. The commissioning of this plant is scheduled to be completed within fifteen months. Moreover, we have executed a Bio-Ethanol plant for IOCL Panipat. It has been a prestigious project in Make in India with Made by India technology. We have also commissioned India's first Hydrogen Fuelling Station. It is a trial project by the government and is doing quite well.

In terms of international projects, we are setting up a Sulphuric Acid plant in the Czech Republic, Egypt, Saudi Arabia and Turkey. We are executing a Calcium Chloride project in Oman and a Hydrogen Peroxide plant in Indonesia. Apart from these, there are various projects in Turkey, Egypt and other countries.

What portion of your revenue comes from exports?

If you look at current financial numbers, the revenue from exports would be around 55 to 60 percent.

Are you looking to increase your international exposure and what kind of projects are you looking for globally?

Our operations encompass over 30–32 countries, providing significant international exposure. In our pursuit of new projects, we adopt a balanced approach, actively

We have secured the contract for India's largest Chlor-Alkali Project with a capacity of 2,200 TPD, awarded by Adani Group

participating in both international and domestic markets. This strategy is aligned with our core objective of "Making Ideas Happen" and remains integral to our future endeavours.

Are you seeing any particular trend with respect to sustainable technologies? Do you see any licensing agreements that need to be changed or do you see any technology coming up to change the overall scenario?

When we say EPC into chemical plants, there are various technologies in the market for different chemical plants. Whatever new chemical technologies we are working on, there is always a continuous process of improvement. We are very closely integrated into working on new technologies. We have our own technology for Hydrogen Peroxide which has three patents as of today.

The most upcoming thing is green hydrogen, whether it is to do with the electrolyzer for water electrolysis or into purification or green ammonia. For sustainability, it is a very important step that the world has taken and there is a tremendous amount of development. This emerging trend is garnering significant attention from numerous companies, and we are likewise receptive to exploring projects in compressed biogas (CBG) moving forward.

What are your plans for the current financial year?

In the forthcoming financial year, our strategic focus is on pioneering advancements in green energy technologies. This initiative aligns with the industry's growing emphasis on sustainability and renewable energy solutions. Additionally, we are gearing up for our next phase of expansion in Indian Peroxide Ltd., aiming to commence a new project that will further solidify our position in the market. Given our robust order book and the positive outlook for the EPC industry, we anticipate significant growth and are poised to capitalize on emerging opportunities.



EV & Battery

Fuelling The Green Future



STEERING THE GREEN WHEELS

The winds of change propelling the adoption of electric vehicles at an unprecedented pace will reshape India's automotive landscape in due course TEAM ICN

he Indian electric vehicle (EV) and battery industry has been experiencing significant growth and development in recent years, driven by government initiatives, environmental concerns, and technological advancements. The market in India has been growing steadily, with increasing demand for electric cars, twowheelers and commercial vehicles.

The EV market is estimated to reach US\$ 7.09 billion in India by 2025. A study by CEEW Centre for Energy Finance

recognized a US\$ 206 billion opportunity for EV in India by ADITYA BIRLA 2030. This will necessitate a US\$ 180 billion investment in vehicle manufacturing and charging infrastructure. The Economic Survey 2023 predicts that India's domestic EV market will see a 49

per cent compound annual growth rate (CAGR) between 2022 and 2030, with 10 million annual sales by 2030. Additionally, the electric vehicle industry is projected to create around 50 million direct and indirect jobs by 2030.

According to NITI Aayog and the Rocky Mountain Institute (RMI), India's EV finance industry is likely to reach US\$ 50 billion by 2030. A report by the India Energy Storage Alliance estimated that the EV market in India is likely to increase at a CAGR of 36 per cent until 2026. In

The Union Budget FY 2023-24 allocated approximately US\$ 631 million towards its FAME-II scheme to subsidize and promote the adoption of clean energy vehicles

addition, the projection for the EV battery market is expected to expand at a CAGR of 30 per cent during the same period.

In 2023, the domestic EV market was dominated by Tata Motors (72%), followed by MG Motors (10.8%) and Mahindra (9%), with the top selling models being Tiago, Nexon and Tigor from Tata Motors, the MG ZS, and Mahindra XUV400. This is followed by Citroen's eC3 EV at 3.5 per cent market share. Swedish luxury carmaker Volvo Cars is exploring possibilities to

> set up a new electric vehicle manufacturing facility outside China and India is a contender in the race

Slowly yet steadily EVs are gaining traction

In India's bustling urban centers, the tide is turning towards sustainable mobility solutions. Electric twowheelers and shared mobility services are emerging as popular choices, offering efficient and ecofriendly alternatives to traditional transportation. With urbanization on the rise, the demand for compact, affordable EVs tailored to urban commuting needs is set to surge, presenting a vast opportunity for market players.

The nation's first EV charging plaza was established by EESL in July 2020, and in just one year the number of charging stations has multiplied over five times. The increasing popularity of EVs in the national capital highlights the success of the Delhi EV Policy launched in 2020. In December 2022, EVs accounted for 16.8 per cent of all vehicle sales in Delhi, marking a YoY growth of 86 per cent. Zoomcar and Tata Power EV Charging Solutions signed

a contract to provide seamless and userfriendly charging experience across all Tata Power stations in India.

Amidst this surge, the heart of the electric vehicle revolution beats in the advancements of battery technology. India's pursuit of indigenous battery manufacturing is gaining momentum, aiming to reduce dependence on imports and drive down costs. Innovations in battery chemistry, energy density and charging infrastructure are pivotal in shaping the future of EVs, promising longer ranges, faster charging times and enhanced affordability.

Massive market potential

EVs could account for more than 40 per cent of India's automotive market and generate over US\$ 100 billion of revenue

Key trends shaping the adoption of EVs

- Acceleration of adoption
- Battery innovation and localization
- Partnerships and collaborations
- Urban mobility solutions
- Regulatory winds of change

by 2030. To realize this revenue potential, India's EV market needs to grow more than ten-fold in volume over the next 6-7 years. This is achievable, but only with focused interventions across five key areas: new product development, GTM/distribution B2B focus, optimization, software development and scale-up of charging infrastructure.

In the vast sea of opportunities,



partnerships and collaborations emerge as guiding stars. Industry players, both domestic and international, are forging alliances to leverage synergies, accelerate innovation and scale production. From joint ventures in battery manufacturing to strategic partnerships in charging infrastructure development, collaborative efforts are instrumental in surmounting challenges and capitalizing on growth prospects.

Challenges galore

Despite the growth potential, the Indian EV industry faces challenges such as high upfront costs, limited charging infrastructure, range anxiety and consumer awareness. Electric vehicles tend to have a higher upfront cost compared to conventional internal combustion engine (ICE) vehicles. The cost of EV components, such as batteries and electric motors, is currently higher than that of conventional fuel engines.

Expensive batteries contribute to the higher initial cost of electric vehicles, making them less affordable for many consumers. The scarcity of charging stations and the need for long charging times pose challenges for EV owners, leading to range anxiety and inconvenience. Limited driving range and the lack of charging infrastructure contribute to this concern. India's vast geographical expanse adds to the range anxiety problem, as long distances between charging stations can cause apprehension among potential buvers. Standardisation efforts are necessary to ensure compatibility and streamline the charging experience for electric vehicle owners.

To overcome these challenges, there is a growing focus on innovation, research and collaboration among government, industry, and academic institutions. Efforts are being made to develop affordable and efficient electric vehicles, battery technologies and charging infrastructure. **Policy support** The Govt. of India has been actively promoting the adoption of electric vehicles through various initiatives such as the Faster Adoption and Manufacturing of Hybrid and Electric Vehicles (FAME) scheme, which provides incentives for the manufacturing and purchase of electric vehicles and their components. In addition to FAME, several states in India have announced their own EV policies with incentives for manufacturers, buyers, and charging infrastructure providers. These policies aim to accelerate the adoption of electric vehicles and reduce reliance on fossil fuels.

In the 2023-24 Union Budget, Finance Minister Nirmala Sitharaman announced a budget allocation of Rs. 35,000 crore for crucial capital investments aimed at achieving energy transition and net zero targets by 2070. Furthermore, the Finance Minister stated that the government will support Battery Energy Storage Systems (BESS) with a capacity of 4,000 MWH

through Viability Gap Funding. For electric vehicle manufacturers, the government has already launched initiatives such

as the Faster Adoption of Manufacturing of Electric Vehicles Scheme – II (FAME – II) and the Production Linked Incentive Scheme (PLI).

The Budget has allocated approximately US\$ 631 million towards its FAME-II scheme to subsidize and promote the adoption of clean energy vehicles. This represents an 80 per cent increase in budget allocation from previous years. The reduced custom duty on Lithium-ion batteries used in electric vehicles and excise duty exemptions on natural gas and biogas could result in more foreign electric vehicles being imported to India.

The regulatory currents exert a profound influence on the industry's course. Evolving emissions norms, vehicle electrification targets, and incentives shape the competitive landscape and market dynamics. Regulatory clarity, stability

Key Challenges

- High upfront costs
- Expensive battery
- Limited charging infrastructure
- Range anxiety
- Lack of consumer awareness
- Lack of standardization

and alignment with industry stakeholders are essential for fostering innovation, investment and market growth.

Future outlook

BOROSIL

The Indian electric vehicle and battery industry have immense potential for growth, driven by favourable government policies, increasing environmental consciousness, and technological advancements. With continued support and investment, India has the opportunity

> to emerge as a significant player in the global electric vehicle market.

> Overall, the Indian electric vehicle and

battery industry are poised for significant expansion in the coming years, presenting opportunities for manufacturers, investors, and consumers alike. By embracing innovation, collaboration, and sustainability, we can harness the full potential of this transformative industry, steering towards a brighter, cleaner and more electrified future.

India's EV market is poised for significant growth in the coming years. With supportive government policies, increasing consumer awareness, and advancements in technology, the country is well positioned to transition towards a more sustainable and eco-friendly mode of transportation. As the demand for EVs increases, it presents a tremendous opportunity for both local and international companies to invest in and contribute to the growth of India's EV ecosystem.





ADVANCED MATERIALS
 CHLOR-ALKALI
 PHOSPHATES
 SULPHITES

FILM PRODUCTS FOR POWER STORAGE AND GENERATION

IPCO highlights some of the opportunities that are emerging as the world moves towards more sustainable technologies for energy production and storage



t's evident that relying on fossil fuels for our energy needs is no longer a sustainable option. Across the globe, the shift towards renewable energy sources is not just a trend; it's a movement gaining momentum by the day. Established technologies like hydropower, solar and wind are leading the charge, while investment in newer avenues such as bio, geothermal and wave/tidal energy is on the rise.

In parallel, advances in battery and fuel cell technologies are opening up significant market opportunities, particularly for businesses engaged in thin film production, membrane development or ceramic tape manufacturing. This article looks at the common requirements of various fuel cell and battery types, as well as the manufacturing techniques required for their production.

One promising avenue in the quest for decarbonization is hydrogen, particularly

when produced using renewable sources. In this first example, we'll focus on its potential applications in the automotive and transportation sectors.

PEM fuel cells:

Fuel cell electric vehicles (FCEVs) harness the power of hydrogen, converting it into electricity through a process enabled by polymer electrolyte membrane (PEM) fuel cells. These cells, featuring

an electrolyte membrane nestled between positive and negative electrodes coated with platinum catalyst layers, are at the heart of this energy

IPCO manufactured the world's first steel belt in 1901

conversion.

Hydrogen fuel meets the anode, where the catalyst initiates the separation of its components, yielding an electrical current. While protons pass through the PEM membrane, electrons take a detour around it, generating electricity. Eventually, electrons rejoin protons on the cathode, forming the emission by-product: water vapor and heat.

Solid oxide fuel cells:

Another electrochemical technology is the solid oxide fuel cell (SOFC), which employs a solid oxide or ceramic electrolyte to conduct negative oxygen ions (or in some cases, protons) from the cathode to the anode. Operating at notably higher temperatures than PEM fuel cells, SOFCs have applications in stationary setups like Combined Heat and Power (CHP) systems for residential and industrial power generation. Interestingly, this technology can also reverse the process, converting energy and water into hydrogen gas.

Solid state batteries:

Unlike fuel cells, which continue to generate electricity for as long as fuel is available, batteries have a finite energy storage capacity.

Conventional lithiumion batteries feature a cathode and anode separated by a porous polymer. In an SSB, there is only a cathode – or positive electrode – and a solid state ceramic separator. There is no anode. When the



High quality thin film produced using IPCO's continuous film casting process.

battery is charged, the lithium leaves the cathode, passes through the separator and forms an anode of pure metallic lithium. This configuration allows for higher energy density, faster charging, enhanced safety and reduced self-discharge rates.

Potential applications include wearables, medical implants, Internet of Things (IoT) devices, with future prospects including vehicle propulsion and largescale energy storage solutions.

While batteries and fuel cells share similarities in a number of ways, the focus here lies on the separator or membrane pivotal in both technologies. Whether it's a polymer electrolyte, solid oxide electrolyte, or solid state ceramic separator, film casting emerges as a critical manufacturing process.

Film casting for sustainable energy technologies

At IPCO, our continuous film casting system has been specially developed to enable the production of thin films, tapes and membranes to exceptionally fine tolerances.

The system uses a steel belt to transport a layer of liquid product through a series of carefully controlled sections. Once these processes have been completed, the solid formed or transformed product is removed from the belt. At this stage the product will be either in final or intermediate form; the latter requiring further processing such as post drying, leaching or stretching.

There are three main components: a high precision slot die, a polished steel belt and a drying or conditioning system.

The slot die coater delivers a uniform and homogeneous casting of the product onto a moving steel belt. A combination of high precision engineering and a small gap between the die and belt means the thickness profile of the film can be set to precise tolerances.

IPCO was built on steel belt technology as the company manufactured the world's first steel belt in 1901 and it has remained a foundation of the business ever since. Polished steel belts used for film casting are manufactured to thickness tolerances accurate to within $\pm 10 \ \mu m$ and polishing grades as fine as Ra $< \pm 0.1 \ \mu m$.

Powerful forces need to be applied to ensure that these heavy, high precision belts remain flat and stable during the production process. This requires a robust hydraulic belt tensioning system, together with sophisticated belt tracking to keep the belt running perfectly straight.

The supporting machine frame, drum shafts and bearings must also be suitable for this heavy-duty application if a high quality end product is to be guaranteed;



COMPLETE PRODUCTION LINES FOR CERAMIC TAPE / FILMS High precision film casting
Innovative Venturi dryer
From 10-300 µm
Pilot plant available





Film casting line – with Venturi dryer – at IPCO's productivity center in Germany.

any bending could result in deviation, compromising product quality.

Temperature is another key process parameter, and IPCO has developed control units for steel belt tempering by means of drum heating, impingement heating or water spray zones. Heating of the feeding drum ensures that the belt reaches precisely the right temperature at the feed point. This requires a maximum of 1 K deviation in surface temperature across the full width of the drum, a real challenge when a typical drum could be 2000 mm wide with a diameter of at least 1200 mm, usually more.

IPCO can also offer air handling solutions to prepare the process air as required for each process step in the desired temperature and humidity.

Innovative Venturi drying system

Once cast onto the belt, the film is carried to the Venturi dryer, a technology unique to IPCO for this application and one that has the key benefit of eliminating any risk of skin formation on the product. This is achieved through the use of a permeable IPCO has recently expanded the scope of its film casting pilot plant at its advanced research and development facility at its headquarters near Stuttgart

metal foam within the dryer, positioned above the drying film. A flow of tempered air is applied to the upper side of this foam-like metallic material, creating a low negative pressure effect on the lower side in accordance with the standard laws of pneumatics.

As a result, a constant suction flow is formed and this, in combination with heating from below the belt, means solvent is evaporated and extracted from the film without the air coming into direct contact with the surface of the product. The result is a homogeneous drying effect that delivers an end product of exceptionally high quality, with low stress and virtually no risk of fault and imperfections. Films can be produced in thicknesses from 10-300 μ m, as required for the end application.

As well as improving product quality and reproducibility, the Venturi process also enhances production efficiency. The increase in thermal transfer efficiency compared with conventional dryer systems also enables a reduction in the length of the drying section.

The overall system offers precise control of every stage of the process from line speed and dryer temperature to belt heating and air speed. Additional drying segments can be incorporated behind the Venturi dryer, including impingement dryers which are safe to use at this stage.

IPCO's single belt film casting units offer a range of benefits including ultra-efficient continuous production, outstanding reproducability and the ability to cast very thin films to fine tolerances.

IPCO Productivity Center

IPCO has invested in an advanced research and development facility at its headquarters near Stuttgart, Germany and has recently expanded the scope of its film casting pilot plant. This is a complete system incorporating heated slot dies of different sizes, a 700 mm wide polished steel belt with heating, one Venturi dryer and two impingement sections.

This plant is available to manufacturers of film, tape and membrane products for process assessment and product testing, and IPCO technicians and engineers are available to provide full support in terms of mapping the process in batch mode. Customers in India interested in discussing the opportunities and facilities available at this test and demo center should initially contact IPCO's Southeast Asia sales and service office in Pune.



COMPLETE PRODUCTION LINES FOR CERAMIC TAPE / FILMS High precision film casting
Innovative Venturi dryer
From 10-300 µm
Pilot plant available





REASONS TO PARTICIPATE

- A well curated agenda focusing on opportunities, challenges and global trends
- A platform providing great networking opportunities with industry experts and solution providers
- Branding Opportunities throughout the platform
- Gain insights from who's who of chemical and petrochemical industry
- Explore innovative products & solutions from the top industry players

Who Should Attend?

- Policy Makers/Decision Makers
- CMDs/CEOs/MDs
- Academia
- IT & Technology Managers
- Plant Managers & Operators
- Automation Heads
- Industrial Automation Managers
- EPC Solution Providers
- Quality Heads & Professionals
- Industry Associations
- Think Tank
- Sales & Marketing Head

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TO INVEST CLOSE TO RS. 8,000 CRORE IN DEVELOPING FACILITIES IN INDIA AND US

Working on the investment to set up a 300,000 ton coal tar distillation plant with downstream units to produce specialty chemicals



Epsilon Carbon and Epsilon Advanced Materials are on an aggressive expansion spree. What is the project wise total Capex planned for both entities till date?

Currently Epsilon carbon is under capital expenditure cycle, focusing on both greenfield expansion in Orissa and brownfield carbon black expansion. We are targeting a capex of Rs. 2,000 crore over the next two years to build out these capacities. Moreover, Epsilon's strategic vision extends beyond domestic expansions. We're venturing into advanced materials, with plans to establish multiple graphite anode facilities, commencing with operations in India and the US. In the next three years, our investment commitment stands at close to Rs. 8,000 crore in developing facilities in both regions India and the US.

Last year Epsilon announced a US\$ 650 million battery component and anode plant in the USA. What factors promoted you to set up the plant there considering you are a strong advocate of local manufacturing? What is the latest development on this facility?

We prioritize local manufacturing

We prioritize sustainability by utilizing 90% renewable power and implementing zero discharge facilities and customization for diverse/various clientele. Hence, we selected North Carolina's Brunswick County site for setting up a manufacturing facility in the US. Brunswick county is one of the fastest growing counties in the NC with developed infrastructure, skilled workforce and welcoming environment for business.

Presently, there is a promising opportunity with prominent/larger USbased customers seeking to establish large-scale giga factories. Consequently, our focus is on establishing a facility in India initially, tailored to their needs, followed by the establishment of a plant in the US, particularly in North Carolina, to cater directly to US customers while ensuring compliance with IRA regulations. Currently, our US facility is in the permitting phase, with advanced engineering stages underway. We aim to commence construction early next year and complete the facility within the next 18 months.

Epsilon Carbon plans to establish Rs. 9,000 crore graphite anode facility in Karnataka. Please elaborate?

Epsilon Carbon announced this investment of Rs. 9,000 crore in Karnataka last year. The aim is to build a 100,000 ton per year graphite anode facility to cater to both Indian and global customers. This facility will produce synthetic graphite at some of the lowest carbon footprint in the world at about 80% lower than what is



produced in China today. Our first phase will be to start off with a 30,000 ton facility and we'll have about a Rs. 3,500 crore investment to build that plant.

Epsilon Carbon also plans to set up a Rs. 10,000 crore Integrated Carbon Complex in Odisha. What will be its salient features, manufacturing capacity and completion date of this project?

Epsilon Carbon plans to replicate the integrated carbon complex that has been built in Karnataka over the last 10 years, where we have different businesses of specialty carbon, carbon black and our advanced materials as well. We are working on the investment to set up a 300,000 ton state-of-the-art coal tar distillation plant with downstream units to produce specialty chemicals that are today not manufactured in India. We hope to replace imports with our production capacity there. This plant will cater to local aluminium smelter demand and also export to the Middle East. Our goal is then to continue the journey of setting up a carbon-black plant and advanced materials plant to create this, to become

one of the World's largest integrated carbon complexes.

The company has announced an investment of Rs. 1,200 crore in polymetallic nodule plant. What is the current status?

We've recently signed a Memorandum of Understanding (MoU) with the metals, the metals company to develop this onshore nodular processing facility. Currently, the metals company is waiting for the offshore permit in the US from the EPA. So, we continue to study this project but not much development is happening over here.

What is the big opportunity in the battery industry? Where does Epsilon fit into the battery ecosystem?

Today India relies heavily on imported battery materials. In 2018, we imported around US\$ 1.23 billion worth of lithiumion batteries, which accounted for more than half of the country's demand. To address this, the Indian government launched the Production Linked Incentive (PLI) scheme for the Advanced Chemistry Cell (ACC) battery to boost domestic manufacturing. This scheme reduced dependencies on imported battery materials and accelerated the rate of innovation within the country. This had a significant impact on the country's battery material industry, which was valued at US\$ 1.66 billion in 2020 and is projected to reach US\$ 4.85 billion by 2027, registering an impressive CAGR of 17.23 per cent during the forecast period of 2022-2027.

This unprecedented growth was amplified due to India's strong manufacturing ecosystem, in innovation and a large pool of technical and engineering talent. The industry has gained significant momentum in recent years and has put us in a position of strategic importance in the global battery materials market.

The magnitude of demand for batteries is high, with the number of GWh (Gigawatt Hours) required increasing from about 700 GWh in 2022 to around 4.7 TWh (Terrawatt Hours) by 2030. Additionally, there are looming concerns about supplies of key battery materials like cobalt and lithium that are pushing the search for



alternatives to the standard lithium-ion chemistry.

This is where India has a major advantage as a leader in the chemical industry to address this challenge. The chemical industry is a crucial contributor to the battery material supply chain, providing essential raw materials to produce batteries.

In 2019, the Indian chemicals industry stood at US\$ 178 billion and is anticipated to reach US\$ 304 billion by 2025, registering a CAGR of 9.3%. It is one of the fastest growing sectors in India and is currently the 10th largest chemical trade partner for the US which is estimated to scale up to 7th by 2030. Herein, lies an opportunity for India's booming chemical industry to take lead and convert minerals into battery materials and reduce the dependence on China.

China has really focused and dominated on developing this material processing industry while minerals continue to be mined in Canada, Australia and Africa. But the processing industry of both anode and cathode is located in China and this is what we as Epsilon think we can build in India and globally also with our mature technology that we have developed over the last five years. So, we see ourselves being a battery materials company to support energy transition and contribute both to Indian companies and global companies.

What strategy should India adopt to become a global manufacturing hub for Battery Chemicals and products? And, what role does Epsilon Group see for itself in making India a global manufacturing hub?

The challenge in battery chemicals today lies in the necessity of achieving a certain scale when constructing these facilities. Currently, India is an emerging market in terms of self-production. Many companies, such as Reliance, Amaraja, and JSW, are investing in manufacturing facilities, but they require time to reach optimal scale. Our industry also needs to match this scale. So, we see an advantage of building these facilities in India to cater to larger facilities that are being built in the U.S.

As India expands its scale, we are prepared with a cost-efficient, wellestablished company capable of meeting both global and domestic demand. Our aim is to localize our operations entirely in India and to support PLI winners and other companies in establishing a robust supply chain to meet India's energy transition requirements.

What are the challenges faced by the battery industry in terms of sustainability and recycling? Role of Epsilon in this direction?

It is very important to understand the process of battery material production, particularly when transitioning from battery minerals to active materials like anodes or cathodes. At Epsilon, we prioritize sustainability by utilizing 90% renewable power and implementing zero discharge facilities. Moreover, we focus on maximizing value through the utilization of byproducts generated during the battery material manufacturing process. This approach not only enhances our cost competitiveness on a global scale but also facilitates the production of more sustainable materials.

Epsilon firmly believes in the future of a circular industry. We also are into lithium-ion battery recycling, and we anticipate significant growth in this sector within the next three to four years, once our virgin anode and cathode businesses have expanded. By integrating recycling processes into our operations, we aim to create a truly circular business model. This involves reclaiming materials from end-of-life batteries and production scrap, reprocessing anode and cathode materials, and reincorporating them alongside our virgin materials. Today globally this is a necessity, and Epsilon is proud to be at the forefront of advancing this technology and promoting circularity.

Some of the major challenges we face in India for recycling in battery industry are as follows:-

- Lack of organised collection of battery waste
- Lack of education and awareness amongst the population in comprehending the criticality of the minerals found in lithium-ion batteries
- Absence of defined processes or guidelines for lithium-ion battery recycling,
- Unscrupulous recyclers misusing the system for monetary gain with no accountability
- Dearth of lithium-ion batteries found in the country
- Exhausting process to import batteries from abroad

Epsilon's performance in FY 2023-24 and what's your expectation from FY 2024-25?

The company continues its growth. We clocked in at about a Rs. 3,000 crore top line last year. As I mentioned earlier, we are in a large Capex cycle this year and anticipate surpassing Rs. 6,000 crore in revenue after the completion of our Capex cycle at Epsilon Carbon. At Epsilon Advanced Materials, we have set a short-term goal of reaching a turnover of approximately US\$ 700 to 800 million within the next three years as we expand these large facilities.

Epsilon became the first Indian company to export liquid coal tar pitch. How do you see the growth opportunity in the global coal tar pitch market and what is your strategy to tap this?

We believe that India has a huge opportunity to cater to global demands

when it comes to these various products. especially coal tar pitch. Coal tar itself is a diminishing commodity in Europe, Japan, and the US. As coal tar production increases in India, we see the opportunity to cater to the Middle East. Currently, the Middle East imports approximately 500,000 tons of coal tar pitch annually and is actively seeking supply chain changes. India is viewed as a potential great supplier in this regard. This is where Epsilon has made investments in its own liquid pitch tanks in Mangalore, becoming the first company in India to export liquid coal tar pitch and support Middle Eastern companies.

Epsilon Carbon aims to become a global leader in carbon products. What strategies would you employ to achieve this goal?

We entered into the carbon black business approximately three years ago. We have been running at 100% capacity and due to the demand from customers, we decided to expand our capacity by adding another 100,000 tons.

In the next six months, we should become a 215,000 ton a year carbon black plant, positioning us as the thirdlargest capacity provider in India. With

The aim is to build a 100,000 ton per year graphite anode facility to cater to both Indian and global customers

our expanded capacity and diverse product range, we are well-equipped to meet the demands of the local Indian tyre market and fulfil a substantial portion of the export market's need for high-quality carbon black.

Currently, we estimate that our carbon footprint is approximately 20% lower than that of carbon black produced by other Indian manufacturers.

pricing and marketing strategies for Epsilon Carbon's products in order to remain competitive in the market?

As we navigate the competitive landscape for Epsilon Carbon's products, it's imperative to devise robust pricing and marketing strategies to maintain our edge in the market. Here are some additional thoughts and considerations:

Integration of Sustainability: Given the increasing emphasis on sustainability in the market, we ensure our pricing and marketing strategies reflect Epsilon Carbon's commitment to environmental responsibility.

Data-Driven Decision Making: We analyze our sales data, customer feedback, and market trends to identify opportunities for optimization and refine our strategies for maximum impact.

Brand Building: Investing in building the Epsilon Carbon brand as a symbol of quality, innovation, and reliability. Consistent branding across all touchpoints, including packaging, advertising, and online presence, is reinforcing our positioning in the market and enhancing brand recall among customers.

Epsilon has recently secured Rs. 100 crore sustainability-linked funding. How do you incorporate sustainability and green elements in your project?

In addition to our circular approach to managing utilities and by-products and sharing them among our specialty carbon, carbon black, and advanced materials businesses, we have outlined a roadmap for the next two to five years to enhance our ESG ratings. Internally, we benchmark all utilities, seeking ways to reduce power and water consumption, improve product yields and secure sustainabilitylinked funding. This funding supports our additional capital expenditure and the deployment of necessary technologies to achieve these improvements. We aim to become a leading sustainable company globally, particularly in the production of various carbon products.

AIMING TO TAP GLOBAL **OPPORTUNITIES IN EV AND** ESS ECOSYSTEMS

Our core group strength and synergy are in manufacturing complex Fluorine and chemical derivatives such as Fluoropolymers and Fluoroelastomers



How has the performance been of **Guiarat Fluorochemicals Limited** (GFL) in 2023-24? What is the expectation from 2024-25? What are the key achievements in 2023-24?

The year 2023-24 has been challenging overall for both the chemical industry as a whole and for GFL. Our Fluoropolymers segment was impacted by destocking in Europe. As a result, our results for FY 2023-24 were muted as compared to the previous year.

However, moving forward, the destocking phenomenon seems to be phasing out and we expect to see continuous growth guarter on guarter from hereon. FY25 is also expected to reflect some of the positive impact from the exit of legacy players in the Fluoropolymers segment.

Our EV business, GFCL EV, saw the commissioning of the initial phase of its integrated battery materials manufacturing facility. With battery agnostic offerings

covering both Lithium Iron Phosphate (LFP) and Nickel Manganese Cobalt (NMC) batteries, the GFCL EV product

portfolio caters to around 40% value of LFP battery cost. With a CAPEX of Rs. 6,000 crore already announced for the

We are strategically positioned to capitalize on the enhanced demand both in India as well as globally



making costs. EVs affordable more and competitive in the Indian market.

The opportunities mainly involve government initiatives aimed at curbing vehicular emissions, such as the implementation of policies like the Production Linked Incentive (PLI) scheme for Advanced Cell Chemistry batteries, coupled with state-level subsidies to facilitate the establishment of electric vehicle manufacturing, underscore a strategic focus on sustainability and innovation. These measures, alongside the burgeoning

next 3 years, we aim to tap significant global opportunities presented by the Electric Vehicle (EV) and Energy Storage System (ESS) ecosystems.

the emerging What are challenges and opportunities for the EV market in India?

Customer perception of range anxiety remains a significant hurdle in India's EV adoption journey. The limited charging infrastructure adds to this worry and poses a challenge to widespread EV adoption.

Additionally, the price disparity between internal combustion engine (ICE) vehicles and EVs remains a barrier for many consumers. However, fostering domestic manufacturing and incentivizing local production of EV components can

drive down production



domestic market spanning various segments including passenger vehicles, two and three-wheelers, present a landscape ripe with opportunities for growth and development within the EV sector.

What is the current market demand for battery chemicals, and how does GFCL EV Products plan to capitalize on this demand?

In the past few years, a number of factors have impacted the global EV markets and hence the battery chemicals market by extension. Some of the key markets are now beginning to mature and what they need are reliable, uninterrupted supply chains together with availability of affordable battery metals. Global disruptions like the Russia-Ukraine conflict have impacted both these areas. Add to that the investments companies have already made in capacity and technology development, and the impact on prices and availability cannot be missed.

On the other hand, the global focus on environment protection and promotion of EVs has resulted in significant expansion in the global EV market. Nearly 14 million new electric cars were sold worldwide in 2023.

In the face of these global scenarios, India's EV market has been remarkably resilient. EV adoption in India is still in its nascent stages, but growing leaps and bounds. Driven by adoption of twowheeler (2W) and three-wheeler (3W) segments, EVs are projected to account for around 40% of total vehicle sales in India by 2030. For the battery and battery chemicals market, this means that the demand will remain robust, which is good news for companies like GFCL EV.

With our product offerings in the areas of Cathode Active Materials, Electrolytes, Battery Binders and Additives, and the dependability of GFL's Fluoropolymer expertise and supply chain reliability, we are strategically positioned to capitalize on this enhanced demand both in India as well as globally.

GFCL EV Products Ltd's vision is to evolve as a respected EV and Energy Storage components company. What is your strategy to achieve this vision? We aspire to establish ourselves globally as a reputable company specializing in EV and ESS components. Our strategic approach to realizing this vision involves becoming a leading material solutions provider to the burgeoning battery manufacturing sector in India, thus facilitating the widespread adoption of EVs and actively contributing to the reduction of carbon footprints.

To achieve this, we are committed to aligning our growth trajectory with market demands, while judiciously allocating resources, including capital investment, to support our expansion and innovation efforts.

The company recently announced an investment of Rs 6,000 crore over the next 4-5 years in EV and ESS battery solutions. Major chunk of the investment is earmarked to set up a battery chemicals factory in Gujarat. Could you please share details with us?

In the preceding two financial years, our company has made considerable investments to increase our production



ADVANCING EV BATTERY SOLUTIONS GLOBALLY

Battery Chemicals | Fluoropolymers Cathode Active Material (CAM)





capabilities across both intermediary and finished product categories in the Lithiumion battery materials sector. Notably, in the last quarter of the fiscal year 2024, we successfully commissioned two new plants dedicated to battery materials production.

Moving forward, our strategic direction entails aligning our growth trajectory with market demands. We intend to judiciously allocate capital expenditure (Capex) towards augmenting our manufacturing capacities to meet the evolving needs of the market.

Can you also outline the company's manufacturing capabilities and capacity for battery chemicals?

Our core group strength and synergy are in manufacturing complex Fluorine & chemical derivatives such as Fluoropolymers and Fluoroelastomers. Within this niche, we proudly stand as one of the select global players, distinguishing ourselves as the sole Indian manufacturer with exports reaching mature markets.

Regarding our battery chemicals capacity, our existing infrastructure is poised to support approximately 5~6 GWh of battery production. This capability underscores our commitment to diversifying our portfolio while leveraging our core competencies to contribute meaningfully to the EV industry.

How are you going to differentiate your battery technology from other industry players?

We have implemented rigorous quality systems at every stage of production, ensuring that our solutions consistently meet the highest standards of battery grade purity, quality and reliability.

This expertise uniquely positions us to provide material solutions that prioritize both quality and cost-effectiveness. Whether catering to domestic or overseas markets, our commitment to excellence allows us to stand out among competitors, offering innovative solutions that address the evolving needs of our customers with precision and efficiency.

Can you provide an overview of the types of battery chemicals that GFCL EV Products aims to specialize in and their applications?

GFCL EV Products specializes in various segments of battery materials, each catering to specific applications within the electric vehicle and energy storage sectors.

In the cathode segment, we offer Lithium ferro phosphate (LFP). In the electrolyte segment, we are present in both the salt (LiPF₆) and finished electrolytes. We intend to produce two key additives in the electrolyte segment and we offer PVDF/PTFE in the binder category.

By strategically focusing on these key segments, we ensure a comprehensive offering that meets the diverse needs of battery manufacturers, supporting the advancement and adoption of electric vehicles and energy storage solutions.

You have also announced setting up a cell performance testing lab to drive innovation in EV/ESS applications this year. Please share details with us?

We are happy to announce the establishment of our Performance Testing Lab (PTL), scheduled for commissioning in the third quarter of this fiscal year. Equipped with state-of-the-art equipment, our PTL will facilitate comprehensive celllevel testing, encompassing both coin and pouch cells. Through this, we also aim to foster collaboration with our customers, enabling us to tailor material solutions to meet their specific cell requirements effectively.

How does the company ensure the sustainability and environmental friendliness of its EV and battery products? Ensuring the sustainability and environmental friendliness of our EV and battery products is a paramount commitment for us. We were among the first companies in India to receive carbon credits issued by the United Nations Framework Convention on Climate Change (UNFCCC) in 2006, demonstrating our early dedication to environmental stewardship.

We adhere to various regulatory requirements, including Environmental, Social, and Governance (ESG) standards. Our compliance measures include:

ISO 14001:2015 certification for

chemicals.

- ISO 45001:2018 certification for Occupational Health & Safety Management Systems, prioritizing the well-being of our employees.
- SA-8000 certification for Social Accountability, emphasizing our commitment to ethical labor practices.
- ISO 26000 certification for Social Responsibility, ensuring that we operate ethically and contribute positively to society.
- ISO 20400 certification for Sustainable Procurement, affirming our dedication to environmentally and socially



Our existing infrastructure is poised to support approximately 5~6 GWh of battery production

Environment Management Systems, ensuring that our environmental impact is rigorously managed.

- ISO 9001:2015 certification for Quality Management Systems, guaranteeing the quality and reliability of our products.
- Responsible Care certification, underscoring our commitment to the safe and sustainable handling of

responsible sourcing practices.

By diligently adhering to these standards and certifications, we uphold our responsibility to the environment, society, and future generations.

With the increasing focus on sustainability, how do you see the future of electric mobility evolving, and where do GFCL EV Products fit into this future landscape?

We strongly believe that the future of electric mobility, both in India and globally, is very bright and promising. The transition from Internal Combustion Engine (ICE) vehicles to Electric Vehicles (EVs) is experiencing exponential growth, spanning both personal and mass transportation sectors within India.

Lithium-ion batteries (LiB) have emerged as the leading energy storage solution globally, powering the EV revolution, while alternative technologies like sodiumion batteries are also advancing. In this landscape, GFCL EV Products is positioned to play a pivotal role by providing innovative material solutions that contribute to a cleaner and greener planet.

In your opinion, how crucial is EV battery recycling in mitigating the environmental impact of electric vehicles?

Definitely, EV battery recycling plays a crucial role in mitigating the environmental impact of electric vehicles. In fact, this practice has gained significant traction worldwide, particularly in markets such as China, Japan and Europe, where initiatives for EV battery recycling are already underway.

By recycling EV batteries and extracting precious metals such as Lithium, Cobalt, and Nickel, we can effectively reduce the environmental footprint associated with battery production and disposal.

What partnerships or collaborations has the company established to support its EV and battery initiatives?

The company has cultivated in-house capabilities in Fluorine chemistry over the past three decades. With a combination of in-house R&D and partnerships with external consultants, we enhance our expertise and bring innovative products and processes to fruition.

Moreover, we continuously seek partnership and collaboration opportunities that promise to strengthen our technology, quality standards, output, and overall solutions for our customers.



ADVANCING EV BATTERY SOLUTIONS GLOBALLY





Supply Chain

Delivering Excellence Through Infrastructure And Solutions



FROM FACTORY TO FRONT DOOR

Optimizing production schedules to managing inventory levels, chemical manufacturing process must be meticulously coordinated to minimize downtime and maximize efficiency **TEAM ICN**

he chemical industry stands as a cornerstone of modern civilization, supplying the essential building blocks for a vast array of products, from pharmaceuticals and agrochemicals to plastics and electronics etc. Yet in the sprawling landscape of industrial sectors. few are as intricate and demanding as the chemicals. At the heart of this complexity lies the complex web of supply chain and logistics management, orchestrating the seamless flow of raw materials, intermediates and finished products across continents and through rigorous regulatory frameworks.

The manufacturing process itself represents the pinnacle of logistical

complexity, where precise orchestration is paramount to ensure ADITYA BIRLA encompassing a diverse array of the seamless execution of chemical reactions and the production of highquality products. From optimizing production schedules to managing inventory levels, every aspect of the manufacturing process must

be meticulously coordinated to minimize downtime and maximize efficiency. As the journey progresses, distribution emerges as the final frontier, where products must be delivered to customers with unparalleled speed and reliability. Here, supply chain managers collaborate with logistics partners to devise innovative strategies for optimizing transportation routes, reducing delivery times and enhancing customer satisfaction.

Supply chain managers are at the forefront of driving positive change and shaping a more sustainable future

A Journey of precision and resilience

Behind the chemical industry's strong line up of product portfolios, there lies a logistical labyrinth fraught with challenges and risks. demanding unwavering attention to detail and an unvielding commitment to excellence. At the outset, the journey commences with the meticulous sourcing of raw materials, where supply chain managers must navigate a global marketplace rife with volatility and uncertainty. From negotiating contracts with suppliers to assessing geopolitical risks, every decision carries profound implications for the entire value chain. Once the raw materials are secured, the intricate

dance of transportation begins, modes ranging from trucks and trains to ships and pipelines. Yet. this journey is not merely a matter of moving goods but a delicate balance of efficiency, safety, and environmental stewardship.

Warehousing and storage emerge as another critical juncture in the supply chain, where chemicals, often volatile and reactive, demand specialized facilities equipped with state-of-the-art infrastructure and stringent safety protocols. Here, supply chain managers must ensure compliance with a myriad of regulatory standards while safeguarding against the ever-present specter of accidents and emergencies.

Bottlenecks

India's logistics infrastructure, including roads, ports, and railways, suffers from inefficiencies, congestion and capacity constraints. The transportation network in India is highly fragmented, with multiple modes of transport operating independently.

Lack of integration between road, rail and waterways leads to inefficiencies in cargo movement, longer transit times and higher logistics costs for chemical companies. Some of the warehouses that are designed to store costly chemicals have poor pipeline connectivity, inadequate power supply and lack good quality security systems. Limited access to data, outdated IT systems and manual processes inhibit the tracking and monitoring of shipments, leading to inefficiencies and operational disruptions. Inadequate warehousing infrastructure. particularly for storing hazardous chemicals,

Elusive challenges

- Rampant pilferage
- Geopolitical situation
- Disruption of global supply chains
- Shortage of raw materials
- Limited Warehousing Infrastructure
- Skilled manpower shortage

is a bottleneck in the Indian chemical supply chain.

Increase in freight costs, unavailability of trained manpower and lack of knowledge about the new trends and technologies, compromise the quality of raw materials during the transportation process. A recent upheaval within the industry emerged owing to global supply chains facing the adverse effects of the Covid-19 pandemic and geopolitical situations including Ukraine-Russia war. This volatile market condition has resulted in operational difficulties and crippled the logistical stability thanks to shortage of chemical raw material. Such uncertainties add to the complexities in the supply chain



and logistics, leading to huge losses to the sellers and distributors.

Technology as a game changer

Amidst the myriad challenges and complexities, lies an opportunity for transformation and innovation. Advanced technologies such as Artificial Intelligence, Blockchain and the Internet of Things are revolutionizing the landscape of supply chain and logistics management, offering unprecedented levels of visibility, traceability and efficiency. Moreover, the imperative of sustainability looms ever larger on the horizon, compelling companies to adopt eco-friendly practices and minimize their environmental footprint. From reducing carbon emissions to promoting circular economy initiatives, supply chain managers are at the forefront of driving positive change and shaping a more sustainable future for the chemical industry.

The role of technology doesn't end here with process automation in chemical

Trends shaping supply chain and logistics landscape

- Adoption of digital technologies
- Focus on sustainability
- Warehousing modernization
- Last-mile delivery solutions
- Regulatory compliance
- Collaborative supply chain networks
- Focus on risk management
- Customer-centric logistics

supply chains. AI and ML driven software continuously stores data of all products and processes, conducts in-depth analysis on process performance and provides intelligent actionable insights to improvise overall supply chain performance. Along with operational efficiencies, these solutions can



also help maintain compliance regulations throughout chemical logistics. Such solutions provide access to real-time data, dashboards and instant reports to monitor and manage logistics and supply chain operations. By adopting cloud technologies, companies can work on the existing data while capturing new information, thus saving time to create complex compositions of chemicals. Control tower solutions for chemical industries can thus be great enablers in saving logistics costs and increasing the overall supply chain productivity. Hence, all the key focus areas of the chemical supply chain - efficient production models, lower transportation costs and greater safety and reliability, can be undeniably achieved with the help of Alenabled solutions.

Outlook

Supply chain & logistics in the chemical industry is characterized by a growing emphasis on technology integration, sustainability, regulatory compliance, globalization, customer-centricity and resilience. Companies that proactively address these challenges and opportunities are likely to gain a competitive advantage and thrive in the evolving landscape.

By the year 2050, India is poised

to unleash its new wave of growth and emerge as the second-largest market after China, attributing to 20% of the total global chemical sales. Reduced chemical requirements for individual client applications, a development driven by customers themselves, are also impacting volume and profitability. Customers, particularly industrial manufacturers and makers of consumer goods, are developing in-house skills to better analyze the value, quality and amount of materials and products purchased from chemical businesses, aided by digitalization. Customers may more readily switch chemical suppliers based on cost and product comparisons, impacting chemical pricing and the composition of chemical goods with greater assurance than previously. Similarly, customers may make better informed selections and be proactive in replacing present chemical elements with more sustainable ones.

The journey of supply chain and logistics management in the chemical industry is a testament to the power of precision, resilience and innovation. In the complex terrain of global markets and regulatory landscapes, the Indian chemical industry must remain steadfast in its commitment to excellence, ensuring that its offerings bring it closer to a safer, more sustainable world.



LEADERSHIP IN DRIVING SAFE CHEMICAL DELIVERIES

Brenntag leverages technologíes such as GPS tracking, real-time monitoring systems and telematics to track deliveries and monitor conditions during transit



Brenntag is the world's largest distributor of chemicals and ingredients. Backed by our long heritage with our birthplace in Germany, we are celebrating our 150th anniversary this year.

In Brenntag, one of our core values is Safety. Globally and in India, Brenntag is committed to driving safe chemical deliveries, made possible through a combination of leadership and vision, compliance with regulations and implementing best practices in logistics and safety protocols.

Leadership and vision

Dr Alok Sharman, Managing Director of Brenntag India shared, "As a leader, it is crucial to articulate a crystal-clear vision to align the whole organization toward achieving secure delivery of chemicals to our customers." As a result, Brenntag in India achieved the following:

- There are no loss time incidents in 2023
- An overall enhancement in staff engagement that leads to a positive transformation in the safety culture
- Brenntag's safety representation on a variety of platforms

Compliance and regulations

Brenntag is committed to adhering to

We collaborate closely with chemical suppliers, transporters and logistics partners to ensure alignment with safety standards and best practices all relevant local, national and international regulations related to the transportation of chemicals. Brenntag ensures that all deliveries comply with all necessary regulations to protect communities, our employees and the environment.

Key safety initiatives at Brenntag India

- All warehouses hold the required licenses and maintain full compliance
- To ensure total compliance and prevent the release of any chemical waste from tanker cleaning into water bodies or land, Brenntag India has formed a partnership with Bayarea Terminal LLP
- Training and Education are provided for chemical delivery drivers, handlers, and staff receive extensive training in various aspects of safety such as emergency response, chemical handling and PPE requirements
- Commemorating the annual Safety Day across all Brenntag sites with employee safety awareness campaigns



In April 2024, Brenntag organized a health check-up camp for our truck drivers from our logistics partner, JWC Logistics. Due to their hectic schedules, many truck drivers may not have the time for cancer



screening, so we collaborated with Nargis Dutt Foundation and JWC Logistics on this initiative.

Implementing best practices in logistics and safety protocol through the following initiatives:

Technology and Monitoring

We leverage technologies such as GPS tracking, real-time monitoring systems and telematics to track deliveries and monitor conditions during transit. We also implement systems for temperature control, spill detection and hazard communication to enhance safety. We also partnered with the Nicer Globe Initiative by ICC.

Nicer Globe initiative is dedicated to the safe and secure transportation of chemicals. It ensures the safe transit of vehicles through real-time tracking of driving violations and sends out instant violation alerts.

Supplier and Partner Collaboration

We collaborate closely with chemical suppliers, transporters loaistics and partners ensure alignment to with safetv standards and best practices. We communicate expectations clearly and establish regular audits and reviews to assess compliance. We

are also an active member of ICC and attend all sessions and at the same time contribute to the discussions and input for safety practices.

Continuous Improvement

We foster a culture of continuous improvement by collecting feedback, conducting incident reviews and implementing lessons learned from near misses or accidents. We encourage



proactive safety measures and empower employees to report safety concerns without the fear of reprisal. ICTA had chosen us for the pilot audit which was successfully completed. In 2023, Brenntag in India was given the Responsible Care recognition, which is the chemical industry's global initiative, practiced in 52 countries, under which chemical companies work together to continuously improve their health, safety, environmental and security performance.

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RESHAPING SUPPLY CHAIN FOR A SUSTAINABLE FUTURE

Maritime industry is rapidly cruising towards reducing carbon emissions for its shippers and many shipping companies publish their carbon emissions report



ogistics Infrastructure in India has been transforming at a rapid pace to make supply chain seamless and cost competitive. Whilst there is a continuous pursuit to reduce logistics costs, we are also witnessing other radical changes evolving. A visit to a client's office till few years back would mean discussions primarily on (a) fastest transit time, and (b) most economical freight. However, over the years these two aspects of transportation are taken care by data analytics. Thanks to Artificial Intelligence and other magical tools, within a few seconds the client can view multiple transportation options between origin and destinations, suggesting the fastest and the most economical options, by the computers. Shippers don't need logistics players like us to guide on their shipment when it comes to factor in only time and freight.

Shippers in present times reckon other aspects also when deciding logistics mode. Major criteria has been: Carbon footprints, types of fuels used, minimising wastage and shorter haulages to minimise emissions.

For EXIM trade, ocean transportation is the most important leg of supply chain and when it comes to restricting carbon emissions, the maritime industry has undergone far more changes in past one decade then it witnessed in the previous six decades. Post World War 2, there

Inventory management plays a crucial role in optimizing costs and ensuring product availability was major technological advances in manufacturing ship engines which started using heavy oil. This happened as oil was readily available with oil refineries sprouting across the world and oil was far more efficient in more speed and mileage for ships. Hence, there was a gradual shift from steam engines to heavy fuel oil and diesel engines and that's the norm for almost the entire shipping fleet of the world. Over 99% of current world cargo fleet runs on heavy oil.

Global warming has become a major concern for our planet and governments and environmentalists are insisting on each industry to take corrective steps in reducing Green House Gas (GHG) emissions. Various nations have been working actively under the United Nations and there are regular Conference of Parties happening, with the last one COP 27 held in November 2022. The logistics industry has been impacted by the same too, and the maritime industry has set itself the following targets for emissions by ships:

- 20% reduction in emissions by 2030
- 70% reduction in emissions by 2040
- Net zero emissions by 2050

The reduction in 2030 and 2040 is as compared to 2008 levels.

Achieving these targets is quite an uphill task with almost 99% of world shipping fleet burning heavy oil, which have high carbon emissions. However, signs of this scenario changing is quite imminent as almost 28% of ships on order are going to use alternatives fuels. These ships are being built with newer engines which would use either the new types of fuels or have dual engines for having capability to use multiple fuel types. That's quite a quantum shift as more and more shipowners are getting convinced to build ships which would use cleaner source of energy. It is expected that over the next five years, there would be more orders for ships using alternate fuels than ships which would use the traditional fuels as bunkers.

New alternate fuels are many and still evolving. Till now there are only two types of bunkers used by commercial ships – heavy oil/very low sulphur oil, and LNG. However there are other new alternatives being worked upon and new ships today have the option of using the conventional fuel or LNG or hydrogen or ammonia or methanol or electricity even.

Whist LNG is a cleaner fuel than heavy oil and has evolved as a preferred alternative, it still remains a fossil fuel. Hence the pursuit for newer alternatives goes on and as of now, few alternatives have emerged. Hydrogen is supposed to be the best alternative as the only emission it would have it water. Rapid progress has been made in using hydrogen fuel cells as



a source of energy not only on ships, but also in vehicles and other equipment. In India, the government has come up with a policy document and is encouraging companies to set up establishments for supply of hydrogen to various industries and various geographies. Despite inherent advantages of hydrogen, the shipping industry is still finding it a challenge to store and supply hydrogen in large volumes. Apart from the huge storage

MARINE FUEL OPTIONS

space, hydrogen would require on ships, keeping the hydrogen molecule in an inactive stage is a big challenge for ships going on long voyages.

Similarly, there are multiple projects working on making ammonia and methanol as the future fuel for ships. Whilst each have multiple advantages, generating those commercially and making it available to the world merchant fleet would take many years. Presently, there are hardly



any commercial ships using hydrogen or ammonia or methanol. There have been few experimental voyages and studies have shown these can replace heavy oils in the future. Maritime industry around the world has been very enthusiastic and many shipping companies have allocated huge funds to these studies. That's how rapid progress is there month after month and there are clear signs of the way things are moving the in the world of bunkers for ships.

The maritime industry is rapidly cruising towards reducing carbon emissions for its shippers. Already, many shipping companies publish the carbon emissions each voyage would have thus enabling shippers to know emissions per container on various ships and various routes, and thus opt for the best option with minimal emissions. While this is prevalent in ocean transportation, we would soon see such trends in other part of the supply chain.

While the shipping segment is getting green, we are also witnessing emergence of green ports. Emerging trends from

Indian ports to go green has been (a) Major equipment e.g. gantries, reach stackers, cargo conveyor belts, etc to run on electricity (b) Supply electricity to ships when alongside, thus enabling ships to not use gensets onboard which use oil as fuel (c) Tug boats used for vessel movements to run on electricity (d) Generate such electricity through wind energy/Solar energy. Many of these practises are already prevalent in few ports around the world and its early days in India before the technological transformations take place totally. However, there are early signs already and many Indian ports have already switched over their gantries and such port equipment to electricity. Other milestones of this green ports initiatives would also be achieved over the next few years.

Another change witnessed in supply chain is usage of Electric Vehicles (EV) for transportation of goods/containers. The world has witnessed a surge in demand for EV vehicles as consumers are preferring options to reduce burning fossil fuels. The

demand for EV is also increasing owing to increasing number of charging stations in various cities. While passenger car segment has witnessed this rapid change recently, the goods vehicles segment would soon follow suit. It has been lagging in this switch as commercial trailers have to generally cover long distances and there may not be charging points available at intermittent intervals during the journey. However, to start off vehicles ferrying containers/cargo over short distances e.g. CFS to Port and such movements can start using electric vehicles. For the port it is thus natural to provide charging points for electric trailers moving in and out of port.

Thus the entire supply chain in getting green and this is happening at a very rapid pace. Operators in each segment i.e. road, ports and ships have to rework their strategy to meet this challenge set by shippers who want to minimise their carbon emissions. This perhaps is going to be the most radical change in logistics in the next decade or so.



FACTORS INFLUENCING CURRENT DYNAMICS OF CHEMICAL INDUSTRY IN INDIA

There are opportunities for both domestic and multinational manufacturers in India due to significant demand from end-user sectors



A s consumer demands become more sophisticated, the chemical industry finds itself at the forefront of innovation and adaptation. In 2024, the chemical industry stands at a crossroads as it navigates a landscape of evolving trends, challenges and opportunities.

India's chemical industry is among the world's most influential due to its advanced technology, efficient process engineering and skilled workforce. The sector has witnessed considerable growth, making a significant contribution to the country's economy and exports. With its cost-effective manufacturing capabilities and proficient workforce, the industry is expected to continue to grow, maintaining its prominent global market position.

The highly diversified nature of the Indian chemical industry has made it an

attractive investment opportunity. The

industry's ability to supply a wide range of commercial products has enabled it to serve as a crucial supplier of raw materials to various end-

use industries, including pharmaceuticals, personal care, food and beverage and specialty chemicals. This has helped the industry to contribute significantly to the nation's economic growth.

Collaboration across the value chain, investment in R&D and strategic partnerships will be essential for unlocking growth opportunities

Se DKSH

leading global advisor of risk, finance and business, the global chemicals industry has been growing exponentially and the market in India is projected to grow at a CAGR of more than 12 percent from 2020 to 2025. In fact, the report states that the specialty chemicals market represents 22 percent of India's overall chemicals and petrochemicals market and is valued at US\$ 32 billion. In terms of trade, specialty chemicals account for a significant portion, more than 50 percent of all chemical exports.

According to a report by KPMG, a

There are opportunities for both domestic and multinational manufacturers in India due to significant demand from various end-user sectors

> such as food, automotive, real estate, fashion, cosmetics and more. This trend is expected to continue driving growth in the industry, surpassing global

growth rates in the foreseeable future.

What's influencing the Indian chemical industry?

With a focus on India, let's take a look at some of the key factors influencing the current dynamics of the chemical industry.

Need for High-Performance Solutions:

In an increasingly competitive market, the demand for specialty chemicals is primarily driven by the need for high-



performance products across various industries.

Focus on Sustainability and Environmental Responsibility:

Environmental awareness and regulatory requirements are reshaping the specialty chemical landscape. Companies invest in research and development to create eco-friendly formulations and minimize waste. Sustainable sourcing, bio-based materials and green chemistry are gaining traction as key differentiators supporting sustainability goals in the market.

Industry 5.0 is expected to Create Sustainability in the Chemical Value Chain:

Industry 5.0 in the chemical industry focuses on human-centricity, sustainability and integrating advanced technologies. As an evolution of Industry 4.0, it focuses on the synergy between humans and machines to drive sustainable business growth and societal well-being as well as prioritizes the well-being and interests of workers while advocating for industries' economic advancement and addressing concerns around climate change.

Digital Transformation:

Businesses across the country are placing more emphasis on the digitalization of their operations as digital technology continues to become an integral part of the value chain. The chemical industry embraces digitalization to drive operational efficiency, product innovation and customer engagement. Digitalization within the industry can further develop resilient supply chains and improve security.

Collaboration across the value chain, investment in R&D and strategic

partnerships will be essential for unlocking growth opportunities and maintaining competitive advantage in an increasingly dynamic landscape.

How DKSH is helping the chemical industry to grow

By embracing innovation and collaboration, the chemical industry can shape a brighter, more sustainable future for future generations. At DKSH, our technical specialists collaborate globally to create innovative, sustainable solutions aligned with industry trends. At the same time, we continue to accelerate our digital efforts to support our business partners in India and around the world.

DKSH Performance Materials is a leading distributor of specialty chemicals and ingredients for various industries like food and beverage, personal care, pharmaceuticals and specialty chemicals.

🎥 DKSH



Specialty Chemicals and Ingredients at Your Digital Fingertips



DKSH India Pvt. Ltd. Mumbal, India Phone: +91 22 6157 7000 Email: info.in@dksh.com, www.dksh.in


Our 54 innovation centers around the world help us develop advanced products and solutions to meet the ever-evolving demands of our customers and create opportunities for our clients.

At DKSH, we work closely with our business partners to develop tailor-made functional products that enhance their performance for specific applications.

Our food and beverage ingredients and additives are highly diverse and have a wide range of applications in beverage and dairy, confectionery and bakery, food supplements and nutrition and processed food and food services.

Our personal care functional products enhance your product performance and have a wide range of applications including skin care, hair care and color, oral care, sun care, makeup, toiletries and more.

Our pharmaceutical functional products enhance your product

Our 54 innovation centers around the world help us develop advanced products and solutions to meet the everevolving demands of our customers

performance and have a wide range of applications from Active Pharmaceutical Ingredients (APIs) to excipients, intermediates, nutraceuticals, biopharma and animal care solutions to packaging materials.

Our specialty chemicals functional products enhance your product performance and have a wide range of applications including paint, coating, ink, polymer, engineering plastic, adhesive, rubber, agrochemical, petrochemical, packaging, graphic, technical film and other specialties.

Our range of tailored value-added services can support you to increase your market potential. From regulatory support and consulting to sourcing and hard-tonew ingredients; find from innovation and formulation capabilities to marketing intelligence solutions _ you can gain from our integrated one- stop approach.

In conclusion, several key factors shape the current dynamics of the chemical industry in India. These include government policies and regulations,

technological advancements, market demand, global trade dynamics and environmental sustainability efforts. As India continues to experience economic growth, the chemical sector is poised for further expansion, provided it navigates challenges such as resource constraints, environmental obstacles and increased competition.

At DKSH collaboration between stakeholders, investment in innovation, and sustainable practices remain at the forefront of our priorities to ensure the industry's long-term success and to further contribute to India's economic development.

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🗳 DKSH

CUSTOMER CENTRICITY REMAINS AT THE HEART OF OUR ACTIONS

We believe that finding right synergies ensures that our acquisitions have been a force multiplier of our human capital



Emerging market scenario for chemical distribution in India?

The chemical distribution in India is at a crossroad of immense opportunities and soaring challenges. A growing economy, emerging brands, lower per capita consumption and an increase in R&D spend are driving growth across sectors. A stable political landscape with a favourable push to the manufacturing sector has put India on the priority list of ingredient manufacturers in

Building strong relationships with our principals ensures a reliable and sustainable value chain developed economies. However, the sector, especially industrial, has been fraught with pricing pressures due to overstocking of inventory and continued dumping. The geopolitical disruptions in the Red Sea and Panama Canal have had their own impact on supplies and prices of ingredients. Despite these challenges, the overall outlook is positive for the Indian chemical sector given the healthy annual growth of around 7% in the index of industrial production and a near doubling of the FDI in FY 2022-23 over the previous year. A revival in domestic demand and surging exports is expected to boost domestic manufacturing.

IMCD India was established in 2008. How has the journey been so far?

Established in India in 2008, IMCD has

grown to cater more than 4,000 ingredients to over 6,000 customers in India and Bangladesh. We are a supplier of specialty chemicals across sectors from life sciences (pharmaceuticals, food & nutrition, beauty and personal care) to industrial solutions (advanced materials, lubricants and energy, coatings and construction).

MCD India has been on an expansion/acquisition spree. What is the current status of these acquisitions?

Over the last two years, IMCD has done five acquisitions - Signet, Parkash DyeChem, TradeImpex, Valuetree and two business lines of CJ Shah & Company. In terms of integration, we believe that finding the right synergies ensures that our acquisitions have been a force multiplier of our human capital which have enabled us to build on each other's' strengths. In fact, our Advanced Materials business group is led by the erstwhile Managing Director of Tradelmpex. These integrations have not only expanded our size but also enriched the diversity and experience of our teams. Given the focus on acquisitions, IMCD has a structured process that allows the integration of systems, processes and people to happen smoothly with a focus on minimal business disruption.

How are these acquisitions consolidating IMCD India's position in the market?

Diversification and driving consolidation

in the distribution space through M&A is a part of IMCD's growth strategy. Signet, for instance, along with IMCD India excipient business has made us the go-to provider for excipients. We have the number one market position in the excipients space. CJ Shah's specialty chemical portfolio has helped us fill in select gaps in our portfolio across industrial and life sciences, especially coatings and construction space. Valuetree, the most recent acquisition, has made us the one-stop solution in the beauty & personal care business. With these acquisitions, I am proud of the fact that last year IMCD India imported the highest volume of ingredients into India as a distribution company.

Key factors that have contributed to IMCD India's success and growth in chemical distribution?

As a chemicals distribution company, our primary asset is our strong network based on long term relationships built with our stakeholders – Customers, principals and employees, the three pillars on whom our success rests. Our endeavour has been to continue to create value and be relevant for all these three pillars for sustainable growth and successful journey.

Customer centricity remains at the heart of our actions, aimed at improving our offerings,

formulations and services. In 2023, we had conducted a customer satisfaction survey with over 100 customers sampled. 'Trust' and 'Ease of doing business' were stated as top two drivers for working with IMCD, with most customers wanting to not only continue the relationship but also strongly recommending us.

Our focus on transparency, innovation and sustainability delivered through a dedicated delivery team gives a lot of confidence to our principals. Building strong relationships with our principals ensures a reliable and sustainable value chain with high-quality ingredients.



Employees are at the heart of everything we do; we strongly believe in entrepreneurship and empowerment. We run many internal programs to support our people both personally and professionally.

What are the future growth strategies and focus for IMCD India in FY 2024-25? Are you looking at more acquisitions? What is India's investment plan for IMCD?



APAC market has the largest share of the global Speciality Chemicals pie (Around 45% by value),

with India being the second largest dominant region in APAC. Hence, India is a key region for the IMCD group strategically. IMCD's outlook remains positive, and we target a sustainable growth approach through a mix of organic market penetration and inorganic acquisitions. We continue to identify new areas of growth and fill in gaps in our existing portfolio to provide a holistic offering to our customers.

With increasing emphasis on sustainability and environmental responsibility, how does IMCD India incorporate these aspects into its

operations and solutions?

At IMCD, sustainability is a top priority for us, and we want to build it into our portfolio of solutions. Moving forward, we expect additions to our existing portfolio that will provide access to sustainable offerings to our customers. This emphasis is also extended to our operations - we recently partnered with a 3PL logistics partner to house our products in a green warehouse which is environmentally friendly as it runs on solar power, is supported by electric vehicles, and has a rainwater harvesting facility. This facility possesses a storage capacity of up to 450 kW of solar energy, generating 6.10 lakh units of energy per year and saving approximately 4,93,000 metric tons of CO2 emissions annually. In addition to this we have gone paperless across most of our internal operations and have made conscious efforts to shift to environment friendlier options on indirect sourcing.

In the rapidly changing and competitive market landscape, how does IMCD India stay ahead by anticipating customer needs and market trends?

IMCD has the benefit of its reach across





regions and applications, which enables it to derive an understanding of market trends and stay ahead of the curve by co-working with customers to deliver products faster to market. Across all our Business Groups, we work very closely with our principals to communicate market trends and leverage technical expertise to build in market applications. Our team of technical experts and our state-of-the-art application centres are at the foundation of our value proposition that propels IMCD as a partner for formulating products that are market-ready. For instance, with a strong focus on electric vehicles and solar sectors, we have been developing the right portfolio to address our customers' challenges and to provide them access supporting them in product development.

How does IMCD India promote a culture of entrepreneurship and innovation within the organization?

Being a distribution company, people are our key assets, and we strongly believe in investing in our employees. Freedom to act and entrepreneurship are our corporate values, with each employee empowered to think strategically. For example, our in-house leadership development program, IPULSE, selects nominees from IMCD companies across the globe as participants who can bring out their ideas to improve business. An outcome of one IPULSE pitch that was implemented has resulted in the expansion of one of our business verticals. This program allows inputs of ideas from across locations and functions, with a fast-paced and transparent environment conducive to experimentation and implementation.

Major challenges and opportunities facing the Specialty Chemicals industry and what would be your suggestions to navigate through them?

The volatility experienced globally has caused a spike in shipping costs and

Diversification and driving consolidation in the distribution space through M&A is a part of IMCD's growth strategy

raw material prices, as well as adversely impacting delivery timelines. Amongst these challenges, is an opportunity for distribution players to act as mitigators in this disruptive environment, by providing a sustainable supply chain with alternative suppliers located in diverse regions globally, thereby enabling global trade. Inculcating agility and flexibility in the value chain would act as a buffer against the shockwaves in supply and demand. Additionally, the lifecycle of products in the speciality chemicals segment is reducing, and increasingly moving towards commoditization. In such a scenario, investing in innovation becomes imperative for developing potentially market-shaping products that will not fall prev to commoditization.

How do you ensure highest standards of safety and regulatory compliances in your operations?

Our health, safety, environment, quality and regulatory department is central to our focus on responsible conduct and sustainable development. We have undertaken many programs in our continuous endeavour to augment our compliances for safety and regulatory aspects, and IMCD India adheres to the internationally recognized quality standards of ISO 9001:2015. We assess all our outsourced vendors, including transportation and warehousing, as per our Environmental, Social & Governance (ESG) guidelines in order to ensure adherence to ESG standards across our value chain.

Additionally, after a thorough evaluation of our processes and premises, IMCD India has been granted the Authorized Economic Operator (AEO) L2 status. The AEO L2 certification enhances our customer servicing ability, through faster customs clearance and shipment release, reduced physical inspection of foods and provides increased security measures and improved

How does IMCD plan to leverage digital technologies for optimizing its processes and improving overall operational performance?

risk management.

IMCD adopted Salesforce (CRM) in 2022 to enable the optimization of internal processes and reporting and since then our digitalization efforts are going up by leaps and bounds. Firstly, the group has launched a global hub for sampling, ordering, product knowledge and documentation - MyIMCD, a full-service platform. This digital portal is available exclusively for our customers round the clock, who can explore our latest product samples, access technical documentation, or place orders with ease. Secondly, we have implemented a new initiative. Customer Care 360, a centralized email address for all routine business inquiries. This will allow our customers to avail benefits of uninterrupted support and faster turnaround. Additionally, we now have a dedicated team focussing on digital marketing initiatives for lead generation to capture the next gen customers who prefer less facetime and more online connection to queries. The aim of digitalization is to improve commercial excellence and to be more effective in customer acquisition.

Where do you see IMCD India 5 years down the line?

We target to continue our exponential growth to become the go-to distribution partner for our customers across the sectors we cater to. Our aim is to create opportunities for all our stakeholders and continue growing together, while incorporating sustainability, digitalization, and innovation in all that we do. I would personally like IMCD India to be the employer of choice for our growing effervescent workforce in the country.

www.indianchemicalnews.com

Your Industrial Solutions Partner Coatings & Construction, Lubricants & Energy, Advanced Materials



PLANNING TO OPEN STRATEGIC WAREHOUSES IN WESTERN AND EASTERN REGIONS IN INDIA

Our efficient manufacturing and supply chain optimization helps us to deliver quality products at competitive prices



Emerging trends that you foresee for the global and Indian chemical industry in 2024?

In 2024, the global and Indian chemical industries will see a boom in specialty chemicals, renewable energy components, EV batteries and semiconductor materials. Trends like resilient supply chains, sustainability, and "Make in India" initiatives are driving domestic production and innovation. The concept of green chemistry is also gaining attention, which could lead to initiatives on reduction of carbon footprint.

How do you look back at the 42 years long journey of the Pon Pure Chemicals and the key milestones that you are really proud of?

Reflecting on Pon Pure Chemicals' 42-year journey reveals a remarkable story of growth

and innovation. Starting the journey as a small start-up, it has become a growing company in the chemical industry with a turnover exceeding Rs. 4,500 crore. Our key milestones include the strategic expansion into imports in 2000 and exports in 2005, followed by the launch of in-house manufacturing in 2017.

We diversified further with the establishment of an R&D unit and ventured into the B2C sector with the Vooki brand.

Our network includes 28 branches and regulatory compliance warehouses in India, five international branches and exporting to 65 countries, serving over 13,000 customers Today, our network includes 28 branches and regulatory compliance warehouses in India, five international branches, and exporting to 65 countries, serving over 13,000 customers. Our progress speaks to our commitment to excellence, customer satisfaction and sustainable innovation.

Current services provided by the company's established SBUs in Basic Chemicals and Specialty Chemicals categories, based on bulk and retail requirements?

We have set new standards in delivery, quality, and customer service by introducing customized packaging, providing Certificates of Analysis (COA) with our supplies, and establishing in-house labs to ensure product excellence. This innovation has resonated well with our clientele, allowing us to proudly serve across India and overseas.

Basic Chemicals: We provide roundthe-clock stock availability, ensuring timely fulfillment of bulk and retail needs. Repacking and Blending capabilities with their own quality lab verifies chemical purity.

Specialty Chemicals: It features an application lab focused on developing new molecules and enhancing existing applications, ensuring innovative and effective solutions for diverse customer requirements.

We adhere to safety procedures at all times and provide awareness programs to our customers, vendors, drivers and all stakeholders.



Can you share a few unique insights

into your sales and distribution network, both domestically and internationally? How does it ensure robust logistics solutions in a complex business environment?

Market Analysis: Predicting demand and filling stocks locally, we proactively ensure product availability, minimizing lead times. Our approach emphasizes meeting the maximum requirements, offering a basket of chemical products to our customers. We also have strategic alliance with global petrochemical conglomerates (Shell, Exxonmobil, Lyondell, BASF etc)

Strategic Location: Our 28 branches and regulatory compliance warehouses and 4 manufacturing units are strategically located near major industrial hubs,

with 34 dedicated shore tanks in multi-ports in India ensuring seamless distribution and reduced transit times

International Network: We started a chemical drumming and repacking unit at Kandla SEZ in 2005, inspired by the practices of Singapore and Dubai. It serves as a vital hub for the export and import of chemicals and chemical products, which made us a global player in the chemical trade and distribution.

This strategic network enables us to navigate complex logistics challenges efficiently, providing reliable delivery and superior service to clients worldwide.

How does the company plan to make the difference in terms of sustainability?

Pon Pure plans to make a significant difference in sustainability by embracing renewable energy and reducing waste. In 2015, we ventured into renewable energy by establishing a windmill division, followed by a solar generation plant. We utilize the renewable energy produced in our other ventures.

We also minimize transportation costs and environmental impact by reusing and re-purposing drums for chemical usage,

PON PURE

contributing to a circular economy. These strategic initiatives highlight our dedication to integrating sustainability into every aspect of our operations, ensuring that our growth remains environmentally responsible.

What measures do you take to stay competitive in the market. considering factors such as pricing. innovation, and customer service?

Innovation: Our robust team of 25 experienced R&D professionals working to give the cutting-edge sustainable solutions that differentiate us in the volatile chemical market. Also, we continuously evaluate processes to meet customer demand and are exploring IT capabilities, automating warehouse operations for

efficiency.

Customer Service: Our customer-centric focused approach enables

us to deliver tailored and comprehensive solutions, fostering strong and long-term relationships.

Pricing: Our efficient manufacturing and supply chain optimization helps us to deliver quality products at competitive prices.

What are the key revenue growth drivers for the company and how are you planning to grow your business in the coming years?

Key revenue growth drivers for Pon Pure Chemicals include customer addition and new product addition particularly in the manufacturing sector. Our low rejection rate compared to industry standards and ability to deliver differentiated products have been instrumental in driving growth.

Moving forward, we have new products in the R&D pipeline, focusing on innovative applications and developing products for various applications and value-added markets. We're also planning to open strategic warehouses in the western and eastern regions in India to enhance our distribution network. These initiatives will help us expand

our customer base and solidify our market presence.

How do you balance short-term profitability goals with longer-term investments in R&D, new product development. and sustainability initiatives?

The new product development for various applications, and sustainability by prioritizing strategic resource use and innovation. The company views investment in R&D as vital for future growth, not just a cost, ensuring a steady supply of new and sustainable products.

By engaging with stakeholders, Pon Pure Chemicals aligns its business goals with societal expectations, reinforcing its commitment to adding value beyond profits. This approach keeps the company competitive and supports growth in a fast-changing market.

Pon Pure Chemicals has been awarded a Silver Medal by EcoVadis for its dedication to sustainability, ethical practices, and environmental management, highlighting its commitment to integrating sustainable practices into its operations and contributing to the global supply chain.

Role of Digital and AI (Artificial Intelligence). Deep Learning (DL), Machine Learning (ML), Internet of Things (IoT), Robotic Process Automation (RPA), Blockchain, and Drone in overall scheme of things. How are you planning to leverage it moving forward?

Digital technologies and AI play a crucial role in our overall strategy. We're leveraging these technologies to optimize operations and enhance customer experience:

- **AI:** We are using AI for price prediction, • demand prediction to enhance our process
- ML: We are utilizing ML to increase the efficiency of sales team
- IoT: We make use of IoT to improve safety and efficiency in warehouses

GLOBALLY PREFERRED & TRUSTED PARTNER -**Catalyzing Your Growth**

 4 Manufacturing Plants 28 Branches & Regulatory Compliance Warehouses

in India

 5 Overseas Branches · Export to over 65 Countries



PON PURE CHEMICALS



• **RPA:** We use RPA to automate routine tasks and to other backend processes

Steps that you are taking to ensure foolproof safety and security of chemical products, both for customers and for the wider community?

Educational and Knowledge Sessions: We conduct various educational and knowledge sessions for our vendors, customers, transporters, and drivers to emphasize the importance of adhering to safety protocols. These programs are provided free of charge, with a focus on our MSME customers to ensure they prioritize safety.

Trust Building: We have a thorough process for selecting customers and endusers, ensuring that those we work with adhere to the necessary safety standards. This ensures that chemicals reach the right customers.

Regulatory Compliant Warehouses: Our warehouses fully comply with regulatory standards to securely store chemicals, maintaining a safe environment.

Recognitions:

- Three Star Export House holder issued by GOI / Directorate General of Foreign Trade
- AEO T3 Certified
- ISO 9001: 2015 for Warehouse Activity, Storage, Testing and Distribution of Chemicals, Speciality Chemicals and Allied Products
- ISO 14001: 2015 for Design, Development, Manufacture and Supply of various Speciality Chemicals.

These steps help us maintain the highest standards of safety and security, reducing risks



for our customers and ensuring that chemical products are handled and transported safely within the community.

Overview of the company's sustainability initiatives and how do you plan to reduce your environmental impact?

Pon Pure Chemicals has long prioritized sustainability by introducing and promoting differentiated, eco-friendly products to the Indian market since 2000. These products are now commercially viable and help us address customers' daily needs while reducing environmental impact. We've reached 13,000+ customers by continuously implementing sustainable processes.

We harness the renewable energy generated to power our manufacturing units. We promote greener tomorrow campaigns on various occasions by distributing free tree and plant seeds to all stakeholders.

Also, we reduce transportation costs and minimize environmental impact, reuse chemical drums, and promote a circular economy. These strategic initiatives demonstrate our commitment to sustainability, ensuring that our growth aligns with environmentally responsible practices at every level.

New areas which are opening up for chemical companies and what's the role that you foresee for your company?

New opportunities are emerging for chemical companies. With the global shift towards renewable energy and new-gen

GLOBALLY PREFERRED & TRUSTED PARTNER Catalyzing Your Growth Industries there's a rising demand for valueadded chemicals, services and intermediates. Pon Pure is poised to supply these industries with innovative solutions tailored to their specific needs.

CSR initiatives to be undertaken by the company in 2024?

The CSR initiatives underscore our commitment to making meaningful contributions to society, promoting sustainable development and supporting communities across various sectors, going beyond just funding.

Education Enhancement: We're expanding our involvement with the School Infrastructure Development under the Namma School -Namma Ooru Palli Foundation. This involves offering scholarships and digital learning resources to foster inclusive educational opportunities. Additionally, we provide career guidance to high school students to help them choose the right path. Beyond financial support, our initiatives include interviewing teachers and aiding in the development of the English primary division, which now accommodates 300 kids annually.

Rural Development: In collaboration with NGOs, we will focus on sustainable agriculture, water conservation, healthcare and skill development projects, empowering rural communities toward self-reliance. We also study government funding and provide recommendations to MSMEs.

Environmental Sustainability: Our environmental sustainability efforts will include tree plantations and plastic waste collection.

4 Manufacturing Plants
5 Overseas 6
Astrona, Regulatory
Compliance Warehouses
in India
Social Statement
So



Digitalization

Driving Transformational Changes



CATALYST FOR GROWTH

To enhance productivity and competitiveness, India's chemical sector must embrace the technological innovations wholeheartedly **TEAM ICN**

n the wake of rapid technological advancements, the Indian chemical industry stands at a crossroads. As it is poised to become more efficient, sustainable, and innovative than ever before, the adoption of smart technologies is no longer a choice but a necessity. Digitalization and automation are not only reshaping traditional manufacturing processes but also revolutionizing the way companies operate and compete in the global marketplace, also propelling them towards greater sustainability, agility and profitability

Amid growing concerns about environmental sustainability, digitalization and automation are driving the adoption of

green technologies in the chemical industry. From energy-efficient ADITYA BIRLA ensuring consistency and quality in processes to waste minimization and recycling initiatives, companies are leveraging digital solutions to reduce their carbon footprint and enhance sustainability across the value chain. Moreover, digital

technologies enable the monitoring and optimization of environmental performance, facilitating compliance with regulatory requirements and industry standards.

According to the EY CEO Outlook Survey 2022, digital transformation is the secondmost prominent capital issue for chemical players across the globe. The global digital chemical industry market size was valued at US\$ 11.1 billion in 2021 and it is expected to reach US\$ 61.7 billion in 2030, record a promising CAGR of 21.4% from 2022 to 2030, as per InsightAce Analytic. The Asia Pacific region is estimated to hold the highest market share during the forecast period. Factors such as the developing chemical industries, increasing R&D investments for manufacturing processes, and the quick adoption of digital technologies by chemical industries in developing countries like Japan, Indonesia, India, and China are anticipated to fuel the regional digital chemical industry market.

Fuelling endless possibilities

The chemical industry's digital transformation is a story of incredible growth and endless possibilities. One of the key benefits of digitalization and automation lies in their ability to enhance operational efficiency. By leveraging data analytics and predictive maintenance tools, chemical manufacturers can optimize their production processes, reduce downtime and minimize wastage. Furthermore, automation enables

real-time monitoring and control, the final product. These efficiencies not only drive cost savings but also enable companies to meet the evolving demands of customers in a rapidly changing market. Moreover, digitalization fosters

innovation and accelerates time-to-market for new products. Advanced simulation and modeling technologies allow chemical companies to design and test formulations more efficiently, enabling faster iteration and product development cycles. Additionally, digital platforms facilitate collaboration and knowledge sharing within the industry, fostering a culture of innovation and continuous improvement.

The proliferation of IoT devices and sensors is revolutionizing the concept of smart manufacturing in the chemical industry

Sustainability as a key driver

In the context of sustainability, digitalization and automation offer significant advantages. By optimizing resource utilization and minimizing energy consumption, chemical manufacturers can reduce their environmental footprint and contribute to a greener future. Furthermore, digital technologies enable the monitoring and mitigation of environmental risks, ensuring compliance with stringent regulatory standards. In essence, embracing digitalization and automation is not just about driving business growth but also about fulfilling corporate social responsibility and contributing to sustainable development. However, the journey towards digital transformation is not without its challenges. Indian chemical companies must navigate issues such as legacy systems, data security concerns and the need for skilled talent. Additionally, there may be resistance to change from employees accustomed to traditional ways of working. Overcoming these obstacles requires strong leadership, investment in training and development, and a commitment to fostering a culture of innovation and adaptability.

Al powered digital tech transformation

In today's data-rich environment, harnessing the power of analytics and Artificial Intelligence (AI) is paramount for chemical companies seeking to gain a competitive edge. Advanced analytics tools enable manufacturers to derive valuable insights from vast amounts of data generated throughout the production lifecycle. From predictive maintenance to demand forecasting and guality control, Al-driven solutions are helping companies



optimize processes, improve efficiency and minimize risks.

The proliferation of IoT devices and sensors is revolutionizing the concept of smart manufacturing in the chemical industry. By connecting equipment and systems across the production floor, companies can create interconnected ecosystems that enable real-time monitoring, remote control and predictive maintenance. IoT-enabled solutions enhance visibility, agility and responsiveness, paving the way for more flexible and adaptive manufacturing operations.

Automation has long been a cornerstone of efficiency in manufacturing, and the Indian chemical industry is embracing robotics and automation technologies like never before. From Robotic Process Automation (RPA) for repetitive tasks to autonomous robots for material handling and logistics, automation is streamlining

Tech trends shaping Indian chemical industry

- Data Analytics and Al-driven Insights
- Internet of Things (IoT) and Smart Manufacturing
- Robotics and Automation
- Digital Twins and Simulation Modeling
- Cybersecurity and Data Privacy
- Sustainability and Green Technologies

operations, enhancing safety, and increasing productivity. Moreover, collaborative robots (cobots) are enabling humans and machines to work together seamlessly, unlocking new possibilities for innovation and efficiency.

Digital twins, virtual replicas of physical assets and processes, are gaining traction as a powerful tool for optimization and innovation in the chemical industry. By creating digital twins of production facilities, companies can simulate scenarios, test hypotheses and optimize operations in a virtual environment before



implementing changes in the real world. Simulation modeling enables predictive analysis, scenario planning and continuous improvement, empowering companies to stay agile and responsive to market

dynamics.

With digitalization comes the imperative to safeguard sensitive data and protect critical infrastructure from cyber threats. As chemical companies embrace cloud computing, IoT and interconnected systems, cybersecurity becomes a top priority. Robust cybersecurity measures, including encryption, access controls and threat detection systems, are essential for safeguarding

intellectual property, maintaining regulatory compliance and ensuring business continuity in an increasingly interconnected world.

Outlook

The Indian chemical industry is at a pivotal juncture, poised to harness the full potential of digitalization and automation to drive innovation, efficiency and sustainability. To realize the full potential, it is essential for stakeholders across the Indian chemical industry to collaborate and share best practices. Government bodies can play a pivotal role by providing incentives for technology adoption, investing in research and development and creating a conducive regulatory environment. Likewise, industry associations and academic institutions can facilitate knowledge exchange and skill development initiatives to equip the workforce for the digital age.

By embracing the latest trends and leveraging cutting-edge technologies, chemical companies can position themselves for success in a rapidly evolving market landscape. The companies will have to establish an accommodating culture that promotes flexibility and learning. With a framework to help present a clear vision for how digital and exponential technologies can impact business strategy, the companies can achieve aspirations for the five key dimensions-user experience, talent enablement, asset reliability and performance, material system innovation and ecosystems.

The journey towards digital transformation may present challenges, but the opportunities for growth and competitive advantage are immense for those who dare to lead the way. It's a journey that promises a future of greater efficiency, safety and sustainability.



Manish Grover

Executive Director (Strategic IS & IS)

IOCL

LEVERAGING DIGITAL AND AI TECHNOLOGIES FOR BUSINESS GROWTH

IOCL leverages AI and analytics to optimize O&M. The Refinery Production Scheduler optimizes production planning by minimizing the gap between planned and actual production



The digital landscape is rapidly transforming the business world. Companies across industries are embracing digital and Artificial Intelligence (AI) technologies to enhance efficiency, gain a competitive edge, and unlock new growth opportunities. This essay explores how IndianOil Corporation Limited (IOCL), the energy of India, is leveraging these technologies to achieve significant business growth.

Optimizing sales & marketing with data-driven insights

IOCL has implemented several innovative tools to streamline sales and marketing processes. The Lubes tender plan tool facilitates data consolidation and visualization, enabling informed decisionmaking. Additionally, RPA (Robotic Process Automation) automates tasks like customer outstanding reports, invoice processing, and GST (Goods and Service Tax) filing, freeing up human resources to focus on strategic initiatives.

Customer churn analytics leverage RFM (Recency, Frequency, Monetary) models to identify at-risk customers. This allows for proactive engagement strategies to retain valuable customers. Price forecasting tools for Petrochemical products provide valuable insights for strategic decision-

Inventory management plays a crucial role in optimizing costs and ensuring product availability making, ensuring optimal pricing strategies in a dynamic market. Moreover, the CGD (City Gas Distribution) competitor tracking tool empowers IOCL to stay ahead of the curve by offering real-time market intelligence.

Transforming supply chain & logistics with automation

IOCL has implemented the largest supply chain integration tool named Integrated Planning Tool with Aveva and Accenture. Further, recently IOCL has implemented the Integrated Shipping tool. This software automates chartering, operations, and financial processes, leading to improved efficiency and cost reduction across the supply chain. Similarly, robotic cleaning of POL (Petroleum, Oil and Lubricant) tanks enhances standardization and efficiency. Network planning tools support strategic decisions for retail network expansion, optimizing resource allocation and customer reach.

Enhancing inventory management with real-time visibility

Inventory management plays a crucial role in optimizing costs and ensuring product availability. The PCCIM (Petro Chemical and Catalyst Inventory Management) dashboard and Refinery Chemicals Inventory Management Dashboard provide real-time visibility into stock levels for the Petrochemical division and refineries, respectively. This empowers



informed decisions regarding inventory optimization and resource allocation. Additionally, RPA automates reports for outstanding payments to MSME vendors, ensuring timely payments and fostering stronger supplier relationships.

Optimizing operations & maintenance with AI and analytics

IOCL leverages AI and analytics to optimize operations and maintenance. The Refinery Production Scheduler optimizes production planning by minimizing the gap between planned and actual production. This approach reduces quality giveaway and leads to increased production efficiency. The FCC (Fluid Catalytic Cracking) Mathura yield optimization tool utilizes real-time data to recommend optimal process parameters for maximizing high-value product output.

Furthermore, Lubes formulation analytics optimize raw material blends for desired lube quality, ensuring consistency and cost-effectiveness. Analytics on Overtime data identifies patterns and trends to optimize overtime utilization and improve operational efficiency.

Robotic cleaning of POL tanks streamlines maintenance processes and minimizes downtime. Finally, AR/VR enabled training tools provide immersive training experiences for employees, enhancing skill development and safety awareness.

Ensuring compliance and efficiency with automation

IOCL utilizes RPA to automate tasks related to GST data extraction, reconciliation and filing. This not only reduces manual errors but also ensures timely compliance with tax regulations. Similarly, RPA automates monitoring of IRN (Invoice Reference Number) generation exceptions, streamlining invoice processing and ensuring data accuracy.

Enhancing customer experience with Al-powered tools

The CGD chatbot tool provides a significant improvement in customer service by reducing transactional workload and offering a more convenient way for customers to interact with the company. This Al-powered solution enhances customer experience and satisfaction.

Embracing the future of digital transformation

IOCL's digital transformation journey is a testament to the power of leveraging digital and AI technologies for achieving business growth. By implementing a range of innovative solutions, the company has optimized processes, improved efficiency, gained valuable insights, and enhanced customer experience. However, the digital landscape is constantly evolving.

Looking ahead, IOCL will need to continuously adapt and embrace modern technologies to maintain its competitive edge. Potential areas of focus include:

- Advanced Analytics and Machine Learning: Leveraging AI for predictive maintenance, demand forecasting, and risk management can further optimize operations and decisionmaking
- Cloud Computing: Utilizing cloudbased solutions can enhance scalability, agility and data security
- Blockchain Integration: Implementing blockchain technology can improve supply chain transparency and traceability
- Cybersecurity Measures: As digital adoption increases, so does the need for robust cybersecurity solutions to protect sensitive data and systems

By continuing to invest in innovative technologies and fostering a culture of innovation, IOCL can ensure its long-term success in the ever-evolving digital age.

This case study serves as a valuable example for organizations across industries, demonstrating the transformative potential of digital and Al technologies for achieving sustainable business growth.

DRIVING COST OPTIMIZATION AND OPERATIONAL EXCELLENCE

By embracing digital transformation as the driving force, companies can achieve a powerful fusion of cost optimization and operational excellence



n today's dynamic business landscape, characterized by rapid technological advancements and evolving consumer organizations expectations, are constantly challenged to stay competitive while ensuring operational efficiency and cost-effectiveness. In this pursuit, cost optimization and operational excellence have assumed paramount importance and organisations are leaving no stone unturned. Digitalization is a major tool in every company's arsenal in this effort. This article delves into various strategies that oil and gas companies are adopting in leveraging digital technologies.

Before venturing into the measures being adopted, let's set the context in which we are evaluating the impact of digitalization! Cost Optimization refers to the process of identifying and implementing strategies to minimize expenses while maintaining or improving operational performance. It's not only about reducing costs, but also having an integrated approach to systematise cost efficiency in various spheres of business. Similarly, operational excellence concerns the continued pursuit of optimising effort and resource consumption across all business processes - streamlining operating practices, eliminating waste, ensuring quality of service/delivery etc.

The oil and gas sector is currently grappling with a myriad of challenges, including heightened scrutiny regarding climate change accountability, volatile

Agile methodologies and DevOps practices are enabling organizations to deliver high-quality products and services crude oil prices, geopolitical uncertainties and difficulties in talent acquisition and retention. Where capital is constrained, market volatility is high, and significant plant overhauls are not a viable option. Achieving a competitive advantage requires agile decision making and disciplined execution. However, amidst these challenges lies a prime opportunity for the industry to address these issues head-on by embracing digital transformation. This allows organisations with strong competencies and robust business processes to leverage digital insights to deliver business benefits.

Traditionally renowned for its extensive physical infrastructure and resource extraction capabilities, the oil and gas industry is now undergoing a profound digital revolution. This transformation, commonly referred to as the "Digital Oilfield," is propelled by the widespread adoption of various cuttingedge technologies that are fundamentally reshaping the operational landscape of companies within the sector. Through the strategic integration of these digital tools, oil and gas enterprises are witnessing remarkable enhancements in operational excellence, resulting in heightened efficiency, safety and profitability.

Numerous oil companies are embarking on comprehensive digital transformation initiatives aimed at optimizing core operations. These initiatives primarily revolve around the deployment of a diverse array of digital technologies, including predictive analytics, automation, mobility solutions (such as wearable technologies, sensors,



robots and drones), 3D printing for functional excellence and the utilization of Cloud and DevOps methodologies in IT domains to bolster support structures. By leveraging these technologies, oil and gas companies are streamlining processes, minimizing asset downtime, improving operational efficiency, reducing labour costs and enhancing overall functional excellence across various operational domains.

Many of the company's most impactful digital projects involve application of optimization techniques in their production and refining operations to maximize output for every unit of energy consumed. This is with the objective of boosting profitability while reducing carbon emissions. Use of digital technologies enables oil and gas companies to achieve higher levels of efficiency and productivity through various means as mentioned below:

Real-time monitoring and optimization

Digital technologies facilitate realtime monitoring and optimization of critical processes and assets, enabling companies to enhance operational efficiency and reduce downtime. Through the deployment of sensors, IIoT devices and advanced analytics, operators can collect and analyse vast amounts of data in real-time, gaining insights into performance metrics and identifying areas for improvement.

Digital twins allow engineers to simulate operating scenarios and identify bottlenecks that hinder throughputs. These help in taking real-world decisions without costly physical interventions and/ or risking safety, security of personnel. Recent reduction in the cost of the technology has also helped increase its adoption.

Integrated asset management

Digital technologies enable integrated asset management strategies. They have helped companies leverage data generated by various automation systems implemented over the last decade or two! This helps companies optimize the asset lifecycle of acquisition, maintenance and performance. Starting with intelligent tagging of assets, analysing equipment performance/behaviour/downtime, reviewing quality of maintenance services etc. enable organisations to take preemptive actions and extend life of assets. Aided by data & analytics, companies are minimizing unplanned downtime, reducing maintenance costs and sweating the assets a bit, or quite a bit more. Advent and adoption of edge devices have also helped devolve decision-making to the field units, thereby increasing the reaction times and taking more timely action.

Continuous improvement

With the exponential increase in compute and storage capabilities, while significant reduction in their costs, oil and gas companies are identifying trends, patterns, and inefficiencies in their processes through analysis of historical data. This allows them to implement various improvement initiatives, enhancing quality, reducing waste, optimizing resource allocation and improving workplace and field safety.

Additionally, agile methodologies and DevOps practices are enabling organizations to deliver high-quality products and services more efficiently through increased collaboration, continuous integration and rapid iteration. Businesses are accelerating the timeto-market and enhancing the agility to respond to customer demands.

Cost optimisation remains the prime focus of every organisation that aspires to remain in business and at the top of the stack. The oil and gas industry is no different. However, given the spread and complexity of their operation, these companies are more susceptible to value leakage through inefficient supply chain, inadequate inventory management,



longer decision-making processes, acquisition/retention of costly talent and dated business models. In recent years, the advent of digital technologies has revolutionized traditional practices, offering unprecedented opportunities for cost optimization across the value chain. Below are some of the measures that the industry is adopting towards meeting the stated objectives.

Optimized inventory management

Advanced analytics platforms, powered by AI, help analyse historical data on consumption patterns, lead times, and external factors like weather, industrial activities, change in user demography/ preferences etc. for generating highly accurate demand forecasts. This allows companies to optimize inventory levels,

Use of digital technologies enables oil and gas companies to achieve higher levels of efficiency and productivity through various means minimizing storage costs and preventing costly disruptions caused by stockouts.

Efficient supply chain

Real-time visibility is key to streamlining the supply chain. Traditional methods often lack real-time data on the location and status of equipment, materials and transport. GPS tracking systems and IoT sensors embedded within equipment and containers provide real-time visibility throughout the supply chain thereby helping mitigate any contingencies in case of any adverse event. New optimisers help identify shortest possible delivery networks in terms of time and cost. These also help simulate scenarios for building redundancies or required failover.

Talent management

Data and analytics further enable various stages of talent management viz. hiring, capability development, deployment, engagement etc. These, scientifically, help organisations understand and plan for more engaged and productive workforce. New- age collaboration platforms further employee interaction, experience sharing, leveraging disparate skills spread across geographies etc.

New business models

Digital technologies have enabled the oil and gas industry to explore nontraditional business models of product and services delivery. E-Marketplaces have helped organisations increase their business at optimal costs, while enabling quick response to customer requirements. The visibility to customer profiles also helps in refining the offerings.

In conclusion, driving cost optimization and operational excellence in the era of digital transformation requires a strategic approach that leverages technology, data and innovation. By embracing digital transformation as the driving force, companies can achieve a powerful fusion of cost optimization and operational excellence. This translates to leaner, more efficient operations, improved customer satisfaction and sustainable competitive advantage.

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TRENDS IN INDIAN CHEMICAL SECTOR:

- Digitalization & Industry 4.0 Gaining Momentum
- Innovations to Drive Growth
- India and South East Asian Countries Set to Emerge as Manufacturing Hub
- ESG Becoming Mainstream

WHO SHOULD ATTEND?

- Supply & Distribution
- Warehousing & Transportation
- Information Technology
- Strategic Sourcing
- Procurement

For Speaker and Partnership Opportunities:

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INDUSTRY 4.0 & DIGITAL TRANSFORMATION TO DRIVE CHEMICAL INDUSTRY GROWTH

By using digital platforms, blockchain and e-commerce, chemical companies can develop new business models and reach new markets and customers



The Indian chemical industry is a dynamic and growing sector, adding around 7% to the GDP and 15% to manufacturing output. The sector is expected to reach US\$ 304 billion by 2025, fuelled by the rising demand from various end-use sectors such as pharmaceuticals, agrochemicals, textiles, paints, and plastics. India's demographic driven growth can potentially take it to US\$ 1 trillion by 2040.

However, the sector also faces significant challenges such as the impact of geopolitical events, increasing competition, variable raw material prices, evolving environmental regulations and changing customer expectations. To navigate these challenges with agility and achieve sustainable growth, the sector needs to speed up the adoption of Industry 4.0 and digital transformation.

Transforming the Indian chemicals industry

Industry 4.0—or the fourth industrial revolution—uses advanced technologies such as artificial intelligence (AI), internet of things (IoT), cloud computing, big data, analytics, robotics and automation to create intelligent and connected plants, factories, products, and services. Digital

Organizations need to rethink their business processes and leverage solutions that can help manage operations across multiple sites from a single location transformation uses digital technologies to transform business processes, models and strategies. Together, they can enable the chemical sector to achieve operational excellence by increasing productivity, enhancing quality, lowering costs, raising customer satisfaction and creating new revenue streams – in a sustainable manner.

By incorporating the use of connected intelligence and insights supported by sensors, smart devices and data analytics, chemical companies can track and manage their processes in real time, identify and avoid problems proactively, and reduce energy and resource use. This can help lower downtime, waste and emissions and ensure profitability, improve customer satisfaction, all while meeting sustainability goals.

Beyond the numbers

Industry 4.0 and digital transformation are not the only areas in which companies can benefit from. Other areas that companies often see improvements in include:

• **Product innovation:** By using artificial intelligence, machine learning and digital platforms, chemical companies can speed up their research and development, create and test new products and tailor their offerings to meet the specific requirements of their customers. This can help them stand out from their competitors, generate new markets and increase customer loyalty.

- Customer intimacy: Bv usina IoT, cloud computing and mobile applications, chemical companies can communicate with their customers, suppliers and partners and provide them value-added services, such as predictive maintenance, remote support and performance optimization. This can help them enhance customer satisfaction. retention and advocacy, and lower customer acquisition and service costs.
- Business model transformation: By using digital platforms, blockchain, and e-commerce, chemical companies can develop new business models, such as platform-based ecosystems, asset-sharing and subscription-based services, and reach new markets and customers. This can help them diversify their revenue sources, grow their market share and reduce their reliance on traditional channels.

Overcoming India's unique challenges

However, while many organisations are already often working towards digital transformation, whether with internal colleagues or from partner firms, many often encounter obstacles such as data silos and a variety of tools and discipline in their adoption journey.

This is a particularly major obstacle we've observed for Indian chemical companies adopting digital technologies. Furthermore, given the smaller scale of their plants, it often is hard for them to give strong business rationalizations based on the usual economic factors. This is an area where organizations will need to rethink their business processes and leverage solutions that can help manage operations across multiple sites from a single location. There are many examples in other countries, particularly in the west, where organizations have built remote monitoring centers to achieve economies of scale and have a team of experts monitor performance and provide solutions across multiple sites.

Another challenge many Indian



chemical companies often face is that they not only have to build a chemical plant or factory, but also all the infrastructure that goes along with it. For example, some of the companies we recently talked to have power plants ranging from 100-300 MW. In such scenarios, companies need to consider technologies that work for both the process plant as well as the supporting infrastructure so as to fully optimize their investments.

A connected industrial ecosystem as a force multiplier

Success will hinge on adopting an ecosystem-first strategy for data and insights. By developing an integrated digital twin enhanced with AI and data analytics, chemical companies can consolidate data from the entire industrial lifecycle to generate insights that drive better, more confident decision-making.

A connected, integrated industrial cloud-based ecosystem further empowers companies to extend the advantages of digital transformation across its multiple locations across geographies, as well as externally, to its partners, suppliers and other stakeholders. This allows teams to view integrated data from any location, allowing them to work together from a shared reference point bolstering real-time collaboration and cultivating communities. This, ultimately, builds a set of continuous feedback loops that spark ingenuity at every level. A connected ecosystem also enables best use of human capital, where instead of each organization or site hiring a large number experts across multiple sites, organization and their partners can hire the right resources at right location and deliver value across the enterprise or eco-system.

People, process and technology

In conclusion, Industry 4.0 and digital transformation are not just buzz words, but powerful forces of change and growth that will transform the Indian chemical industry. However, to unlock the real value and lasting benefits of technology, leadership teams will need to clearly define their purpose and strategy for the long-term. Throughout the adoption process, leadership teams will also need to be involved, by identifying the business processes that need to be adjusted to ensure successful implementation.

By adopting and implementing Industry 4.0 technologies, the industry can not only improve its operational efficiency, product innovation, customer intimacy and business model transformation, but also achieve its sustainability goals and create a positive impact on the society and the environment. The time is now for the Indian chemical industry to embrace Industry 4.0 and digital transformation and unleash its full potential to reach US\$ 1 trillion by 2040.

NAVIGATING THE COMPLEXITIES OF DIGITAL TRANSFORMATION IN MANUFACTURING

Implementing digital transformation requires changes in organizational culture, processes and workflows



Ind-to-end digitization in the oil and gas industry presents several challenges as the operations and nature of business is itself complex. Moreover with regulatory requirements, and the scale of the industry with varying degree of digital maturity levels of various facilities even within the same organization, plug and play solutions and one size fits all for end to end digitization is not an option in the oil & gas, chemicals and petrochemicals industry.

Digital transformation is not just required for maximal gains but it could also be a way to survive with global energy transition likely to lead to the closure of marginal assets across the oil and gas value chain in the coming decades. To remain competitive, oil and gas assets strive to transform operations, by improving yield, energy, throughput, reliability and availability while reducing costs.

The main challenges, barrier and

impediments faced in end to end digitization in manufacturing space, particularly in oil and gas, chemicals and petrochemical installations as following

Legacy infrastructure

Though there are various state-ofthe-art facilities in the industry, at the same time we have extensive legacy infrastructure, including outdated equipment, systems and processes.

There is no talent pool with expertise in both oil and gas operations and digital technologies such as data analytics & AI/ML Integrating digital technologies with these legacy systems can be complex and costly. Moreover with varying degrees of digital maturity it becomes a problem to execute projects efficiently, economically and uniformly. For example, one facility has all smart plant drawings and documentation while other has them only in physical hard copy form, that too not complete at times and with low legibility. Overcoming these infrastructure limitations requires investment in bringing infrastructure to the level that digital solutions can be implemented.

Therefore, a particular Proof of Concept (PoC) which could be very successful at one place with better Return on Investment (RoI) would not be an ideal fit for another place.

Though difficult, it pays off rather to carry out digitization at the place where presently there is dearth of digitization and documentation and where the gap is huge to cover, while it becomes easier to test any new technology at the place where doing and implementing a pilot is easy.

Data integration from several platforms

Oil and gas operations generate vast amounts of data from various sources such as sensors, equipment, and personnel. Integrating and analyzing this disparate data efficiently to gain actionable insights can be challenging.

Taking a data to a single platform, reconciliation and to create a single source

of truth itself is a challenge, and there poses another challenge that to create single source of truth we should integrate the systems which do not talk with each other, are not compatible, have come up at difference epoch thus use different technology and may not have latest versions compatible with latest digital solutions on offer.

Sabotage risks

The digitization of operations increases the risk of cybersecurity threats such as data breaches, ransomware attacks and sabotage. With end to end digitization is thought of to create value through transparency, end-to-end view and faster and informed decision making, the risk is to protecting critical infrastructure and sensitive data from cyber threats, sabotage, leakage of sensitive information. When we think of a digital journey, we should also see the armoury needed to defend against the bandits on the journey.

Regulatory compliance

Oil and gas industry is subject to stringent regulations regarding fire, safety, environmental protection and various specific standards based on service and facilities nature and region. Ensuring compliance with these regulations while implementing digital technologies requires careful planning and adherence to industry standards. For example: Implementing a video analytics solution inside unit battery limits of refinery or petrochemical installations all equipment needs to be ATEX certified, compliant to fire standards/area zone, this requirement increases the cost times 10X as compared to may be in a mall or sports complex or retail installation.

Legacy workforce

Oil & gas talent pool is trained in conventional knowledge, experienced



in operating process facilities. While those trained in data analytics and digital technologies have limited or no understanding of oil and gas facilities and processes. There is no talent pool with expertise in both oil and gas operations and digital technologies such as data analytics, Al/ML. While organizations recruit, train and invest in people to bridge this gap, retaining such trained talent with the necessary dual skills can be a challenge for companies seeking to digitize their operations.

Cultural resistance to change

Implementing digital transformation requires changes in organizational culture, processes, and workflows. Resistance to change from accustomed/conventional traditional ways of working to digital ways is a challenge in oil and gas industry with several processes having checks and balances, robust conventional system this adoption of digital technologies and endto-end digitization first requires changes in processes and systems and 'way we work' then comes adoption of digital technologies.

Perception silos

Even if digitization related departments of organizations are enthusiastic about digitization, this doesn't mean that people working on the ground in manufacturing will be. It's important to know what the user needs and not what Industry 4.0 technologies are offering. If we create new platforms which increase rather than decrease the work of people on the ground, the platform will be Digital Dodo which will soon be extinct and find no user, however good it might be. Unless user buy-in is there, right support to users is provided digital adoption remains a challenge. To succeed at scale, however, any new digital solution must integrate seamlessly with the organization's culture, ways of working, infrastructure and available skill level.

Cost and Rol concerns

While digitization offers potential cost savings and operational efficiencies in the long term, the initial investment required can be substantial. Demonstrating a clear return on investment (RoI) and securing funding for digital initiatives can be challenging, especially in periods of low oil prices.

Stall at PoC and infinite wait for scale up

While there are plenty of things at PoC, 90% percent don't go beyond the pilot phase, and here the Rol or technology isn't the problem. Though pilots are successful, exceeding their technical goals, they face roadblock in the form of cultural resistance and resistance to change. It is easy to move PoC as the application area is limited and things are cohesive, the user group is small, decision making swift and change management easy to communicate. But, things change when PoC is scaled up as group dynamics of large scale tears apart all agility and swiftness of small groups.

Secondly, at PoC, the technologies and use cases don't always generate clear value, PoC at times don't demonstrate solving a problem convincingly and bringing a clear financial gain to the table. With project teams not able to clearly demonstrate the impact of PoC. Management can't see clear cost benefits and thus are not willing to invest for scale up.

Addressing these challenges requires a strategic approach, collaboration across the industry, and a commitment to innovation and continuous improvement. Despite the challenges, the benefits of end-to-end digitization in terms of improved safety, efficiency, and competitiveness make it a worthwhile endeavour for oil and gas companies. To overcome these barriers, digital transformation should focus on value creation, incorporate systems to track progress and benefit impact at every step and cultural transformations.

Global market leader in chemicals and ingredients distribution

BRENNTAG

BAGGED ORDERS WORTH RS. 200 CRORE IN DIGITAL SOLUTIONS IN FY 2023-24

We have been flowing back a significant portion of our profits back into the company for development





Industry trends with respect to digital transformation solutions?

In the last few years, Industry 4.0 revolution has been taking place and there are a lot of digital technologies that have been spawned from this revolution. There have been a lot of new software and analytical tools, all of which has been made possible because of higher computational and storage capabilities and communication speed.

Early adopters have found out that just adoption of technology is not going to really provide them value unless there is proper monetization and utilization of these technologies to actually solve business problems. With learning from failures by early adopters, a lot of companies are now focusing more on getting value out of these technologies.

Both globally and in India, we are beginning to see companies realizing that people and processes are equally important in addition to technology. Involving the right people with industry domain expertise is necessary, to restructure work processes to harness these technologies, to improve efficiency, safety, reliability, ease of working, etc.

Our focus is to provide a solution that will actually help in certain areas like safety, reliability, sustainability and efficiency

Percentage of companies opting for new digital technologies?

When we first started deploying these digital solutions, there were very few MNCs who were willing but today, almost everyone in this industry wants to do something and explore. Globally, they are in different phases at various levels of advancement but almost everyone is looking at it positively. Here in India, industry players including refiners are exploring and trying to see what they can do in this area. More than 80% of the people are at least trying to put some sort of digital element in place while just 10-15% have actually set up some real applications. At the same time, one would see a higher percentage of adoption in the western world and in the Middle East.

How do you see deployment of Al based engineering solutions?

Al is a key component of value generating digital solutions. I would call such digital technology based solutions relevant to our industry as Applied Al solutions. Applied Al helps in achieving more objectives, faster and better and in automating mundane tasks. It provides augmented intelligence, for making better decisions, maybe more optimally. It also enables faster learning, ability to create new revenue streams, better collaboration, better user experience and enhanced efficiency, safety, reliability and all this in a more sustainable manner.



Do you see new technologies like ChatGPT being incorporated for industrial applications?

Ever since it was introduced in the market last year, ChatGPT has helped to bring a lot of focus on digital and more specifically Al. In our industry too, there is a lot of merit and value being created to utilize some of the Machine Learning tools for analysis and ChatGPT for information generation. Companies are trying to figure out how they can utilize ChatGPT to find easier ways to interact with the machine.

Earlier one had to type something and do things physically but here you are able to sit back, ask questions, maybe voice questions or just a prompt or series of prompts to get the answers. It's the next level of being able to interact with the machine and extract value.

ChatGPT has helped this whole area and the applications are still evolving. There are all types of applications where ChatGPT can be used in a modified way. It can be done using retrieval and augmented generation. We have to remember that it is one portion of bigger set of AI technology applications. Ingenero has been promoting IngeneroX (Ingenero's digital solutions). Do you see solutions catering to sustainability, innovation, supply chain, process, and manufacturing?

IngeneroX is a suite of Applied Al based solutions that help us to make better decisions in the supply chain and Manufacturing. It includes data collection and handling, analysis and intelligence generation, communication through more intuitive visualization of results, prescribed actions and implementation of actions. We have been deploying IngeneroX solutions for almost eight years.

The solution helps in making better plans and reacts quicker to changes that happen in the marketplace through optimal planning. In terms of innovation, one is able to build a model for the manufacturing process, supply chain process or any of the other business processes using a digital twin, which helps speed up the innovation process

The digital twin traditionally was based on purely fundamental models but today a hybrid of fundamental models and datadriven models are possible with machine learning. Hence with this digital twin, one is able to be more innovative. It offers a clearer picture of what is happening in terms of level of emissions, for example, and helping us to make appropriate changes to lowering them.

How will Ingenero solutions help companies with respect to digital transformation?

We work with process manufacturers and provide a combination of software as well as associated services for achieving operational excellence. There is a lot of generic foundational software that is available in Artificial Intelligence or Machine Learning but one has to combine it with people and process. Our focus is to provide a solution that will actually help in certain areas like safety, reliability, sustainability and efficiency. It is more proactive and it is a lot safer to operate these facilities. If something is going wrong it will be able to fix it. In terms of production, one can do remote tracking, guiding of production reliability, better



yields with its efficiency, better recoveries, better conversions, cost efficiency, energy efficiency and much better sustainability.

Solutions provided by Ingenero?

Broadly, I can divide solutions we provide into three verticals for the process industry. These are: design engineering, operations engineering, digital solutions for both design and operations engineering that includes efficiency, reliability, safety and sustainability.

On design engineering, we get involved right from the conceptual stage to processing engineering skills and then going into the early decision phase followed by taking it all the way through construction commissioning. So, while we are involved in each of these stages but our core strength is conceptual design and operations engineering.

Ingenero has been providing complete systems with validation and mitigation services to ensure that clients are safe and compliant with all API and OSHA regulations. Solutions under this category?

In whole area of process safety, each country has its own regulatory body. OSHA in the US took a lead and it became a template for others to follow. The US was the first to make a lot of things mandatory including process safety management. It has a set of 14 elements and with time it has evolved. The Centre for Chemical Process Safety which is part of the American Institute of Chemical Engineers is again emulated by regulatory bodies across the globe. They have come up with a little more practical risk based approach with 20 elements.

We really provide services to make sure these elements can be followed. For example, we do safety audits, management of change, pressure relief system adequacy checks, flare load We have also been supporting decarbonization technology companies with design engineering

adequacy, anomaly detection, SIL, LOPA among other services.

In the next 2 years, Ingenero will be celebrating its 25th year. What's your target for this special occasion?

We have been actually deploying automated digital solutions in the past ten years. Earlier, we were providing a lot of operations support, but today we have automated software using applied AI doing end to end things. In the first year, we started conceptualizing and putting digital solutions in place. And in the next nine years, we deployed our solutions at 50 plus sites. We have about 500 plus use cases in five different regions including the US, Middle East, India and Asia Pacific. We have worked with refineries, petrochemicals and midstream. The type of use cases that were covered include profitability, reliability, safety, efficiencies, energy sustainability, waste management and water management.

Orders bagged and executed in FY 2023-24 both in Chemical and Petrochemical?

In addition to proof of concept and pilots, last year we covered about 30 sites. That's the volume of digital business we are doing and it is continuously growing, in addition to the work we do in design engineering and operations support, including safety.

Company's performance in FY 2023-24? Growth that you foresee in FY 2024-25?

Being a privately held company, we don't reveal revenue and profit numbers, I would like to mention that we bagged orders worth Rs. 200 crore in digital solutions last year. Last year, we saw a 60% growth and we have been growing at almost 20% to 25% consistently. At the same time, we have been flowing back a significant portion of our profits back into the company for development and that's why we've been able to really come up with a lot of these solutions.

Given the current visibility, we continue to see the type of growth today that we have seen in the last couple of years and expect good growth in the next year or two. We are very bullish about things in all three categories but digital has really taken the lead. At the same time we also see a good amount of growth in engineering as well as safety. We have been doing a lot of sustainability engineering work with several customers. We are seeing new projects and interestingly, these are happening in the Middle East, even more than the West.

Manpower recruitment plan for the next two years?

When we first started and built our company, our core strength was all kinds of specialized process engineering type of work. A lot of our people had operations experience and it was a very unique combination of people with operations shop floor experience as well as design engineering, and technical, analytical, and software. Comparatively, the group has evolved now with 50 percent of this core team involved with digital solutions. It is a diverse team with domain experts with experience in process, operations, process modelling, and software architecture. Another 25 percent is in the more traditional engineering both Process and multidisciplinary engineering. Remaining 25 percent is focuses on safety and sustainability.

We have a very active hiring process



and anticipate 40-50 percent growth in manpower. We expect to be adding 100 to 200 resources in India itself.

Ingenero has been perfecting robust and reliable Machine Learning models. How many of these models you have perfected?

There are a lot of generic foundation models and ML algorithms in the market and a lot of people think that they can just use them easily for various applications but that is far from the truth. There is a lot of specialized engineering that is required to sustainably monetize these. Over time we have built a lot of modules which require lesser specialized engineering even for more complex unit operations like distillation columns. reactors and furnaces. However, specialized engineering is still an important piece in any applied AI implementation in our industry.

Any modules for enhancing process manufacturing applications?

Our digital twins don't just update us on the current scenario but also have the ability to go back into history and run scenarios from the past. This is made available to people at the plant or anywhere else. That's the beauty of the Internet of Things (IoT) and ability to remotely access.

Today a lot of it is driven either through dynamic dashboards or even voice activated chatbots. But over time, we are trying to evolve it into being like an agent where the machine will go do searching, computations and present the possible solutions for the complications.

We have done dynamic benchmarking for the entire facility, whether it's an individual asset or the entire plant, or even for the asset level, we have now specialised modules for optimizing the control systems that are already there and improving asset health for furnaces, distillation columns, compressors, pumps and heat exchangers. We have been fairly unique in being able to modularize it and



INGENERC

Excellence Through Insight

actually being able to deploy them. Some examples of modularized Apps we have successfully deployed are:

APCPro (Optimize underperforming APC controllers for improved performance and efficiency).

OptimaX (Dynamically identify best operating condition and close

the gap).

ActionX (Real time identification of process deviations and prescriptions to rectify).

AgentX (GenAl based conversational application with the digital solution for proactive interactions).

Partners for providing complete Al based solutions?

While some of the software solutions that we build by and large are proprietary to us, we also have partnered with Honeywell, AspenTech, IIT Bombay, Gent University and others. Wherever necessary we partner with others as we don't want to really reinvent the wheel in certain areas. But when providing proprietary solutions, we package it around open algorithms.

How do you see competitive landscape?

In Applied AI, there's a lot of noise around the foundational models and generic models. However, we are focused on value addition beyond these models and are very specialized. We provide a comprehensive Applied AI solution where we have actually deployed the technologies and have been fairly unique. In terms of competition, we have a subset of the end to end Applied AI technology areas being addressed by a few companies, providing simulators hardware data platforms,

Business

software, making this a very confusing space for a lot of customers. We have fairly unique set of offerings

Intelligence

that ensures value generation and have taken a good lead with a lot of very good applications.

In the design engineering space, there are a lot of engineering companies. So our claim to fame there is more strength in process.

In process safety again, there are very few players in India and we have a unique edge having been part of the safety reviews and audits of almost every refinery in the US over the last 15 years, in one way or the other. We have tremendous experience and are now trying to combine it with digital solutions.

On sustainability, we have been actively supporting clients with digital solutions to do the best they can with existing assets. We have also been supporting decarbonization technology companies with design engineering. We are also in the process of partnering with some of the CSIR facilities and some of the institutes where some very good work is happening. We are trying to work jointly on a few of these technologies and ultimately take these to our customers.

Sustainability

Paving The Way For A Better Tomorrow



FROM WASTE TO WEALTH

As the chemical industry evolves, sustainability and circular economy principles will guide its trajectory towards a greener and more resilient future

he Indian chemical industry stands at a pivotal juncture, poised to embrace sustainability and integrate circular economy principles into its operations. At the forefront of this transformation is the need to mitigate the environmental impact of chemical manufacturing processes. Historically, the industry has been associated with high energy consumption, water usage and waste generation. To address these challenges, Indian chemical companies are increasingly adopting cleaner production techniques, optimizing resource utilization and investing in green technologies. Initiatives such as energyefficient manufacturing processes, water recycling systems and waste-toenergy projects are becoming integral to sustainable chemical production.

Key drivers of sustainability in chemical industry

- Public perception of chemical companies
- Government policies and sstringent regulations
- Improved capital market performance
- Higher valuations (return on capital invested)
- Technological advancements
- Competitive landscape and reconfigured ecosystems

As per International Energy Agency (IEA), the chemical industry is a significant producer of Scope 1 and Scope 2 emissions and plastic waste. The industry also consumes significant volumes of natural resources such as fossil fuels and coal, which generates undesirable effluents and pollutes the environment if not treated properly. With the ratification of the 2016 Paris Agreement, the governments of many

countries have drawn stringent regulations that mandate global chemical companies to set ambitious targets such as netzero emissions by 2050 and step into a sustainability-focused ecosystem.

As one of the key contributors to the country's economic growth, the chemical sector holds immense potential to drive innovation, foster environmental stewardship, and spearhead the transition towards a greener future. However, achieving sustainability goals in this industry requires a concerted effort from all stakeholders, including government, businesses and consumers.

Pivoting towards sustainability

The global market for green chemicals was estimated to be US\$

1.7 billion in 2022 and is anticipated to reach US\$ 3.3 billion by 2030 with a CAGR of 8%-10%. Asia-Pacific is anticipated to be the fastest growing market while Europe currently holds the maximum market share \sim 36%. China and India are emerging as manufacturing hubs of key market players and are expected to lead the manufacturing of sustainable chemicals. Europe and the

U.S. continue to focus on R&D related activities for green chemicals and will lead the way for a more sustainable ecosystem of chemicals. Chemical companies are also producing green specialty chemicals, biobased chemicals, organic chemicals and other such chemicals as per their product stewardship strategy.

Green hydrogen will be yet another cornerstone of the chemical industry's

shift away from fossil fuels. Its active role in ammonia and methanol production could prove to be a starting point in enabling the decarbonization of the chemical industry. By 2030, the cost of green hydrogen production is expected to decline by 60% from the current US\$ 4–5.5 per kg. The main factors behind this would be cost-effective electrolyzer technologies, the decreasing cost of renewable electricity, and increasing levels of utilization fuelled by centralization of production, design optimization and a better mix of renewables.

Several global chemical companies have proactively committed to longterm reductions in Greenhouse Gases (GHG) emissions and eventual net-zero aspirations. Sixteen of the top 20 global chemical companies have pledged to cut a percentage of their GHG emissions by 2030, and nine committed to achieve net-zero carbon emissions by 2050. BASF has cut its GHG emissions by almost 50 per cent over the last three decades, despite doubling production volumes. It achieved this using patented catalysts to lower carbon dioxide emissions and increase efficiency at its plants. In comparison, Indian chemical companies are lagging. Only five of the top 20 Indian chemical companies have set GHG reduction targets until 2030, and none have declared a target year to achieve netzero emissions.

The chemicals industry can improve its environmental, social and governance (ESG) performance overall, as demonstrated by several chemical companies. Defining an ESG strategy to embrace sustainable practices, implementing necessary changes in energy-intensive operations and using enablers to execute said strategies could help transform this dynamic industry into a clean energy hub that serves as an example for the rest of the world.

Key ingredients for circularity

By promoting the reuse, recycling and recovery of resources, companies can minimize waste generation and maximize resource efficiency. Closed-loop systems, where by-products and waste streams are recycled or repurposed, offer promising avenues for reducing environmental footprint and conserving valuable resources. Additionally, the implementation of extended producer responsibility (EPR) frameworks encourages chemical manufacturers to take responsibility for the entire lifecycle of their products, from production to disposal.

Innovation plays a crucial role in

driving sustainability within the chemical industry. By leveraging advancements in biotechnology, nanotechnology and process optimization, the industry can reduce its reliance on fossil fuels, minimize toxic emissions and develop sustainable alternatives

to conventional chemicals. Moreover, collaboration across the value chain is essential for fostering a circular economy in the chemical sector. Partnerships between manufacturers, suppliers, and consumers can facilitate the exchange of resources, promote closed-loop systems and drive innovation in product design and recycling technologies.

Acting in tandem with policy shift

The chemical industry contributes significantly to the nation's GDP and is anticipated to reach approximately US\$ 304 billion in demand terms by 2025. Cognizant of the potential of the industry, the Government of India has taken multiple measures to promote the sector such as

sules to promote the sector such as

Overcoming challenges

 Despite the growing awareness, a few challenges persist on the path towards sustainability and circularity in the Indian chemical industry. These include technological barriers, financial constraints, and the need for cultural and behavioral change. Overcoming these challenges requires a holistic approach that integrates technological innovation, policy support, and stakeholder engagement.

100% FDI to boost investments, creation of Petroleum, Chemical and Petrochemical Investment Regions (PCPIRs), PLI schemes and the National Green Hydrogen Policy. The pace of the country's energy transition in line with the 2070 net zero announcement will be exciting to witness. Industries will need to align themselves with the national agenda on sustainability as they plan for further growth, and the chemical industry will play a vital role in achieving this transition.

The chemical players that will move faster on sustainability and find solutions will have a clear edge over others. These companies can actively leverage growth opportunities than jeopardizing their

> operational licenses. To reach net zero, the chemical industry will need to innovate across all valuechain segments. This means that companies will have to develop new processes that are either carbon neutral or low carbon, which will involve leveraging greener energy

sources and sourcing sustainable raw materials.

Perks of adopting sustainability

In a competitive capital market with a constant demand for high returns, sustainability is being perceived as a differentiator. Therefore, companies focusing on sustainability have a lower cost of capital and better chance of being prioritized by investors. The shift towards sustainability requires the adoption of circular business models, use of renewable feedstocks, and reuse and recycling of endof-life products.

Companies leveraging such opportunities will have considerable growth prospects and the option to re-position themselves in new business ecosystems.



By 2030, the cost of green hydrogen production is expected to decline by 60% from the current US\$ 4–5.5 per kg.

Moreover, companies that explore digital technology solutions to increase resource productivity will have the upper hand in the competitive market. Companies with ingrained sustainability principles have a well-defined environment and health and safety management policies that are aligned with profit goals. Over that, the regulatory compliance ensures lower risk for any bad reputation.

Way forward

The Indian chemical industry has a unique opportunity to lead the transition towards sustainability and circularity. Players need to integrate sustainability values in their long-term business strategies, business policies and operational processes. This will shape and prepare them to address changing behavior and expectations of the internal and external stakeholders, also improve competition and profitability. By embracing cleaner production methods, promoting resource efficiency and fostering collaboration across the value chain, chemical companies can drive positive environmental and social impact while ensuring long-term economic viability.

As the industry evolves, sustainability and circular economy principles will guide its trajectory towards a greener, more resilient future.



SUSTAINABILITY: BIOPLASTICS AND BIODEGRADABLE PLASTICS

There are opportunities for both domestic and multinational manufacturers in India due to significant demand from various end-user sectors

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e cannot live without plastics having innumerable applications in every facet of life, right from transportation, packaging, reliable storage, clothing, sports, furniture, foams, pipes to industries. However, most conventional plastics such as polyethylene (PE), polypropylene (PP), polystyrene (PS), poly (vinyl chloride) (PVC) and poly (ethylene terephthalate) (PET), are non-biodegradable, and their cumulative buildup in the environment has been a danger to the planet. To overcome all these problems, some steps have been undertaken. The post-1950 era has witnessed tremendous growth in plastic production because of a variety of reasons. In the year 2019 alone, the plastic production was 368 MMT which was estimated to reach 8,300 MMT between 1950 and 2015, with a total

plastic waste of 6,300 MMT. In an ideal circular economy, plastics would be made from renewable or recycled resources (Fig. 1). However, the traditional life of most plastic materials is linear. Of these, 78% plastic was discharged into landfills, 12% incinerated and only 9% recycled. Although recycling has increased since the 1980s, the recycling of non-fibre plastic remains stagnated at 18% and almost

However, the traditional life of most plastic materials is linear. Of these, 78% plastic was discharged into landfills, 12% incinerated and only 9% recycled no textile fibres are recycled. Plastic pollution is seen by one and all and several legislative actions are in place. The first approach involved production of plastics with a high degree of degradability.

Why bioplastics?

Since plastics are an integral part of modern living and with the ever-increasing awareness of the environment as well as the health hazards of petroleum-derived plastics, there is an emphasis on the use of biomass derived alternatives. As the name suggests bioplastic is a longlasting polymer made from renewable raw materials that may be used in place of nonrenewable petro-polymers.

Bioplastics are misunderstood by many as biodegradable. However, bioplastics consist of either biodegradable plastics (i.e., plastics derived from fossil feedstock) or bio-based plastics (i.e., plastics derived from biomass or renewable carbon resources). Biodegradable plastics can be degraded by microorganisms present in the environment by entering the microbial food chain. This property does not depend on the origin of the raw materials, which could be either fossil or biomass origin. When plastics are used as substrates for microorganisms, evaluation of their biodegradability should not only be based on their chemical structure, but also on their physical properties (melting point, glass transition temperature, crystallinity, storage modulus, etc.). Beside the covalent forces of polymer molecules, various



Figure 1: Different types of plastics and their biodegradability

kinds of weak forces such as hydrogen bond, van der Waals and coulombic forces, among macromolecular chains affect not only the formation of polymer aggregates, but also the structure and physical properties and function/reactivity of the polymer aggregates and thus the degradability.

Feedstock for bioplastics

The universal feedstocks used to produce bioplastics include corn, wheat, potato, maze, rice husk, palm, sugarcane, etc. which are easily available in many countries across the globe. Compared with fossil petro-plastics, bio-based plastics can have a lower carbon footprint and show advantageous materials properties; moreover, they can be compatible with current recycling streams and some offer biodegradation as an end of life (EOL) option if performed in controlled or predictable environments. The use of bioplastic has the potential to reduce carbon dioxide emissions by 30 to 70%. It yields a 42% reduction in carbon footprints. Bioplastic production requires 65% less energy than the usual petro-plastic. The global bioplastics market is developing

due to new technologies and the emphasis on the net zero goal. According to Nature Reviews, the annual production of 100% bioplastics is \sim 2 MMT in which about 2/3 is biodegradable. If partial bio-based Pus and polyamide co-polymers are included in these statistics, then it would be \sim 7.5 MMT in 2018 which is predicted to reach 9.1 MMT in 2023 with market size of US\$ 1.1 billion and 1.7 billion, respectively.

The bioplastic market is categorized into three segments: by type, by application, and by region. Based on type, it is divided into biodegradable plastic and nonbiodegradable plastic. Based on application, the market is classified into flexible packaging, rigid packaging, textiles, coating and adhesives, agriculture and horticulture, consumer goods and others. Region wise, the market is divided into North America, Europe, Asia-Pacific, South America. Middle East and Africa. Currently, bioplastics cost more than twice the petro-plastics. As stated, before there is also a confusion about the bioplastics which are derived from biomass, but it does not mean all are biodegradable (Figure 1). On the contrary, the comparison of fossilderived and bio-derived plastics is given in Figure 2.

Biodegradable polyurethanes

When petroleum-based reserves are exhausted, biobased polymers will take over. Also biomass derived polymers to obtain vinyl monomers, carboxylic acids, alcohols, amides and rubbers will come to the centre stage. For instance, polyurethanes (PUs) are one of the most widely used plastics, mainly in flexible and rigid foams, with global production of 18 MMT which uses the carcinogenic isocyanate monomer. Instead of the unsafe and fossil-based route, PU can be produced from cyclin carbonates (produced from cycloaddition of epoxides) and diamines derived from vegetable oils.

It should be noted that PU can be synthesized by combining multiple biological materials. Except for turpentine, vegetable oil, cellulose, lignin, phenolic and sugar, there are other bio-renewable materials, like proteins and starches, etc. that have the characteristics of wide sources, low price, large output and no pollution. PU obtained from vegetable oils are hydrophobic. Consequently, by adding proteins, sugars and other natural hydrophilic compounds, hydrophilic polymer materials can be obtained for



Figure 2: Petro-plastics and bio-plastics (Source: Rosenboom et al. Nature Reviews- Materials, 7 (2022) 117-137)

medical materials and devices. Adding cellulose, lignin and other reinforcing materials to vegetable oil-based polymers can improve the mechanical and thermal properties of the materials. The composite of different biological materials can not only obtain excellent PU materials, but also obtain good environmental and economic benefits, which should be advocated and applied.

FDCA based biodegradable plastics

The synthesis of 2,5-furandicarboxylic acid (FDCA) based polymers is getting

significance due to their biodegradability (hydrolytic and enzymatic) and compostability, as a replacement for petro-polymers due to their excellent thermomechanical and barrier properties. based homopolyesters FDCA faced technological and commercial hurdles. Direct manufacture of FDCA from biomass is still limited to 5-hydroxymethyl furfural (HMF) which is in turn derived from glucose, fructose, sucrose, high fructose corn syrup, jerusalem artichoke and starch (Figure 3). The industrial production of FDCA has not attained its full potential due to its low yield and high cost since the current

average for FDCA synthesis is \$2,300/kg. To make the process economically viable, FDCA production cost should be below \$1,000/ton. The major processing costs are associated with the HMF formation stage and the long residence time for HMF oxidation. Replacing simple sugars with food wastes could be a sustainable option for HMF production from environmental and economic perspectives. Starch from food waste such as bread wastes, cooked rice, pasta, noodles and cellulose-rich fruit peels can be used to synthesize HMF. However, the industrial production of FDCA based homopolyesters is delayed due to several



Figure 3: Synthesis of 5-HMF from sugars

factors including poor optical property, low ductility and slow crystallization rate. In order to tune the properties of FDCAbased homopolyesters, FDCA has been copolymerized with several aliphatic (adipic acid, succinic acid, lactic acid, sebacic acid, polyglycolic acid and polyethylene glycol) and cyclic (caprolactam and isohexides) comonomers (Figure 4).

Biodegradability versus plastic chemical recycling

Biodiversity and occurrence of polymer-

degrading microorganisms vary depending on the environment, such as soil, sea, compost, activated sludge, etc. Generally, the adherence of microorganisms on the surface of plastics followed by the colonization of the exposed surface is the major mechanisms involved in the microbial degradation of plastics. The enzymatic degradation of plastics by hydrolysis is a two-step process: first, the enzyme binds to the polymer substrate then subsequently catalyzes a hydrolytic cleavage. Polymers are degraded into low molecular weight oligomers, dimers and monomers and finally mineralized to CO2 and H2O. Therefore, biodegradable plastics are viewed as a potential solution to plastic pollution because they are environmentally friendly. Further, they can be derived from renewables thereby reducing GHG emissions. The much talked about polyhydroxyalkanoates (PHA) and lactic acid (raw materials for PLA) can be manufactured by fermentation using agricultural residues and microorganisms. Biodegradable plastics offer a lot of advantages such as increased soil fertility, low accumulation of bulky plastic materials in the environment, and decrease in the cost of waste management. Furthermore,



Figure 4: FDCA based homopolymers as bio-degradable bioplastic

biodegradable plastics can be recycled to useful metabolites (monomers and oligomers) by microorganisms and enzymes. A second strategy involves degradation of some petro-plastics by biological processes. Some aliphatic polyesters such as PCL and PBS can be degraded with enzymes and microorganisms. Polycarbonates (particularly the aliphatic types) possess some degree of biodegradability. It is advisable to recycle non-biodegradable plastics though chemical recycling and all plastic waste can be converted into hydrocarbons using hydrogen and the nasty atoms like CI, S, N are converted into HCI, H2S and NH3 that can be absorbed by using well established technologies. For instance, polystyrene (used in making some disposable spoons, plates, cups, and some packaging materials) can be recycled and used as filler for other plastics or through solvolysis and hydrogenation.

Conclusion

In order to circumvent the problems associated with the production of plastic

goods production and end-of-life (EOL). bioplastics were introduced as a viable substitute to petro-plastics. A variety of materials belong to the category of bioplastics, which largely differ from each other depending on the polymer they are composed of, as well as in respect to the structural characteristics that mainly affect their accumulation in the environment when dumped. Mechanical. chemical, biochemical recycling, biodegradation (composting) are some of the approaches to deal bioplastic pollution. Instead with biodegradation, microbes and of hydrolyzing enzymes can be employed depolymerize bio-plastics to into monomers instead of producing carbon dioxide on complete biodegradation.

Moreover, a future challenge in the bioplastics market could be the production of new blends of biopolymer that are more easily biodegradable without losing the characteristics (such as mechanical strength or flexibility) that make the bioplastics attractive in the first place. Bioplastics will replace petro-

plastics in all types provided the costs are similar; currently the bioplastics are 3-4 times more expensive. The use of food and lignocellulosic wastes as potential low-cost feedstock should be further developed. Also, photosynthetic algae have shown remarkable carbon fixation abilities in producing sugars for bacterial fermentation and subsequently used for the bioplastics production. Algae biomass could also be blended with conventional plastics to reduce the dependency of petroleum-based sources. Some of the algae species are found to accumulate polyhydroxyalkanoates (PHA) which can be extracted for bioplastics production.

Several nations and international organizations are encouraging circular plastic economy which is bolstered by the policies by UNIDO and G20 nations. It is vital not to overlook the technologies of bioplastics disposal, their impact on microplastic formation in the environment and aquatic life. Therefore, the life cycle assessment of bioplastic is important before bringing them into the industrial sector.



CATERING TO WASTE TREATMENT AND MANAGEMENT FOR A SUSTAINABLE FUTURE

Creating a green environment by implementing innovative and cost effective solutions through advanced technologies of waste management

Ashok Panjwani

Executive Director - UPL Director - BEIL, KEIL SSWML, BRCPL, GECPL & NCTL



Turnkey solutions provided by BEIL Group with respect to environment protection which are innovative and cost-effective?

BEIL Infrastructure Ltd., formerly known as Bharuch Enviro Infrastructure Limited, is a leading company in the waste management industry. Headquartered in Ankleshwar, a major chemical hub in Gujarat, BEIL has operations in over four states in India and a diverse range of ten waste management services. BEIL is committed to expanding its presence to cover almost every state in the country.

BEIL's core business areas encompass a wide range of activities. These include the collection, segregation, transportation, trading, processing, composting, recycling, treatment, and disposal of various types of waste. This also includes solid, liquid and gaseous substances, as well as municipal solid waste, electronic waste (e-waste), batteries, solar plates, used oil, paint waste, construction and demolition debris, bio-medical waste, hazardous waste, sewage, wastewater, plastic waste, rubber waste and more.

Additionally, our services extend to the operation and maintenance of common effluent treatment plants, sewage

We are excited to announce our upcoming project of converting AgriWaste to bio-CNG, which is in its nascent stage and will take place in FY 2024-25 treatment plants and water and wastewater treatment plants. We also undertake the use, sale, marketing and distribution of all products and by-products that are generated during the treatment or disposal of waste and waste products.

These products may include compost, energy, and refuse-derived fuel generated from waste-to-energy processes such as bio-methanation, methane gas from landfills, biogas, bio CNG, electronic products suitable for re-use (with or without refurbishing), paper, metals and other materials, including chemicals obtained from the treatment of wastes.

BEIL Group's achievements in FY 2023-24 and what are your plans for FY 2024-25?

During the Fiscal Year 2023-24, we have accomplished an extraordinary feat by setting a new record for the largest amount of landfill waste received. Moreover, BEIL has triumphantly acquired and dispatched the highest quantity of Co-Process waste to date. The remarkable efforts of our Shivalik Solid Waste Management team have played a pivotal role in achieving this unprecedented milestone. Additionally, our esteemed group company, Enviro Technology, has received a staggering number of tankers, reaching a grand total of 55,630. Lastly, Kerala Enviro Infrastructure Limited has reached an all-time peak in handling bio-medical waste, showcasing our commitment to excellence in waste

management.

At BEIL Group, our commitment to sustainability drives us to focus on developing green products. To further this goal, we have devised a plan to utilize solar panels on our completed landfill, generating an impressive 2.5 MW of power. This initiative not only helps us reduce our carbon footprint but also contributes to a cleaner and greener future.

In addition to our efforts in renewable energy, our dedicated project team is tirelessly working on converting municipal solid waste to bio-CNG. This groundbreaking project is set to take place at our Coimbatore facility, where we process an impressive 500 MTPD of municipal solid waste. By transforming waste into a valuable resource, we are actively contributing to a more sustainable and ecofriendly society.

Furthermore, we are excited to announce our upcoming project of converting AgriWaste to bio-CNG, which is in its nascent stage and will take place in FY 24-25. This innovative endeavour will not only help us reduce agricultural waste but also provide a renewable source of energy. By harnessing the power of nature, we are taking significant steps towards a greener and more sustainable future.

BEIL has acquired exceptional quality in building environmental management projects confirming to

Our Unit Facilities

- Landfill sites are managed by BEIL and Group companies in Ankleshwar, Dahej, Shivalik, and Kochi
- Incineration facilities are established at Ankleshwar and Dahej units for hazardous waste, and in Kochi for bio-medical waste
- Municipal Solid Waste recycling plants are operational in Ahmedabad and Coimbatore
- The group oversees numerous STPs and ETPs across India



international standards and good engineering practices. How are these different from your competitors?

At BEIL & its Group, our vision is to become a world-class hazardous waste management company. We are committed to creating a clean, green, and healthy environment by offering reliable

> and cost-effective waste management solutions. Our goal is to treat toxic/nontoxic industrial, municipal, bio-medical, plastic and e-waste, converting them into reusable materials while minimizing waste for disposal in a scientifically safe engineered manner.

> Our mission is to protect and preserve our natural resources, ensuring a sustainable future. We achieve this

by implementing innovative and costeffective waste management solutions, utilizing advanced technologies. By doing so, we contribute to the creation of a green environment.

What sets us apart from our competitors are the following key factors:

Customer's Delight: We prioritize customer satisfaction and strive to exceed their expectations.

Environment Friendly: Our practices are designed to minimize environmental impact and promote sustainability.

Integrity: We uphold the highest ethical standards in all our operations, ensuring transparency and trust.

Leadership: We are industry leaders, constantly pushing boundaries and setting new standards.

Technical Excellence: Our team
consists of experts who possess exceptional technical skills and knowledge.

What hazardous waste management solutions are provided by the Group?

BEIL and Group companies are proud to operate multiple landfill sites across Ankleshwar, Dahej, Shivalik, and Kochi. These sites are meticulously designed to ensure the safe disposal of hazardous waste, minimizing any potential risk of environmental release.

Our commitment to environmental stewardship is unwavering, and we take great care in selecting locations that pose no threat to surrounding areas. In line with our dedication to responsible waste management, we

are excited to announce the upcoming establishment of a new landfill site at Jhagadia. This new addition will further strengthen our ability to protect the environment and ensure the well-being of the communities we serve.

BEIL has successfully implemented and operated MEE plants at both Ankleshwar and Dahej Unit. These stateof-the-art industrial systems utilize steam heat to efficiently evaporate water from liquid solutions. Through a series of vessels, each operating at a progressively lower pressure, the steam generated in each stage effectively heats the subsequent stage. This innovative process not only ensures significant energy savings but also enhances overall efficiency.

BEIL also offers Incinerator, Common Operated Effluent Treatment Plant (CETP) and Municipal Solid Waste (MSW) services.

India's market size of municipal solid waste management solutions? BEIL's solution for municipal solid waste management?

The municipal solid waste management market is experiencing significant growth globally, with India being one of the top 10



countries in waste generation. According to The Energy and Resources Institute (TERI), India produces over 62 million tons of waste annually. With a collection efficiency of 95.4%, the country collects 152,749.5 TPD of the total 160,038.9 TPD generated. Take advantage of this growing market and invest in sustainable waste management solutions today.

BEIL Group operates two state-ofthe-art MSW processing facilities, one in Ahmedabad with a capacity of 250 MTPD and another in Coimbatore with a capacity of 500 MTPD. Our facilities are designed to efficiently and scientifically dispose of municipal solid waste, ensuring that it undergoes a transformation in its physical, chemical, and biological properties. This transformation not only makes it easier to dispose of

The upcoming landfill site at Jhagadia will further strengthen our ability to protect the environment and ensure the well-being of the communities we serve the waste but also allows us to recover valuable resources from it. Through our advanced processes, we are able to produce high-quality compost and RDF (Reduced Derived Fuel), contributing to a more sustainable and environmentally friendly waste management solution.

Global and India market size of e-waste recycling solutions? BEIL's e-waste recycling solutions?



The e-waste management market is a rapidly growing industry, with the global market expected to reach US\$ 155.4 billion by 2030. In India, the market is also flourishing, with a projected value of US\$ 5.1 billion by 2032.

India's e-waste management is in dire need of improvement, with a significant increase in e-waste generation in recent years. The majority of e-waste is being mishandled by small, undocumented shops, leading to environmental hazards. However, with the current installed capacity only catering to a quarter of the total e-waste generated, there is a pressing need for more efficient recycling solutions. Frost & Sullivan's projection of 11.5 million tonnes of e-waste by 2025 highlights the urgency for better waste management practices. India's 400 registered e-waste recyclers have the potential to make a significant impact, with an increased capacity of 1.07 million tons per annum as of March 2021. BEIL's state-of-theart e-waste plant across multiple locations is revolutionizing waste management.

Global and India market size of common effluent treatment plant solutions? Brief us about common effluent treatment plant solutions provided by the Group?

The worldwide market for ecological wastewater treatment reached a substantial US\$ 16.7 billion in 2022. The Indian Water and Wastewater Treatment

Market, on the other hand, was valued at US\$ 1.51 billion in 2022 and is expected to experience a significant growth rate of approximately 11.22% during the forecast period of 2023-28.

BEIL operates a state-of-the-art Common Effluent Treatment Plant (CETP) in Ankleshwar with a capacity of 2.2 MLD. This facility efficiently collects, treats, and disposes of wastewater from various industrial sites, including smallscale tanneries. Additionally, in Baddi, Himachal Pradesh, we have established a massive CETP with a capacity of 25 MLD, catering to the needs of industrial estates and MSMEs. With our expertise and commitment to environmental sustainability, we ensure that industrial wastewater and domestic sewage are effectively managed, contributing to a cleaner and healthier ecosystem.

Global and India market size of plastic waste recycling solutions? Talk briefly about plastic waste recycling solutions provided by the Group?

In just a decade, the global plastic recycling market is set to witness remarkable growth. With a compound annual growth rate (CAGR) of 7.39%, it is projected to reach a staggering US\$83,299.5 million by 2032, starting from its current value of US\$ 40,838.5 million in 2022. Similarly, the global recycled plastic market is expected to experience significant expansion, with a CAGR of 4.7% and a projected value of US\$ 67.1 billion by 2030, up from US\$ 46.5 billion in 2022.

India, in particular, is making great strides in the recycled plastics market. Valued at US\$ 3,784 million in 2022, it is expected to reach US\$ 5,277 million by 2028, with a CAGR of 5.6% from 2023 to 2028, according to IMARC Group. This growth showcases the country's commitment to sustainable practices and highlights the potential for further development in the coming years.

BEIL is making steady progress in

We are excited to announce our upcoming project of converting AgriWaste to bio-CNG, which is in its nascent stage and will take place in FY 24-25 the processing of plastic waste at its Ankleshwar Unit.

What sort of waste to energy solutions provided by the Group?

An incinerator plant, also referred to as a waste-to-energy (WTE) plant, serves as a furnace that incinerates hazardous materials at elevated temperatures to eliminate contaminants. Through the combustion process, the heat produced generates steam in boilers, which in turn powers turbo generators to generate electricity.

Incinerators are primarily utilized for the treatment and eradication of hazardous waste, while also having the ability to recover certain energy or materials. When executed correctly, incineration can significantly reduce the volume of hazardous waste and eliminate its toxic organic components. It is capable of treating various forms of hazardous materials, including liquids, gases, sludge, and soil. However, metals such as lead and chromium cannot be destroyed through incineration.

The BEIL Group operates hazardous waste incineration facilities at Ankleshwar and Dahej units, as well as a facility in Kochi specifically for biomedical waste.

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These facilities are dedicated to ensuring the safe and efficient disposal of hazardous waste, contributing to environmental sustainability and public health.

Global and India market size of waste water management solutions? Talk briefly about waste water management solutions provided by the Group?

The global water and wastewater treatment market witnessed remarkable growth in 2022, with a valuation of US\$ 301.7 billion. However, the future prospects are even more promising as it is projected to reach a staggering US\$ 536.4 billion by 2030. This exponential One crucial component of water and wastewater management is the sewage treatment plant. Also known as a wastewater treatment plant, it plays a vital role in collecting and treating wastewater from homes and businesses. By purifying the wastewater and making it safe to return to the water cycle, these plants contribute to public health and environmental sustainability.

Sewage treatment plants are an indispensable part of sanitation and water infrastructure. It is imperative that governments, businesses, and individuals recognize the significance of sewage treatment plants and actively support their growth. By doing so, we can collectively contribute to the wellwith a focus on three major initiatives: Women Empowerment Centre, Compost Site and Scholarship for Underprivileged Children.

The center is committed to training underprivileged women in tailoring skills, empowering them to earn a livelihood. By securing contracts for uniform stitching from schools and industries, the center ensures sustainable income for these women. Additionally, the center has contributed significantly by producing masks for distribution to government and private sectors.

BEIL has taken the initiative to adopt two villages, Jitali and Dahej, in Bharuch District. Through door-to-door collection of household waste, the company



growth is a testament to the increasing importance of water and wastewater management worldwide.

India's wastewater treatment market was valued at US\$ 5.141 billion in 2022 and is expected to grow at a CAGR of 11.76% to reach a market size of US\$ 11.199 billion by 2029. This highlights the country's commitment to improving its water infrastructure and ensuring the well-being of its citizens. being of our communities, protect the environment, and pave the way for a sustainable future.

BEIL and Group build and operate many STPs for the Government and World Bank.

Major CSR initiatives being undertaken by BEIL Group?

BEIL is dedicated to its CSR Projects,

converts the waste into compost and establishes nurseries for community development.

BEIL allocates a substantial amount of funds towards providing scholarships for economically disadvantaged students, particularly in the field of engineering. By supporting their education and facilitating job placements, BEIL is actively contributing to the upliftment of these students.

Petrochemicals

Unlocking New Growth Horizons



CHARTING A NEW GROWTH TRAJECTORY

The surging domestic demand serves as a primary driver for the growth of the petrochemical industry in India **TEAM ICN**

The petrochemical industry stands as a cornerstone of India's industrial landscape, serving as a catalyst for economic growth, innovation and job creation.

The industry is at a pivotal juncture, poised to capitalize on emerging opportunities while navigating challenges in an evolving global landscape. One of the defining features of the Indian petrochemical industry is its robust growth trajectory, underpinned by a burgeoning domestic market fueled by demographic shifts, urbanization, and rising consumer aspirations.

This domestic demand presents a compelling opportunity for industry stakeholders to expand production capacities, enhance product portfolios, and cater to diverse market segments.

India's petrochemical sector is projected to grow at about 11 per cent per annum to reach US\$ 100 billion in 2027, and will continue to grow at a similar rate to reach US\$ 350 - \$370 billion in 2040, as per a report by McKinsey & Company.

Growth drivers

The petrochemical industry in India plays a pivotal role in the country's economy, serving as a critical link in the manufacturing value chain and contributing significantly to industrial growth and employment generation. Petrochemicals serve as building blocks for a wide range of products across sectors such as plastics, textiles, pharmaceuticals, automotive, and construction. Over the last one decade, the Indian petrochemical industry has witnessed robust growth, driven by various factors including increasing demand for polymers, favorable government policies, and investments in infrastructure and technology.

Given its significant import dependence, India could potentially need more than 15 world-scale petrochemicals assets by 2035 to meet domestic demand. Presently, there are 11 naphtha or dual feed cracker complexes in operation with combined ethylene capacity of about 7.05 million tonnes per annum. In addition, there are six aromatic complexes in operation with a combined Xylene capacity of about 5.5 million tonnes. Demand for plastics in India is expected to reach from 24 million

tonnes by FY 2022-23 to 35 million tonnes by FY 2027-28.

With India's rapid urbanization, rising disposable incomes, and expanding middle class, there has been a surge in demand for petrochemical products

such as polymers, synthetic fibers, and plastics. To meet the growing demand, major players have been investing in

With India's rapid urbanization, rising disposable incomes and expanding middle class, there has been a surge in demand for petrochemical products such as polymers, synthetic fibers and plastics capacity expansion and modernization of facilities. New petrochemical complexes and refineries are being set up to enhance production capabilities and cater to diverse market requirements.

Trends shaping the industry

A notable paradigm shift is witnessed in the industry's composition, with a discernible tilt towards specialty chemicals. These chemicals, tailored for specific applications, offer not only higher margins but also a strategic avenue for industry players to carve out niches amidst

intensifying competition. In an era marked by heightened environmental c o n s c i o u s n e s s , sustainability imperatives are catalyzing transformative changes within the petrochemical landscape. From investing in recycling technologies

to curbing carbon footprints, industry stakeholders are embracing sustainability as a cornerstone of their operational ethos.

Seamless integration with refining operations is emerging as a strategic imperative for petrochemical players. This synergy not only optimizes feedstock utilization but also fosters operational efficiencies. propelling companies towards enhanced competitiveness and resilience. Embracing a technological renaissance, petrochemical companies are harnessing the power of automation, artificial intelligence, and data analytics to drive operational excellence and product innovation. This relentless pursuit of technological prowess underscores the





industry's commitment to staying ahead of the curve.

Petrochemical parks are evolving as epicenters of innovation and collaboration, fostering a conducive ecosystem for industry players to thrive. These hubs, characterized by state-of-the-art infrastructure and regulatory support, herald a new era of synergistic partnerships and technological advancements. As India's petrochemical industry navigates currents, enhancing global global competitiveness emerges as a strategic imperative. From bolstering product quality to exploring export avenues, industry players are charting pathways to assert their presence in international markets, amplifying India's footprint on the global stage.

Diversifying feedstock sources stands paramount in mitigating risks and bolstering resilience. From exploring alternative sources such as coal and biomass to optimizing natural gas utilization, industry stakeholders are spearheading a diversification drive to fortify the industry's supply chain dynamics.





Demand for plastics in India is expected to reach from 24 million tonnes in FY 2022-23 to 35 million tonnes by FY 2027-28

Policy push

At the heart of India's petrochemical resurgence lies a conducive policy environment, meticulously crafted to foster innovation, competitiveness, and sustainability. Government initiatives such as "Make in India" and the National Petrochemical Policy serve as cornerstones, laying the groundwork for industry players to thrive amidst dynamic market forces, promoting ease of doing business serving as catalysts, attracting investments and bolstering the industry's growth trajectory.

The Department Chemicals and Petrochemicals, Ministry of Chemicals

Upward trends

- Growing domestic demand
- Expansion of production capacities
- Government initiatives
- Focus on value-added products
- Technological advancements
- Integration with downstream industries

and Fertilizers, Govt. of India has also introduced several initiatives including the Petroleum, Chemicals, and Petrochemicals Investment Regions (PCPIRs) policy, which aims to develop integrated petrochemical hubs with state-of-the-art infrastructure and favorable business environment.

It is implementing a scheme to support setting up need based Plastic Parks, with requisite state-of-the-art infrastructure, enabling common facilities through cluster development approach, to consolidate the capacities of the domestic downstream plastic processing industry. The scheme aims to increase investment, production

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and export in the plastics sector.

Government policies incentivizing strategic integration between refining and petrochemical operations optimize feedstock utilization and enhance operational efficiencies. This symbiotic relationship not only strengthens the industry's value proposition but also bolsters energy security and import substitution endeavors.

Policies facilitating collaboration between academia and industry would foster a culture of innovation, driving technological breakthroughs and product diversification. At the same time, government initiatives facilitating market access and trade facilitation play a pivotal role in enhancing the industry's global competitiveness.

Bilateral trade agreements, export promotion schemes and diplomatic endeavors open new avenues for Indian petrochemical products in international markets, amplifying the industry's footprint on the global stage.

Overcoming challenges

The volatility of feedstock prices directly impacts production costs and profit margins of the companies. Fluctuations in crude oil prices, geopolitical tensions, and supply chain disruptions underscore the need for robust risk management strategies and proactive measures to mitigate market uncertainties. Moreover, environmental sustainability emerges as a pressing concern for the petrochemical industry, necessitating a paradigm shift towards cleaner production processes, resource efficiency, and circular economy principles.

Embracing technologies such as green chemistry, carbon capture, and recycling holds the key to reducing environmental footprint while enhancing long-term resilience and competitiveness. By investing in research and development, leveraging digitalization, and fostering collaboration across the value chain, Indian petrochemical companies can stay at the forefront of technological advancement and address evolving consumer preferences and regulatory requirements.

As the petrochemical sector undergoes digital transformation and automation, there is a growing need for a skilled workforce equipped with the requisite technical expertise and adaptive capabilities to drive innovation and productivity. The industry will have to pay attention to the nurturing of quality human resources.

Outlook

The petrochemical industry in India is poised for continued growth and expansion, driven by strong domestic demand, government support, technological advancements and global competitiveness.

The change is propelled by a significant expansion of its intermediates' production capacity, and growing focus on reducing the sector's carbon and environmental footprint by both industry as well ad policy makers. With its high demand growth, India is projected to contribute to more than 10 per cent of the incremental global growth in petrochemicals over the next decade.

With Indian petrochemical capacity projected to grow by more than 30 per cent during the period of 2017–2025, the players are increasingly focusing on the production of value-added and specialty petrochemicals to capture higher margins and cater to niche markets. The rapid evolution of new crude-to-chemicals technologies is further contributing to the oil and gas majors focusing more on petrochemicals.

Petrochemical players will need to carefully assess market dynamics, capability requirements, business model fit, competitive landscape, and potential disruptions before making strategic longterm bets.

Players focusing on commodity products will need to identify downstream derivatives for their next wave of growth, while ensuring healthy returns and synergies from their existing asset base. New entrants can enter one of the white spaces in downstream petrochemicals products or expand into competitive segments with a better value proposition.

By leveraging these strengths and embracing sustainable practices, Indian petrochemical companies can navigate challenges and capitalize on emerging opportunities, thereby contributing to the country's economic development and industrial progress.



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R&D: CATALYST FOR REFINERIES GROWTH AND EFFICIENCY

Targeted solutions to produce sustainable fuels, reduce emissions, minimize waste generation and facilitate sustainable practices



n the oil refining industry, Research and Development (R&D) stands as the cornerstone of progress, ushering in innovative technologies that elevate efficiency, sustainability, and profitability within the industry. Refineries transform Black Gold (crude oil) into valuable products like gasoline, diesel, lubricating oils and petrochemicals. However, to navigate evolving consumer demands, environmental regulations, and economic pressures, refineries rely heavily on continuous advancements in R&D.

Role of R&D in refineries

Refineries operate within a dynamic landscape, responding to global shifts in energy demand, environmental concerns, and technological breakthroughs. Amidst these challenges, R&D emerges as a vital driver for growth and efficiency. Its primary objectives encompass:

Process optimization: R&D focus on

enhancing refining processes to maximize yields, minimize energy consumption and reduce environmental impact. This includes developing new generation catalysts, new technologies and process intensification solutions.

Product diversification: Refineries are diversifying their product portfolios to meet changing market demands and regulatory requirements. R&D plays a pivotal role in developing new technologies for producing value added products.

Sustainable technologies: With

HPGRDC has developed breakthrough technologies in the field of refining like Hydrogen PSA, HiGas, HP-DAK, Hp-Trijet, Crude to Chemicals and HP-TDAE the ongoing stringent environmental regulations and Net Zero initiatives by industry, refineries must adopt cleaner technologies. R&D efforts target solutions that produce sustainable fuels, reduce emissions, minimize waste generation and facilitate sustainable practices.

Chemicals, additives & catalysts: The heart of refining innovation

Among the various components of R&D chemicals, additives & catalysts stand out as core of the innovation for the refining and petrochemical industry.

Refineries: Refineries use a wide spectrum of catalysts for running various process units producing value added products. There are different catalysts in the refinery like FCC catalyst, additives, hydro processing catalyst, and lube processing catalyst. In addition, refineries use multiple chemicals to improve yields, reduce corrosion and reduce energy consumption.

Petrochemicals: This industry uses niche catalysts whose usage will produce commodity petrochemicals and also high value niche petrochemicals. R&Ds role in testing and developing these catalysts play a very important role in value maximisation.

HPCL R&D Centre

HPCL has set-up its prestigious 'HP Green R&D Centre' at Bengaluru, India in 2016 with an objective to develop innovative & path breaking technologies and products. The Centre has been setup in the eastern fringes of Bengaluru, the garden city of India, and is located 15 km from ITPL/Whitefield.

HP Green R&D Centre (HPGRDC) is being built in phases in a campus of 104 acres, comprising of 16 laboratories viz., FCC/RFCC, Hydro processing, Catalysis, Bioprocesses, Crude Evaluation & Fuels Research, Analytical, Process Modelling & Simulation, Nano Technology, Petrochemicals & Polymers lab, Engine Testing lab, Tribology lab, Corrosion Studies lab, Novel Separations lab, Residue Upgradation lab and Battery Research lab.

HPGRDC is recognized by the Department of Scientific and Industrial Research (DSIR) and has collaborations hydrotreating along with FCC additives like BCA (Bottom Cracking Additive), PMA (Propylene Maximisation Additive) etc. Besides catalyst, multiple refinery chemicals like neutralising amines, filming amines, dewaxing aid, dewatering aid and fuel additives. HPCL refineries use all the indigenously developed chemicals in Mumbai and Visakh Refineries.

Proprietary equipment: HPGRDC has developed fixed bed reactor internals for hydrotreating units and also feed nozzles for FCC units. All the FCC units in HPCL refineries are using HPGRDC designed and fabricated feed nozzles.

Global technology centre: HPCL has established a Global Technology Centre at

processing of UCO in hydrocrackers.

HPCL has distinguished itself as the first refining company to place an order for an electrolyser to green its refinery operations. These comprehensive efforts by HPCL are contributing to the Viksit Bharat initiative of innovation, sustainability, and economic growth in the global refining and petrochemical industries.

Future outlook: R&D as a competitive edge

Looking ahead, R&D will remain a cornerstone of refining competitiveness. Refineries that prioritize innovation and



with research institutes in India and abroad. HPGRDC is focusing on the following areas of refineries for catalysing its progress

- Indigenous technologies
- Refinery chemicals & catalysts
- Proprietary equipment
- Global Technology Centre

Indigenous technologies: HPGRDC has developed breakthrough technologies in the field of refining like Hydrogen PSA (Pressure Swing Adsorption), HiGas (Process Intensification), HP-DAK (production of low aromatic solvents), Hp-Trijet (Sustainable Aviation Fuel), Crude to Chemicals, HP-TDAE (Treated Distillate Aromatic Extract)

Refining chemicals & catalyst: HPGRDC has successfully developed and tested catalysts of FCC, Naphtha and diesel HPGRDC to provide advanced technical services to refineries with the strong back-up of technologies and catalyst knowledge of HPGRDC. This centre will provide advanced technical services to HPCL refineries.

HPCL's commitment to sustainability is further highlighted by its development of HCNG technology, a novel approach that not only promises to make CNG green but also enables the production of highend application carbon nanotubes without the use of water and completely free of CO2 emissions.

Additionally process intensified carbon capture technology has been developed by HPCL and a blue hydrogen plant is being set up. In addition, HPGRDC is implementing technologies for HP-Trijet (Triglycerides to Jet Fuel) and also coinvest in R&D capabilities will gain a competitive edge by:

- Embracing digitalization and analytics to optimize operations
- Exploring circular economy concepts to minimize waste and maximize resource utilization
- Collaborating with start-ups and technology disruptors to harness emerging trends like hydrogen fuel and carbon capture

In conclusion, R&D is the catalyst that propels refineries toward growth, sustainability, and resilience in a rapidly evolving industry landscape. By fostering innovation, collaboration and strategic investments, refineries can navigate challenges and seize opportunities, ensuring a future of efficient, responsible and profitable refining operations.

INDIAN PETROCHEMICALS: A BRIGHT FUTURE AHEAD

India's demand for petrochemicals across molecules is expected to grow faster than the global average



Petrochemicals are a vital cog in the global industrial arena and a major growth driver for economies. The petrochemical industry occupies a pivotal place in the country's economy, with increased domestic consumption and rising demand from various end use sectors such as medicines, construction, agriculture, textiles, automotive, etc.

It is one of the fastest growing sectors, with demand growing at a CAGR of 6% plus over the last five years in 2023-24 (with a blip in 2020-21). The penetration level of petrochemicals in India is, however, far lower than the global average. India's per capita consumption stands at 12 kg compared to the global average of 35 kg, indicating significant headroom for growth.

The pandemic has brought about various changes in the Indian petrochemical market, including digitization, increased

consolidation activities, and a focus on scenario-based planning. India is sitting in the cusp of per capita GDP as well as per capital purchasing power and history has shown that once past this inflexion point, the growth and demand for basic petrochemicals is insatiable. The direction in which Indian society is moving will imminently lead to requirement of new demand for basic petrochemicals as well as sow the foundation for speciality and functional chemicals.

India is fast emerging as a global hub for petrochemicals activity. With its high demand growth, India is projected

India's per capita consumption stands at 12 kg compared to the global average of 35 kg to contribute to more than 10 per cent of the incremental global growth in petrochemicals over the next decade. And given its significant import dependence, India could potentially need more than 15 world-scale petrochemicals assets by 2035 to meet domestic demand.

Despite several factor including cost issues being faced, taking advantage of the China Plus One strategy adopted by global players, some Indian petrochemical producers are planning to ramp up production levels in 2024 and beyond with an eye on domestic demand and export opportunities.

Last year saw, 1,250 KT of new PE capacity being added and going further, domestic players are adding 7 MMT (PE), 5.7 MMT (PP), 3.6 MMT (PVC) capacities by 2028 to further augment the huge capacities already existing in the country and create employment.

India's demand for petrochemicals across molecules is expected to grow faster than the global average. Net imports are about 10 per cent of demand, and the supply-demand gap is even more acute at a product-grade level, with almost 100 per cent import dependence in intermediates such as styrene and acrylonitrile. While a public sector company is investing in setting up a green-field plant (by FY 27) for styrene which will help reduce the imports coming into India, a private sector company is investing in putting up an acrylonitrile by FY 24 end.

With government focus on reducing imports and promoting Atmanirbhar Bharat, QCOs, focusing on some key



chemical products like Nitric Acid, Acetic Acid, Phenol and Aniline where India doesn't have domestic capacities and will also be a good opportunity for domestic players.

India is also emerging as a preferred manufacturing hub for specialty chemicals for domestic and export markets. Approximately 20% of the total chemicals market in India, the specialty chemicals sector has been playing a pivotal role in driving the chemicals industry's growth. As per ICRA research report, India is having only around three per cent share in global specialty chemicals industry, which it is poised to grow at a CAGR of 11 per cent till FY26.

Further, annual GDP growth at \sim 7%-8% would require sustained investment in the basic building blocks of commodities, polymers and chemicals, as well as new materials - 1 MMT new Ethylene capacity every year, Polymer consumption 2x by 2030 from present 17 MMT to 35 MMT, Domestic players are adding 7 MMT (PE), 5.7 MMT (PP) and 3.6 MMT (PVC) capacities by 2028

Polyester consumption 2x by 2030 from present 5 MMT to 9.5 MMT.

The focus on Sustainability will further drive demand for 'Green' energy to decarbonize the existing and new capacities as well as create demand for 'Green' chemicals and materials.

Mega transitions like Oil to Chemicals (O2C) is likely to have profound impact on the industry. O2C technology and the transition towards green hydrogen offer significant potential to transform the petrochemical industry and enable the pursuit of net-zero emissions. Petrochemical companies have a vital role to play in advancing the adoption of green energy. In fact, many of the companies like NTPC, Adani Enterprises, JSW Energy, ReNew Power, Acme Solar, HPCL, Reliance Industries and IndianOil, have made announcements for setting up a cumulative annual green hydrogen manufacturing capacity of 3.5 MMT.

Lastly, focus on energy, trade and investment, digital economy, health and environment will pave new opportunities and growth areas for the Indian petrochemical industry.

The overall outlook for the petrochemical industry in India is more positive than it was in 2023 as several state-owned energy corporations have made investments to boost petrochemical feedstock availability and extend their presence in the downstream derivatives market. The focus of the industry is to plan capacity addition and meet the domestic as well as export demand. The industry needs to be nurtured with the right policies and fiscal support from the government.

EXPANSION PROJECT TO TREBLE CAPACITY FROM 3 MMTPA TO 9 MMTPA

Enhancement in refining capacity is expected to have a multi-pronged impact not only for NRL but the entire industrial ecosystem



Numaligarh Refinery Limited (NRL) registered the highestever PAT since its inception at Rs. 3,703 Crore in FY 2022-23. How has the company performed in FY 2023-24?

FY 2023-24 ended on a positive note for NRL in terms of physical and financial performance. This is despite a setback in the form of a fire during the first quarter of the FY 2023-24 while the refinery was getting back to operations after a planned turnaround of about a month. Refinery turnaround involves inspection and maintenance of all units of the refinery in a holistic manner to ensure its smooth and efficient functioning and is carried out at regular intervals of four years.

Despite this unforeseen adversity and a valuable quarter lost during the beginning

of the FY 2023-24, the company bounced back with resilience and the refinery was able to record a crude throughput of 2,510 thousand metric tonne, equivalent to 100% capacity utilization for 10 months.

Annual Accounts closing is under progress and we are hopeful that the financial performance will reflect the physical performance.

Current production capacity of

The 2G bio-refinery is unique in the sense that bamboo biomass is being used as a feedstock, which no one else in the world has ever tried

NRL and how has it changed over the years?

The present refining capacity of NRL is 3 million tonnes per annum (MMTPA) which is the design capacity since inception and commencement of commercial production in the year 2000. However, the company has embarked on a major expansion drive to treble its refining capacity from 3 MMTPA to 9 MMTPA. We are encouraged by the performance of the refinery so far and are aiming at crossing the design capacity of 3 MMTPA and achieve 110% capacity utilisation this year.

Latest development on NRL's expansion? Total capacity post expansion and how is this going to impact NRL's overall performance?

The ongoing Numaligarh Refinery Expansion Project (NREP) to treble the capacity from 3 MMTPA to 9 MMTPA has achieved around 60 per cent progress on ground. Further, as part of the integrated refinery expansion plan, a 1,640 Km crude oil pipeline is being laid from Paradip to Numaligarh, the progress for which is around 70 per cent on ground. The scheduled completion of NREP is December 2025 and we are mobilising all our resources and moving ahead aggressively to achieve the target as per set timelines.

Enhancement in refining capacity is expected to have a multi-pronged impact



not only for NRL but the entire industrial ecosystem. With increased refining capacity, NRL will be able to contribute in enhancing regional energy availability apart from venturing for exports to neighbouring countries. It is expected to boost economic growth in the region by creating direct and indirect employment opportunities as well as growth in ancillary industries.

NRL has announced Capex of Rs. 35,000 crore in the next 5 years. Can you please elaborate on this?

Refinery project is almost 60% through on ground while the Paradip Numaligarh Crude Oil pipeline has achieved a progress of 70%. Corresponding amount of capital expenditure in terms of financial commitment has been made. These form a major part of the Rs. 35,000 crore investment which will continue till the end of 2025. NRL is also putting up a Polypropylene unit of capacity 360 KPTA for which environmental clearance is awaited. Once on board, another Rs. 7,000 crore would be apportioned from the above Rs. 35,000 crore capex proposed.

What is the development of setting up a 2G bio-refinery?

The 2G bio-refinery plant at Numaligarh which is designed to produce 49,000 metric tonnes of bioethanol has already been mechanically completed during the end of March 2024; with some residual jobs remaining. It is a pretty complex project and therefore would typically require 3 to 4 months for commissioning. All out efforts are being undertaken to commission the plant quickly and safely tentatively by mid July 2024.

The 2G bio-refinery is unique in the sense that bamboo biomass is being used as a feedstock, which no one else in the world has ever tried. The North East of India has abundance of bamboo availability which is being tapped for the purpose. The bio refinery would require around 300,000 metric tonnes of dry bamboo annually. In order to maintain unhindered supply, we have also carried out major tweaking in the whole supply chain of bamboo. Our aggregation model is about offsite chipping of the bamboo and a great deal of value addition will happen at the village level.

Other than bioethanol, a chemical called furfural and acetic acid would be produced in the process, which would

ensure the economics of the project. The Government of India has granted a Viability Gap Funding (VGF) of around Rs. 150 crore for the project.

NRL has signed a pact with NTPC for a green chemicals project. Please share details?

Banking on the experience gained by NRL so far, NTPC has signed a MoU with our company for collaboration and knowledge sharing in setting up a biorefinery like the one we are putting up in Numaligarh. The biorefinery will be put up in Salakati, West Assam and a separate catchment area for growing bamboo has been identified.

Biofuels have a great future ahead as is manifest by the focus it has gained in recent years not only in the milieu of the Government of India, but globally. NTPC can also explore the opportunity to utilise the lignin from bamboo and feed it into their plant along with coal, to make their electricity greener.

NRL and Inland Waterways Authority of India (IWAI) has inked a pact for petroleum products transportation. How is the progress on this front?



Most of the over dimensional and overweight consignments for NREP have been transported to Numaligarh utilising waterways. Most of these equipment are being produced in Dahej in Gujarat along the West Coast of India; then being transported through big vessels up to Haldia to be trans-shipped onto river going barges that take NW2 via Bangladesh to reach Assam.

The consignments are finally offloaded at a location very close (about 10 Km) from our refinery wherein a jetty has been constructed on the river Dhansiri, a tributary of the mighty Brahmaputra. However, in order to navigate this route, we need waterways and adequate drafts around the year.

I take the opportunity to thank IWAI for their support in facilitating the above due to which we have been able to transport consignment of weight upto 1,500 tonnes along this route. Moreover, the current infrastructure will pave the way for future transportation of materials as well as products through the river route that would happen mostly downstream. NRL will produce Polypropylene in the future while solid sulphur is already being produced. Eventually, the river route is expected to be utilised to transport a variety of refinery products, other than transporting petrol and diesel.

The company also opened its first overseas office in Bangladesh. Is there any

plan to expand more overseas offices?

NRL has a pipeline named India Bangladesh Friendship pipeline running up to Parbatipur in Northern Bangladesh from its terminal at Siliguri, West Bengal for transportation of Diesel. We are also exporting Paraffin Wax to Bangladesh and have plans to export Polypropylene which has a good demand in Bangladesh, mainly to meet its packaging needs for cement and readymade garment industries.

To expand our footprints and export more products to Bangladesh, we thought it prudent to open an office in Dhaka. We are also exploring markets in Nepal and Myanmar and tap its potential for NRL products.

How does NRL contribute to the socio-economic development of the region?

There are three to four key contributions of NRL towards socioeconomic development of the region.

Firstly, direct and indirect employment

NRL is also putting up a Polypropylene unit of capacity 360 KTPA for which environmental clearance is awaited to hundreds of youths from the region. Secondly, we are the highest tax payers in the North East region and the Income Tax Department has repeatedly recognized the company on this account. Thirdly, NRL has been able to transform the socio-economic status of the region through its social initiatives that are undertaken under corporate social responsibility.

Fourthly, we operate a 100 bedded multi-speciality hospital called VK NRL Hospital within our township premises; that has been

able to deliver quality health care in the region since the year 1998. The hospital also conducts mobile medical camps, delivering healthcare to the doorsteps of the community in 70 villages covering a population of 80,000 rural residents within a radius of 10 Km of the refinery. We have also set up a VK School of Nursing that provides quality Nursing Education to girls from the region to make them self-sufficient and capable of earning their own livelihood.

What are some of the major challenges faced by NRL in its operations?

Operating expenses per barrel of crude oil for a 3 MMTPA refinery is very high since manpower and associated expenses are almost at par for a refinery with higher capacity. We are hopeful to overcome the challenge when our 9 million tonnes refinery is commissioned by the end of the year 2025.

Also, in order to ensure long term growth and sustainability, we are planning to put up a petrochemical complex for producing Polypropylene, which is the road ahead for all existing refineries. This is expected to attract more and more ancillary industries in the domain of chemicals, especially niche chemicals. Also, considering Government of India's mandate of 1% blending of sustainable aviation fuels (SAF) to Aviation Turbine Fuel (ATF) by 2025 in line with global sustainability standards, NRL is exploring the means to produce SAF.

We are tucked in one corner of the country and have a major challenge of high transportation (freight) costs for our products. But fortunately over a period of time, with phenomenal economic development, North East is witnessing double digit growth in both diesel and petrol demand, easing our logistic issues. For example, when we first started marketing our products in the year 2000, the geographical range was 1,500 - 2,000 km for which we had to bear substantial freight under recovery. Now, the product envelope has shrunk to almost around 700 - 800 km and therefore our freight economics have improved significantly. As we diversify into more products, we are hopeful that we are able to meet the growing demand for our products in the region. Also, we are focussing on export to our neighbouring countries like Bangladesh, Bhutan, Nepal and Myanmar which are geographically closer.

NRL plans to achieve net zero by 2038. Can you discuss the steps taken by NRL to ensure the safety and environmental sustainability of its operations?

Our first and major initiative is the carbon neutral Bio Refinery in Numaligarh, which is under commissioning. The only carbon dioxide emissions that take place are during the fermentation process; when glucose gets converted to ethanol. We are planning to capture this carbon dioxide in liquid form.

Another green initiative is putting up a 2.4 KTPA green hydrogen plant; which is expected to be commissioned by June 2025.

Several other technologies are being adopted to make the refinery fuel efficient and green. By reducing fuel consumption for running the refinery, we aim to reduce greenhouse emissions.

We are also creating a huge carbon sink by afforestation of hectares and hectares of land in different districts of Assam. We have already acquired around 70 hectares of deforested land and developed three major nurseries for generating bamboo saplings in collaboration with the Government of Assam. Another MoU with the Assam government for afforestation of 28 hectares is on the cards.

Going forward, we are planning to capture carbon dioxide which gets generated in the process; to reduce Scope 1 emissions.

To create pathways to meet our net zero targets, we are in serious discussions with major players in the field.

What role does NRL play in the global energy transition and shift towards cleaner and renewable energy sources?

As stated earlier, we have embarked on a 2.4 KTPA green hydrogen plant project. For that purpose, we need around 18 MW of electricity from round the clock green electricity sources. We are exploring opportunities for power purchase agreements for green electricity.



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AIMING TO INCREASE PETROCHEMICAL INTENSITY INDEX TO ABOUT 15%

BPCL has a Petrochemical Intensity Index of approximately 2.3 per cent which will increase to 8 per cent by 2028



Latest trends/opportunities in the Indian and global petrochemicals market?

India has one of the lowest consumption rates in the world - $\sim 0.3x$ of the world average (per capita of 12 kg versus 38 kg world average). Developed countries such as the US have per capita consumption of 93 kg whereas China is not far behind with 83 kg. Countries in the development path are bound to increase per capita consumption of petrochemicals. India is one of the fastest growing major economies with an upcoming middle class.

Pressure on fossil fuel usage is expected to account for around 30% of growth in oil demand by 2030 and 50% by 2050 for petchem and is expected to grow at a CAGR around 9-10% and take 10-12% of global market by 2040. Evolving geopolitical scenarios – shift from core manufacturing markets and drive towards making supply-chains more resilient is expected to increase petrochemicals manufacturing in India. The conducive government policies towards atmanirbhar Bharat, forward integration and feedstock security are set to push

Petrochemical project integrated with the refinery to the tune of approximately Rs. 55,000 crore is already under implementation stage at our Bina and Kochi refineries petrochemical growth in India.

Technology developments are happening rapidly with focus on net zero and circular economy. Considering all the above, it is anticipated that India will require approximately 10-14 world scale crackers by 2040.

Performance of Bharat Petroleum Corporation Limited (BPCL) refinery in FY 2023-24 and what is your expectation from FY 2024-25?

BPCL refineries have recorded the highest ever throughput of 39.93 MMTPA during FY 2024 showing an increase of 3.63% YoY and the market sales has been a record at 51.04 MMTPA, showing a growth of 4.33% YoY.

BPCL has successfully established itself in niche petrochemicals namely Acrylic Acid, Acrylates and Oxo Alcohols produced from Propylene Derivative Petrochemical Plant (PDPP) plant at Kochi Refinery which were being imported into the country thereby saving valuable foreign exchange.

BPCL has announced an investment of Rs. 1.4 lakh crore in petrochemicals and gas business. What is the latest development?

Petrochemical project integrated with the refinery to the tune of approximately Rs. 55,000 crore is already under implementation stage at our Bina and Kochi refineries.

BPCL intends to increase its refining

capacity and also petrochemical intensity further and activities for further expansion and diversification are at various stages of evaluation. We are also evaluating expansion-cum- diversification to petrochemicals at our Mumbai Refinery. Projects for production of both niche and bulk petrochemicals are being evaluated.

The company also announced Rs. 49,000 crore Capex for Bina refinery expansion. How is this going to impact BPCL's overall refining capacity, by products and its positioning in India and global petrochemical market?

With the implementation of the ongoing project at Bina Refinery (BR), crude processing capacity will be increased by 3.2 MMTPA resulting in about 1 MMTPA of additional transportation fuels. The petrochemicals production from the Ethylene Cracker Unit, downstream polymer units and its associated facilities will be about 2.2 MMTPA, thereby increasing Petrochemical Intensity Index of Bina Refinery to 25 per cent and BPCL to approximately 8 per cent.

Availability of additional transportation fuels will help in increasing self-sufficiency of fuels in the north and north-east of India. Petrochemicals produced from Bina Refinery will easily find markets within the economic zone of Bina Refinery. Products proposed include certain polymer grades which have good demand and are being imported into the country. This project is expected to spur the growth of downstream industries in and around Bina.

BPCL has announced an investment of Rs. 5,044 crore in the PP plant at Kochi Refinery? Can you please elaborate on this?

Activities have commenced for setting up a 400 KTPA PP unit at Kochi Refinery, utilizing Polymer Grade Propylene available from the PFCCU of Kochi Refinery. We propose to utilize the PP produced from Kochi Refinery to satisfy the demand in the Kochi economic zone. EIL has been appointed as Project Management Consultant (PMC) for this project.



How BPCL is leveraging on diversifying petrochemicals amid changing global energy basket?

As mentioned before, there is definitely a huge potential for increasing petrochemicals production in the country. BPCL is well positioned to be a part of the growth story. Towards satisfying this demand and also positioning BPCL and the country as a major manufacturing hub for petrochemicals, BPCL is pursuing various strategic options in the refining and petrochemical space. BPCL has set itself ambitious targets and has charted a roadmap with the idea of "Nurturing the core and future big bets", encompassing the energy and petrochemicals scenario.

What is BPCL's share in the Indian petrochemicals market today and where do you see this 5 years down the line?

Today, BPCL has a Petrochemical

Activities have commenced for setting up a 400 KTPA PP unit at Kochi Refinery, utilizing Polymer Grade Propylene available from the PFCCU of Kochi Refinery Intensity Index of approximately 2.3 per cent which will increase to 8 per cent by 2028. BPCL is working on strategies to increase it to about 15 per cent in the near future. BPCL envisages synchronous growth in the petrochemicals market of the country.

How would you address any potential challenges or issues in the industry that may impact the company's success?

BPCL owns and operates three refineries, two at coastal locations and one in central India. Each of the three refineries have their own uniqueness and versatility. The network of pipelines and infrastructure enables products to reach each and every part of the country. As a result of BPCL's innovative offerings, be it in the field of marketing or in the field of producing speciality products such as Drillol, niche petrochemicals, speciality lubes, dearomatized solvents and the list continues, BPCL is well positioned to handle any challenges.

We are working on various facets such as improving energy efficiency, creep expansion cum modernization, introduction of speciality products, increasing production of renewable energy and green hydrogen which will prepare BPCL for the future and handle any challenges faced. The experienced and dedicated staff of BPCL have contributed to the success of the company and are well prepared to handle challenges faced in any field.

SET TO BECOME A FORMIDABLE PLAYER IN THE PETROCHEMICALS INDUSTRY IN INDIA

As on date, the total commitment made is Rs. 69,368 crore and a capital expenditure of Rs. 45,479 crore has been made as of 31st March, 2024



2024 Industry trends/challenges in the petrochemicals sector?

Geo political conflict, trade protectionist policies, retarded macroeconomics, high inflation and supply glut are expected to exert pressure on the global petrochemical industry. Capacity rationalization is inevitable especially in Europe in near term due to poor and scale of economics. Energy transition, coupled with green initiatives, sustainability and few others like CBAM (Carbon Border Adjustment Mechanism) will be key influencers on future petrochemicals business.

HPCL aims to commission around 2.4 MMT integrated petrochemical project at Pachpadra, Barmer in Q2, 2025. What is the current status of the project? The construction of all process units of the ongoing 9 MMTPA integrated grassroot refinery cum petrochemical project at Barmer, Rajasthan (HRRL) is in progress. As on date, the total commitment made is Rs. 69,368 crore and a capital expenditure of Rs. 45,479 crore has been made as of 31st March, 2024. The key process units viz. Diesel Hydrotreating (DHDT) and Hydrogen Generation Unit (HGU) are under pre-commissioning. Mechanical completion of Cooling Tower 1, Raw Water

The integrated petrochemical project at Pachpadra, Barmer will produce 2.41 MMTPA petrochemicals products Treatment Plant, Compressed Air and Cryogenic Nitrogen Plant was achieved during January-March 2024. The physical progress for the other key process units CDU/VDU, DCU, PFCCU and VGO-HDT is more than 90% and progress in all other packages and units are being accelerated with average daily manpower deployment of 25,000 at the site.

Once completed, how is this going to contribute to HPCL's overall positioning in the Indian petrochemicals market? Can you please share the break-up of products such as HDPE, LLDPE, and PP from this complex?

This plant will produce 2.41 MMTPA petrochemicals products, out of which approximately one MMTPA PE and one MMTPA PP and the rest Benzene, Toluene and Butadiene. With these products, HPCL will be a formidable player in the petrochemicals industry in India.

Also, what will be the impact on HPCL's overall revenue/ performance of this petrochemical complex post its commissioning?

Post commissioning the petrochemicals complex, HPCL is expecting to have a significant jump in its financials.

HPCL already launched brand HP DuraPol in the pre-marketing

phase. How has the response been from the market? What is going to be the future marketing strategy?

HPCL launched its Polymer brand HP DuraPol last year. The response is good from the market. HPCL has an extremely good reputation in the fuel segment, with the HP DuraPol brand, the same will be further reinforced.

Innovation and technological advancements are key drivers in the petrochemicals industry. Could you provide some examples of how HPCL is embracing innovation for its product portfolio?

HP Green R&D Centre (HPGRDC) has enhanced its capabilities for pioneering innovation and research and now our R&D ecosystem comprises 20 cuttingedge R&D laboratories at HPGRDC, Bangalore. During the year, HPGRDC recorded the highest-ever yearly patent applications of 104 (both domestic and international) taking the total number of patent applications to 547. The year also witnessed highest-ever 51 patents (domestic & international) being granted to HPGRDC taking the total number of patents to 210 as of 31st March, 2024.

With the rising importance of the circular economy, what steps is HPCL taking to promote recycling and reduce the environmental impact of its petrochemical products?

HPCL started using 20% recycled material in its lube packaging which will cement our position in the circular economy.

What is the current refining capacity of HPCL?

Current capacity is 15.8 MMTPA on its own and 11.3 MMTPA as a JV at HMEL.

Once all ongoing refinery expansion projects are completed, what will be the capacity?



33.5 MMTPA on its own and 11.3 MMTPA as a JV at HMEL.

Apart from petrochemicals, HPCL is also diversifying into biofuels, CGD, hydrogen value chain and EV. What is the latest development on these fronts?

HPRGEL, our wholly owned subsidiary handling the renewable and green energy portfolio has commenced supplies of renewable energy from its newly commissioned 5 MW solar power project at Jhansi (Uttar Pradesh). The 6 MW solar project at Panipat (Haryana) has been mechanically completed and supplies are expected to commence shortly.

Enhancing the footprints in CGD business, HPCL won the bid for Sikkim Geographical Area (GA) in PNGRB 12th Bidding Round. Our joint venture HPOIL Gas Private Limited also bid successfully for Nagaland GA in this round. As of 31st March 2024, HPCL along with its joint ventures is setting up a CGD network in 25 Geographical Areas spread across 14 states. Towards enhancing EV charging stations, HPCL has signed an MoU with Tata Electric Mobility. This initiative is expected to leverage Tata's EV insights and HPCL's extensive fuel station network. Electric Vehicle (EV) charging facilities were commissioned at 1,201 retail outlets during January - March 2024 taking retail outlets with EV charging facility to 3,603 as of 31st March, 2024. Solar panels were installed at 5,688 retail outlets during January - March 2024 taking the total number of retail outlets with solar power to 17,618 as of 31st March, 2024. Now, 80% of HPCL retail outlet network is powered by renewable energy.

What are the key CSR initiatives planned by HPCL for FY 2024-25?

HPCL has always strived to be a model of excellence and a catalyst of transformation in all its endeavours be it business prosperity or its commitment to society. It has always believed in creating shared values and delivering happiness through its various initiatives that have touched millions of lives.

Few key CSR activities are Project ADAPT (providing inclusive education, state of art therapies and vocational training to special children and young adults in an enabling and inclusive environment to help them realize their potential), Project Agastya (to ignite and inculcate scientific spirit in the young minds by providing hands-on and practical science education among the new generation learners from less advantaged communities), Project Nanhi Kali (the main objective of the project is to achieve gender equality through guality education of girl children by supporting the education of girls belonging to less privileged primarily first-generation learners) and many more.

SETTING UP A 500 KTA PDH-PP PLANT AT USAR, MAHARASHTRA

GAIL has 15 per cent share of India's petrochemical market and the company seeks to increase it further

Overview of GAIL's petrochemical division, including its products, production capacity, and market presence? How important is the petrochemicals sector for GAIL?

GAIL's main petrochemical plant is located at Pata, Uttar Pradesh which has a production capacity of 810 KTA. It also has marketing rights for the products of Brahmaputra Cracker & Polymer Limited which has a capacity of 280 KTA. The Pata plant produced 7,81,508 MT polymer in FY 2023-24. The highest ever daily polymer production of 1,575 MT from



LLDPE-2 plant was achieved in January 2024.

GAIL is also setting up a 500 KTA PDH-PP plant at Usar, Maharashtra. A 60 KTA PP unit is coming up at Pata. It also



acquired the 1,250 KTA plant in Mangalore. All these indicate the importance of the petrochemical division for GAIL.

How has GAIL petrochemical division performed in FY 2023-24 and what is the expectation from FY 2024-25?

GAIL sold 1,036 KTA of polymers (787 KTA from Pata and 249 KTA from BCPL) last year. It is expected that both production and sales will increase this year.

How does GAIL's petrochemical division contribute to the overall growth and profitability of the company?

GAIL has 15 per cent share of India's petrochemical market and we seek to increase it further. Growth drivers coupled with capacity addition will result in growth in top line as well as bottom line for GAIL.

Can you provide an update on any recent or ongoing projects undertaken by GAIL's petrochemical division to expand its product portfolio or production capacity?

GAIL is investing over Rs 13,000 crore for the PDH-PP plant at Usar and 60 KTA PP unit is coming up at Pata GAIL is investing over Rs. 13,000 crore for the PDH-PP plant at Usar and 60 KTA PP unit is coming up at Pata. GAIL's production capacity will expand significantly when these plants come into production.

What are the key growth strategies or initiatives being implemented by GAIL's petrochemical division to stay competitive in the industry?

GAIL will focus on future demand drivers such as packaging industry, e-commerce driving packaging, automobile/construction Industry and agriculture industry to grow its business in the country. It will also seek to increase its overseas presence.

GAIL last year acquired JBF Petrochemicals Ltd. How is this going to contribute to GAIL's overall petrochemicals performance?

The acquisition of the plant, which has been renamed at GAIL Mangalore Petrochemicals Limited, will enable diversification of the company into PTA (raw material for PET & Polyester).

GAIL also signed a Rs. 63,000 crore deal to source petrochemical feedstock from BPCL. What is the deal all about?

The agreement with BPCL will secure availability of feedstock propane for the upcoming Usar plant for 15 years. GAIL will procure 600 KTPA of Propane from BPCL's LPG import facility at Uran.

What steps has GAIL's petrochemical division taken to ensure the safety and environmental sustainability of its operations?

GAIL has set a target to achieve Net-Zero (Scope 1 and Scope 2) status by 2040 while reducing Scope 1 and Scope 2 emissions by 100% and Scope 3 emissions by 35% (from the baseline year of 2020-2021) by 2040. GAIL has also



embarked upon the journey of adoption of Sustainable Factory GreenCo Rating. In last 3 years, seven GAIL sites have achieved GreenCo Rating at different levels, including Pata which has achieved Gold rating.

How does GAIL's petrochemical division adapt to changing market trends and customer preferences?

The petrochemical division holds regular customer meets and holds exhibitions to engage with its customers and gather their feedback to adapt to changing market conditions.

How GAIL's petrochemical division is adopting innovation and technology for driving the growth and success?

GAIL is adopting latest technology and diversifying into new polymer types to meet market requirements GAIL is adopting latest technology and diversifying into new polymer types to meet market requirements.

How does GAIL's petrochemical division contribute to the development of the local communities and promote corporate social responsibility?

GAIL undertakes various CSR initiatives in and around its production units to improve the lives of the local communities.

Can you discuss some of the major challenges faced by GAIL's petrochemical division in its operations?

One of the major challenges for the petrochemicals sector in India, including that of GAIL, is the country's low per capita polymer consumption which is just 14 kg as against the world average of 39 kg. However, we hope that with favourable policy and prices, this represents an opportunity and the polymer demand of India may grow upto 9 per cent per annum.

Energy Pioneering New Frontiers



FUELING THE FUTURE

Hydrogen and compressed bio-gas are poised to play a transformative role in India's journey towards a sustainable energy future **TEAM ICN**

n recent years, India has emerged as a global leader in renewable energy adoption, with ambitious targets set to reduce carbon emissions and combat climate change. The country is planning to achieve 500 GW of renewable energy capacity by 2030. As of March, 2024, the installed renewable energy capacity has reportedly reached 143.64 Gigawatt (GW) with the addition of 18 GW in FY23. As India embarks on this transformative journey, the spotlight is increasingly turning towards hydrogen and compressed gas to further bolster the nation's renewable energy portfolio.

Hydrogen, often touted as the fuel of the future, presents a compelling case for India's energy landscape. With abundant renewable resources such as solar and wind power, India possesses a significant advantage in producing green hydrogen through electrolysis. By leveraging electrolyzers powered by renewable energy, the country can generate hydrogen without carbon emissions, offering a clean alternative to fossil fuels. Moreover, hydrogen holds immense potential as a versatile energy carrier, capable of powering industries, transportation, and even serving as a storage medium for excess renewable energy. In keeping with the potential, India aims to produce 5 million metric tonnes of green hydrogen by 2030, with demand surging to 25 million metric tonnes by 2050 for transport, steel and ammonia production.

Compressed natural gas (CNG) is another renewable energy solution that has gained prominence in India's energy transition. As a cleaner and more sustainable alternative to conventional fuels, CNG offers significant environmental benefits, including reduced greenhouse gas emissions and air pollution. India's expanding network of CNG infrastructure, coupled with supportive government policies promoting its adoption in transportation, has led to a surge in demand for this eco-friendly fuel. The share of natural gas in energy basket is 6.7% presently in India. The Government has set a target to raise the share of natural gas in energy mix to 15% in 2030. Meanwhile, there has been 20% increase in natural gas production from 28.7 billion cubic meters (BCM) in 2020-21 to 34.45 BCM in 2022-23.

By reducing reliance on imported fossil fuels and promoting domestic production, India can enhance its energy resilience and mitigate risks associated with fluctuating global oil prices. Moreover, the widespread adoption of CNG vehicles presents an opportunity for job creation, local manufacturing, and economic development, particularly in rural areas. However, realizing the full potential of hydrogen and compressed gas in India's renewable energy transition requires concerted efforts from all stakeholders.

Emerging trends

Efforts are underway to develop hydrogen infrastructure, including production, storage, distribution, and refueling facilities. Pilot projects and demonstrations of hydrogen refueling stations for fuel cell vehicles are being conducted in select cities to showcase the feasibility and scalability of hydrogen as a transportation fuel. Investments in hydrogen

There has been 20% increase in natural gas production from 28.7 billion cubic meters (BCM) in 2020-21 to 34.45 BCM in 2022-23 storage technologies such as compressed hydrogen and liquid organic hydrogen carriers (LOHCs) are also increasing to address challenges related to storage and transportation.

Hydrogen is being explored for a wide range of applications across sectors such as transportation, industry, power generation, and heating. In addition to fuel cell vehicles, hydrogen is being used as a feedstock in industries such as steel, fertilizer, and chemical production to reduce carbon emissions and enhance process efficiency. Power-to-gas (P2G) projects are being developed to store excess renewable energy as hydrogen and inject it into the natural gas grid or use it for power generation during peak demand periods.

At the same time, the advantages of CNG extend beyond environmental considerations to economic and energy security aspects. It is considered a cleaner-burning alternative to gasoline or diesel, as it emits lower levels of carbon dioxide and air pollutants. It has lower cost as well as it is available in abundance. It offers similar performance to conventional fuels and has a well-established infrastructure for production, storage, and distribution.

Addressing key challenges

Despite the potential of hydrogen, cost competitiveness remains a key challenge for widespread adoption. Efforts are being made to reduce the cost of hydrogen production through technological innovation, economies of scale, and optimization of supply chains. Research initiatives aimed at developing low-cost electrolyzers, efficient hydrogen storage solutions, and advanced fuel cell technologies are underway to drive down costs and improve scalability.

As the hydrogen ecosystem expands,

there is a growing need for skilled professionals with expertise in hydrogen production, storage, utilization, and safety. Training programs, workshops, and academic courses focused on hydrogen technologies are being offered to build a talent pool capable of supporting the growth of the hydrogen industry in India. Collaboration between academia, industry, and government agencies is essential to develop a skilled workforce and foster innovation in the hydrogen sector.

The construction of CNG refueling stations is capital-intensive, limiting its accessibility in certain regions. The range of CNG-powered vehicles is generally lower than that of conventional vehicles, necessitating more frequent refueling. Moreover, although CNG emits fewer pollutants compared to gasoline or diesel, it is still a fossil fuel and contributes to carbon emissions.

Renewable fuels offer a sustainable energy future, but challenges such as infrastructure, cost, and technology must be overcome. Governments, businesses, and researchers must collaborate to create a favorable environment for alternative fuel adoption through supportive policies, partnerships, and integration with renewable energy. Consumer awareness and acceptance must also be enhanced.

Government support

India's commitment to hydrogen is

Indian hydrogen ecosystem is evolving rapidly

- Government-Led Initiatives
- Hydrogen Production from Renewable Sources
- Hydrogen Infrastructure Development
- Public Private Partnerships on R&D
- Focus on Cost Reduction and Scalability
- Skill Development and Capacity Building

evident through various initiatives, including the National Hydrogen Mission, aimed promoting research, development, and deployment of hydrogen technologies

across sectors such as transportation, industry, and power generation. The Union Cabinet approved the National Green Hydrogen Mission with a total initial outlay of Rs. 19,744 crore, including an outlay of Rs. 17,490 crore for the SIGHT programme, Rs. 1,466 crore for pilot projects, Rs. 400 crore for R&D and Rs. 388 crore towards other mission components. The

government's support through policy incentives, research funding, and publicprivate partnerships underscores its determination to integrate hydrogen into the energy mix effectively. Furthermore, collaborations with international partners and investment in R&D are vital steps towards fostering a robust hydrogen ecosystem in the country.

Government has also been investing in expanding CNG infrastructure to promote cleaner transportation fuels. With an emphasis on reducing vehicular emissions and dependence on imported fossil fuels, the government is incentivizing the adoption of CNG vehicles

and establishing refueling stations across urban centers and transportation corridors.

The Ministry of Petroleum & Natural Gas (MoPNG) is undertaking few initiatives with respect to the greater use of hydrogen in the

energy mix. The first pilot is based on Grey Hydrogen, where hydrogen is blended with compressed natural gas (CNG) to the extent of 18%, for use as transportation fuel at Rajghat Bus depot.

The Ministry has planned five more pilot projects based on green hydrogen. It has also created a Hydrogen Corpus Fund that participates in funding R&D projects which are led by the oil

industry. Among the projects currently being funded are for finding Multiple Pathways for production of hydrogen; H-CNG; and hydrogen production through decomposition



of natural gas. Academic institutions are involved in these projects to leverage their knowledge in frontier areas.

Way forward

Investments in infrastructure development, technology innovation, and skill enhancement are crucial to overcoming existing challenges and accelerating deployment. Additionally, regulatory frameworks must be adapted to facilitate the integration of these technologies into the existing energy ecosystem, ensuring seamless transition and scalability. Moreover, public awareness and stakeholder

> engagement play a pivotal role in driving acceptance and adoption of renewable energy solutions like hydrogen and compressed

gas. Educational campaigns highlighting the environmental benefits, cost savings, and long-term sustainability of these technologies can empower individuals and businesses to make informed choices, further catalyzing the transition towards a cleaner and greener future.

India stands at a critical juncture in its journey towards a sustainable energy future, with hydrogen and compressed gas poised to play a transformative role. By harnessing the power of these innovative technologies and leveraging its vast renewable resources, India can not only meet its energy needs but also emerge as a global leader in the fight against climate change. With strategic investments, policy support, and collaborative efforts, India can unlock the full potential of renewable energy, paving the way for a cleaner, greener, and more prosperous tomorrow.



SHAPING THE FUTURE OF INDIA'S HYDROGEN ECOSYSTEM

India's hydrogen ecosystem faces several challenges that need to be addressed for its widespread adoption and commercialization



As the world transitions towards a sustainable energy future, hydrogen is emerging as a key player in India's energy landscape. With ambitious goals of achieving net-zero emissions by 2070 or earlier, India is strategically positioning itself to leverage its vast renewable energy resources and foster a resilient hydrogen ecosystem. I like this article to provide an overview of some of the current development, emerging trends, and challenges in India's hydrogen ecosystem, while highlighting its critical role in achieving net-zero targets, fostering economic growth and driving regional energy transformation.

India's hydrogen ecosystem is witnessing significant momentum driven by a combination of government initiatives, private sector investments and technological advancements. The National Green Hydrogen Mission (NGHM) launched by the government aims to promote hydrogen production, storage, distribution and utilization across various sectors. Under the NGHM, several pilot projects and demonstration plants for green hydrogen production through electrolysis are underway, tapping into India's abundant renewable energy potential.

India is exploring other hydrogen production pathways such as blue hydrogen from natural gas with carbon capture and storage (CCS) and grey hydrogen from fossil fuels with carbon capture and utilization (CCU). These pathways are by many expected to play a transitional role until green hydrogen becomes cost-competitive

Decentralized hydrogen production and distribution models offer resilience against disruptions in centralized energy systems at scale.

Biomass, as a renewable energy source, plays a crucial role in the hydrogen ecosystem by serving as a feedstock for hydrogen production through biomass gasification and reforming processes. India's abundant agricultural residues, forestry waste and organic biomass offer ample opportunities for biomass-based hydrogen production. Bioenergy has gained particular importance and is poised to play a pivotal role in significantly contributing to the energy mix.

The transportation sector is emerging as a key driver of hydrogen demand in India, with a focus on fuel cell electric vehicles (FCEVs). Hydrogen fuel cell vehicles offer an attractive alternative to conventional internal combustion engines, providing zeroemission mobility with fast refuelling times and long driving ranges. The government's Faster Adoption and Manufacturing of Electric Vehicles (FAME) scheme includes provisions for promoting FCEVs and establishing hvdroaen refuellina infrastructure. Investments in hydrogen-powered vehicles and refuelling stations are accelerating, laying the groundwork for a hydrogen-based transportation ecosystem. As the demand for clean transportation solutions continues to rise, the manufacturing, distribution, and servicing of hydrogen fuel cell vehicles are expected to generate significant economic activity and employment opportunities.

Several emerging trends are shaping the future of India's hydrogen ecosystem. One trend is the increasing collaboration between public and private stakeholders to drive innovation, scale up deployment and address key challenges in the hydrogen



value chain.

Government agencies, research industry institutions. players and international partners are coming together to foster technological advancements and policy support. Greenstat Hydrogen India has together with key partners dedicated significant efforts to establish several Centers of Excellence in Hydrogen and Process Safety (COH-H). These centers aim to share and foster technological advancements, expertise and experience gained from pilot and R&D projects. In the face of the global climate challenge, it becomes imperative to seek and implement solutions on a global scale, necessitating collaboration among nations, organizations and individuals worldwide.

This challenge transcends borders and affects every corner of the planet, underscoring the need for collective action and cooperation. I believe that by coming together and pooling our resources, expertise, and innovative ideas, we can develop comprehensive strategies to mitigate the impacts of climate change and much faster speed up the transition to an Hydrogen Ecosystem.

Another mega trend is the focus on decentralized hydrogen production and distribution models. Small-scale electrolyzers and hydrogen refuelling stations are being deployed in remote and off-grid areas, enabling access to clean energy solutions and promoting energy selfsufficiency. These decentralized models hold the promise of expanding access to clean energy solutions in areas where traditional energy infrastructure may be lacking or unreliable. By generating hydrogen locally through electrolysis, communities can reduce dependence on centralized energy sources and mitigate the risks and cost associated with long-distance transportation of hydrogen.

Decentralized hydrogen production and distribution models offer resilience against disruptions in centralized energy systems, such as power outages or supply

One trend is the increasing collaboration between public and private stakeholders to drive innovation, scale up deployment and address key challenges in the hydrogen value chain chain disruptions. By diversifying energy sources and increasing local production capacity, communities can enhance their energy security and autonomy. These models contribute to sustainability goals by facilitating the integration of renewable energy sources, such as solar and wind, into the hydrogen production process.

Decentralized hydrogen production and distribution represents a promising avenue for expanding access to clean energy, promoting energy self-sufficiency, and advancing sustainability objectives. As technology continues to evolve and costs decrease, decentralized models are expected to play an increasingly significant role in the GH2 landscape, driving innovation and enabling widespread adoption of hydrogen as a clean energy solution.

Despite the promising developments, India's hydrogen ecosystem faces several challenges that need to be addressed for its widespread adoption and commercialization. One challenge is the high cost of green hydrogen production compared to conventional hydrogen pathways. Achieving cost parity with fossil fuels requires technological advancements, economies of scale, and supportive policies and incentives.

Infrastructure development is another challenge, particularly the establishment

of hydrogen refuelling stations and transportation networks. The limited availability of refuelling infrastructure poses a barrier to the widespread adoption of hydrogen-powered vehicles and other applications.

The hydrogen ecosystem holds the key to achieving India's net-zero emissions targets by 2070 or earlier. By transitioning to green hydrogen and decarbonizing key sectors such as transportation, industry, and power generation, India can significantly reduce its carbon footprint and contribute to global efforts to mitigate climate change.

The development of the hydrogen economy presents immense opportunities for economic growth and job creation. Investments in hydrogen infrastructure, manufacturing, and R&D will create new employment opportunities and stimulate economic activity across various sectors. Additionally, India's position as a hub for renewable energy resources provides a competitive advantage in the global hydrogen market, attracting investments and driving innovation. Moreover, the development of hydrogen infrastructure, including production facilities, storage solutions, and distribution networks, will require substantial investment and skilled labor, leading to job creation in construction, engineering, and maintenance services. The deployment of hydrogen technologies

The transportation sector is emerging as a key driver of hydrogen demand in India

in various sectors will also stimulate research and development activities, driving innovation and creating high-skilled employment opportunities in the fields of science, engineering, and technology.

India's leadership in the hydrogen ecosystem can also catalyze regional energy transformation in South Asia. By sharing expertise, technology, and best practices, India can collaborate with neighboring countries to develop regional hydrogen markets, infrastructure, and supply chains. Initiatives such as the International Solar Alliance (ISA) and the Hydrogen Initiative under the Coalition for Disaster Resilient Infrastructure (CDRI) provide platforms for collaboration and knowledge exchange, positioning India as a driving force for regional energy transformation.

To summarize, India's hydrogen ecosystem is poised for growth and transformation, driven by a strong leadership and its commitment to sustainability, technological innovation and economic development. By overcoming challenges, fostering strong international collaboration. and leveraging its renewable energy resources, India can emerge as a key global leader in the hydrogen economy. The transition to a hydrogen-based energy system will not only enable India to achieve its net-zero targets but also stimulate economic growth, create new jobs and drive regional energy transformation, positioning India as a key player in shaping the future of energy.





PETROCHEMSUMMIT 2 0 2 4

Identifying New Opportunities for Value Creation

13 December 2024 | The Park | New Delhi

SECOND EDITION ——

For Speaker and Partnership Opportunities:

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V.O. CHIDAMBARANAR PORT'S GREEN HYDROGEN INITIATIVES

VOC Port has already initiated a proposal to establish a 5 MLD desalination plant



South Eastern coast, V.O. Chidambaranar Port Authority, Tuticorin, an autonomous entity under the Ministry of Ports, Shipping & Waterways (MOPSW), Government of India, stands as one of the nation's most rapidly burgeoning major ports. The Port has handled a record traffic of 41.40 million tonnes during the last financial year.

In a resolute endeavour to bolster renewable energy adoption, the Ministry for Ports, Shipping, and Waterways is steadfastly propelling major ports of India towards a 60% share of renewable energy in total power consumption, targeting a commendable reduction in carbon emissions by 2030.

Green hydrogen is produced by the process of electrolysis where water is split into hydrogen and oxygen using electricity generated from renewable sources like solar, wind, or hydropower. This process results in a clean and emission-free fuel that has immense potential to replace fossil fuels and reduce carbon emissions.

In a bid to catalyze India's prominence in the global green hydrogen arena, the Ministry of Shipping and Ports has identified three major ports viz., Kandla, Paradip, and V.O. Chidambaranar Port, as nodal ports for developing hydrogen hubs, capable of handling, storage, and production of green hydrogen.

The Ministry of New & Renewable Energy (MNRE), has also recognized V.O. Chidambaranar Port, as the nodal port in the East Coast of India for green hydrogen projects. This strategic initiative aligns with the objectives outlined in the National Green Hydrogen Mission, which seeks to

Green hydrogen can serve as a clean fuel for port crafts, including tugboats, ferries and other maritime vehicles harness hydrogen's potential in various industrial sectors.

Endowed with a prime location along international maritime routes and bolstered by seamless connectivity to hinterland industries via robust road and rail networks, V.O. Chidambaranar Port emerges as an ideal enclave for the production, storage, and distribution of green hydrogen, ammonia, and methanol.

The biggest challenge in becoming a green hydrogen hub is the availability of water. To overcome this, VOC Port has already initiated a proposal to establish a 5 MLD desalination plant, with several firms expressing keen interest in setting up the facilities within the port area. The renewable power required for manufacturing of green hydrogen shall be arranged by the concerned agency through the National grid.

Green hydrogen can serve as a clean fuel for port crafts, including tugboats, ferries, and other maritime vehicles. Hydrogen fuel cells can power cargo handling equipment such as forklifts, cranes and trucks within the port, reducing emission. Hydrogen fuel cells can provide reliable backup power for critical port infrastructure, ensuring uninterrupted operations.

Moreover, an indigenously developed hydrogen fuel cell ferry built by Cochin Shipyard Limited was launched by our Hon'ble Prime Minister at VOC Port, Tuticorin on February 28, 2024. This zero-emission, zero-noise vessel is a revolutionary step towards India becoming a hydrogen fuel vessel manufacturer.

The Shipping Corporation of India (SCI) also has plans to convert its existing two ships to run on green hydrogen and it has been targeted to convert at least 50



V.O. Chidambaranar Port has embarked on a mission to set up a green hydrogen pilot plant in the port area per cent of all tugs of the major ports in India into green tugs by 2030. Green hydrogen can also replace fossil fuels in refining, fertilizer production, iron and steel manufacturing, chemical production.

Embracing the ethos of Viksit Bharat, V.O. Chidambaranar Port has embarked on a mission to set up a green hydrogen pilot plant in the port area. The renewable energy required to produce green hydrogen shall be made available from the port's existing 5 MW solar power plant/2 MW wind turbine generator. To execute the project, a proposal seeking budgetary offer is being invited from the prospective firms. The above initiative is being undertaken

> to instil investor confidence in executing the green hydrogen plant in the port area.

For development of green hydrogen and its derivatives in the port lands, MoU's have been exchanged with ACME, NTPC Green Energy Limited, ReNew Power, EG Solwin Hybrid Private Limited and Green Infra Renewable Energy Farms Private Limited.

With а steadfast commitment to sustainability V.O. and innovation, Chidambaranar Port is emerging as a pioneer in India's quest for green hydrogen. Through strategic partnerships, pioneering initiatives, and a proactive approach, the port is poised to redefine the maritime landscape, heralding a new era of clean energy prosperity.



HYDROGEN: MAKING INDIA SELF RELIANT

India is investing in large-scale green hydrogen projects and forming strategic partnerships with global leaders in hydrogen technology



ndia's journey towards energy self-reliance is being significantly bolstered by the potential of hydrogen as a sustainable energy source. The hydrogen market outlook is promising, with key insights from industry experts and strategic national missions setting the stage for a transformative energy landscape.

Hydrogen market outlook

The global hydrogen market is experiencing a dynamic shift, primarily driven by advancements in green hydrogen technology and supportive policy frameworks. According to BloombergNEF, the levelized cost of hydrogen (LCOH2) has seen a slight increase due to inflation and higher financing costs. However, green hydrogen is expected to become competitive with grey hydrogen (produced from natural gas) in several key markets by 2030. This competitiveness is attributed to technological advancements and economies of scale, which are projected to reduce the cost of green hydrogen production significantly.

Green hydrogen, produced through the electrolysis of water using renewable energy, is set to undercut grey hydrogen as early as the end of this decade in major economies such as Brazil, China, India, Spain, and Sweden. This shift is crucial for decarbonizing industries and achieving net-zero targets, especially for a country like India, which has a large industrial base dependent on fossil fuels.

IndianOil is working on the tri-reforming concept of producing hydrogen using the methane and CO2 along with steam

National Green Hydrogen Mission

India's National Green Hydrogen Mission is a strategic initiative aimed at positioning the country as a global hub for green hydrogen production and export. Launched by the Indian government, this mission underscores the country's commitment to reducing its carbon footprint and achieving energy independence. The mission includes various policy measures and financial incentives to promote the adoption of green hydrogen across different sectors, including transportation, industry, and energy storage. Key components of the mission involve the establishment of green hydrogen production facilities, the development of a robust hydrogen infrastructure, and fostering research and development in hydrogen technologies. The government has outlined specific targets to produce and utilize green hydrogen, which will play a crucial role in reducing greenhouse gas emissions and enhancing energy security.

The initial outlay for the Mission will be Rs. 19,744 crore, including an outlay of Rs. 17,490 crore for the SIGHT programme, Rs. 1,466 crore for pilot projects, Rs. 400 crore for R&D, and Rs. 388 crore towards other Mission components.

Green hydrogen targets

India has set ambitious targets for green hydrogen production to meet its energy and climate goals. The government aims to produce 5 million metric tonnes of green hydrogen annually by 2030. This



Inauguration of hydrogen Fuel Cell buses at India Gate, New Delhi

target is supported by the development of renewable energy capacity, with a focus on solar and wind power, which are critical for producing green hydrogen.

To achieve these targets, India is investing in large-scale green hydrogen projects and forming strategic partnerships with global leaders in hydrogen technology. Additionally, the government is providing financial incentives such as subsidies, tax breaks, and grants to encourage private sector investment in green hydrogen infrastructure. These measures are expected to drive down the cost of green hydrogen production and make it more competitive with traditional fossil fuels.

Indian Oil's green hydrogen initiative

IndianOil is the leading petroleum refining company of India with 11 of the 23 operating refineries. IndianOil refineries are the largest producer of hydrogen for the captive use. IndianOil R&D is pioneering the hydrogen research program amongst the oil & gas sector in the country for the past 2 decades.

Expanding its presence beyond the boundaries of conventional fuels, IndianOil R&D has state-of-the-art research facilities covering the panorama of hydrogen production, storage and fuel cells, together aimed towards qualifying the triple test of efficiency, durability and economics. Moving ahead by building strong foundations with both industry and academia (national & international), IndianOil R&D is set to traverse towards scale-up, demonstration and commercial deployment of innovative hydrogen energy solutions for portable, stationary, off-road and mobility applications.

Hydrogen production & storage

Considering natural gas one of the key enablers to the hydrogen economy, IndianOil R&D is developing novel carbon capture technologies from various pathways including chemical,

electrochemical, bio-chemical and electro-bio-chemical routes to convert brown hydrogen into grey hydrogen.

To overcome the barriers hydrogen transportation, of IndianOil is proposing a distributed hydrogen generation approach by developing aqueous phase methanol reforming solutions in conjunction with leading engineering company of the country and ably guided by the one of the best engineering institution. For addressing the CO2 menace, IndianOil is working on the trireforming concept of producing hydrogen using the methane and CO2 along with steam.

Realizing the importance of



Hydrogen Fuel Cell car being refueled at IOCL R&D Centre



CBG Reforming based hydrogen production and refueling plant being commissioned at IOCL R&D Centre

integrating the agrarian philosophy of the country with the need to develop clean renewable energy technologies, IndianOil is working with the leading institute for scaling up the biomass gasification technology aiming towards higher yields and efficiency of conversion.

Indian Oil R&D is also focusing research activities in hydrogen production by gasification technique through a variety of feedstock such as coal, biomass, petroleum coke, petroleum residue etc. In this direction experimental facilities have been set up at IndianOil R&D.

Realizing the importance of hydrogen storage, IndianOil R&D is following a multi-pronged approach to develop customized solutions for the Indian market. The development of Type III hydrogen storage cylinder with one of the leading engineering institutes in the country in going to offer significant opportunities to develop low cost indigenous hydrogen storage solutions in India. Further, IndianOil R&D is actively developing solutions for hydrogen storage through Metal Organic Frameworks for enhancing the storage capacities at room temperatures through innovative material science interventions.

Fuel cells

State-of-the-art research facilities have been setup at IndianOil R&D to undertake the R&D activities on both Polymer Electrolyte Membrane Fuel Cells (PEMFCs) and Solid Oxide Fuel Cells (SOFCs). With capabilities of developing low cost innovative materials to computational dynamics, stack development and engineering, IndianOil R&D is one of the leading labs in the country with capabilities of evaluating upto10 kW PEM fuel cells. Having commissioned India's 1st fuel cell forklift last year (2019). IndianOil is running various collaborative programs with leading fuel cell institutes and technology developers for developing inhouse solutions for various applications. With a vision of making affordable hydrogen based solutions, Indian Oil R&D is working towards harnessing refinery arade hydrogen for fuel cell application through fundamental research in impurity tolerant anode catalysts and high performance durable cathode catalyst. To develop solutions for low power stationary and automotive application, air cooled fuel cell test facility is also being set-up in the campus. The centre has also launched India's first hydrogen powered fuel cell bicycle. IndianOil R&D has also set-up state of art test facility to develop indigenous low cost catalysts for SOFC and SOEC.

Electrolyser

IndianOil R&D is also working towards development of PEM and AEM-based electrolysers in-line with Hon'ble Prime Minister's vision of making India a hub of green hydrogen export. With cutting

IndianOil R&D to undertake the R&D activities on both Polymer Electrolyte Membrane Fuel Cells (PEMFCs) and Solid Oxide Fuel Cells (SOFCs) edge research facilities to evaluate the performance of in-house catalysts and cells, IndianOil is taking giant leaps in both the fundamental and engineering innovations for durable and low cost green hydrogen generation.

IndianOil R&D is also working towards transformation of conventional thermochemical processes for CO2 capture, NH3 synthesis, CO2 to valuable products etc. to a more efficient and greener electrochemical route.

Innovating mobility: The power of fuel cells

Fuel cell technology is emerging as one of the important spokes in the e-mobility paradigm. Hydrogen can be used as a fuel for Fuel Cells. The electrochemical reaction converts fuel (hydrogen) at anode and oxygen from the air at cathode to water and liberate electrical energy in the form of electrons. Fuel cells are highly efficient as compared to other mobility options. Fuel cells vehicles have inherent advantages of long range and lower refueling time as compared to battery vehicles. Hydrogen gas is compressed and stored onboard in cylinders, typically at a pressure of 350 bar.

IndianOil has initiated a scientifically program to undertake designed operational trials of 15 Fuel Cell buses powered by Green hydrogen on the identified routes in Delhi, Haryana and U.P. Under this program, first set of fuel cell buses were launched from India Gate. This project is the first ever initiative in India to dispense green hydrogen at 350 bar to operate fuel cell buses. IndianOil has also established a state-of-the-art dispensing facility at our R&D Faridabad campus that can refuel green hydrogen produced from electrolysis using solar PV panels. A cumulative mileage of more than 3 lakh kilometers will be covered across all buses for long term assessment of performance and durability of this new technology. The data thus generated through these rigorous trials will act as a national repository that will shape the future of zero emission mobility in the country powered by green hydrogen.
POWERING INDIA'S GREENER FUTURE

The role of bioenergy emerges as a pivotal force in reshaping the nation's energy landscape **TEAM ICN**

n the face of climate change and dwindling fossil fuel reserves globally, the transition towards renewable energy has never been more pressing. In keeping with the future energy needs of its exploding population, Indian policymakers have been preparing a bioenergy blueprint that not only holds the key to sustainability but also addresses environmental concerns and promote rural development.

By diversifying the sources of energy, India can reduce its reliance on finite resources while simultaneously revitalizing rural economies through increased agricultural productivity and job creation. The bioenergy landscape in India encompasses a

diverse array of technologies and feedstocks, ranging from biomass power generation to biogas production. Biomass power plants, fueled by agricultural residues, forest biomass, and energy crops, play a crucial role

in decentralized electricity generation, particularly in rural areas where access to grid power is limited. Simultaneously, the proliferation of biogas plants, utilizing organic waste and agricultural by-products, not only provides clean cooking fuel but also addresses waste management challenges, thereby fostering sustainable development at the grassroots level.

As per International Energy Agency (IEA) estimates, bioenergy may produce 130 million tonnes of oil equivalent (Mtoe) of useful energy by 2040, or about 15% of India's total energy demand at that time. Statista predicts electricity generation in bioenergy market to amount to 38.76 bn KWh in 2024.

Bioenergy: A viable alternative?

The available biomass in India currently stands at 750 million metric tonnes (MMT)/ year with surplus biomass availability of 230 MMT/year. With a large surplus of biomass and other waste available in the country, energy recovery from these resources is a viable solution. The bioenergy projects have been instrumental in promoting rural development and providing additional income sources for farmers. As of August 2022, based on the total installed capacity of bioenergy projects in India, an estimated 0.43 million direct jobs and 0.66 million indirect jobs had been created in the economy. Of

> these, approximately 0.25 million iobs across the value chain of bioenergy projects are for women.

> Bioenergy offers plethora а environmental,

economic, and social benefits. One of the most compelling aspects lies in its potential to mitigate greenhouse gas emissions. Unlike fossil fuels, which release carbon dioxide sequestered deep within the earth's crust, bioenergy sources such as biomass and biofuels harness carbon that is already circulating in the atmosphere through the process of photosynthesis. This carbonneutral cycle ensures that the net carbon

of

Bioenergy production has the added advantage of utilizing a variety of feedstocks

emissions from bioenergy are substantially lower than those from fossil fuels, making it a crucial component of any strategy aimed at curbing climate change. Bioenergy can be derived from various sources such as agricultural residues, organic waste, energy crops and forest residues. Biomass power generation, biogas production from organic waste, and biofuel production from crops like sugarcane, jatropha and non-edible oils have been key focus areas. Moreover, bioenergy production has the added advantage of utilizing a variety of feedstocks, ranging from dedicated energy crops like switchgrass and miscanthus to agricultural residues such as corn stover and wheat straw.

Furthermore, bioenergy has the potential to address pressing waste management challenges by converting organic waste streams into valuable energy sources. Municipal solid waste, forestry residues and animal manure can all be transformed into biogas through anaerobic digestion, providing a renewable alternative to traditional landfill disposal methods while simultaneously generating clean energy.

Overcoming challenges

The widespread adoption of bioenergy is not without its challenges. The availability and sustainable management of feedstocks remain a key concern, with competition between food and fuel crops necessitating careful land-use planning and agricultural Moreover, the scalability practices. cost-effectiveness of bioenergy and technologies require continuous innovation and investment to realize their full potential. In navigating these challenges, collaboration between government, industry and research



Key challenges

- State policies focus on biomass in power generation
- Inadequate feedstock supply (fuel reliability and quality)
- Lack of public data on biomass availability across geographies
- Limited storage options
- Supply chain bottlenecks
- Limited offtake of biofertilisers

institutions becomes imperative. Policy support in the form of incentives, subsidies and regulatory frameworks is essential to incentivize investment in bioenergy projects and create an enabling environment for technology deployment.

To ensure the sustainability of bioenergy production, it is essential to implement robust regulatory frameworks that promote responsible land use, biodiversity conservation, and social equity. Furthermore, technological advancements in bioenergy conversion processes are essential to improving efficiency and reducing costs. Research into advanced biofuels such as cellulosic ethanol and bio hydrogen holds promise for unlocking the full potential of bioenergy while minimizing its environmental footprint.

Policy push

India has been actively pursuing bioenergy as a part of its strategy to meet its energy needs sustainably. Embarking on an ambitious energy transition journey, the country has set a target of fifty percent cumulative electric power installed electricity capacity from non-fossil fuel-based energy resources by 2030 and achieving net zero by 2070. At the forefront of country's efforts has been the push towards biofuel production and adoption. With an ambitious target to achieve 20% ethanol blending in petrol and 5% biodiesel blending in diesel by 2030, the government's National Biofuels Policy has set the stage for a significant transformation in the transportation sector. The promotion of biofuels not only reduces the nation's reliance on imported fossil fuels but also mitigates greenhouse gas emissions, contributing to India's commitments to combat climate change.

The Indian government has been implementing various initiatives to promote bioenergy, including financial incentives, subsidies, and research and development programs. Schemes such as the Pradhan Mantri Kisan Urja Suraksha evam Utthaan Mahabhiyan (PM KUSUM) have been launched to support the installation of solar pumps, grid-connected solar power plants, and biomass-based power plants.

There are benefits to the private sector, as well, in the form of opportunities to decarbonize their industries. Other benefits include savings on fertilizer subsidies and a reduction in waste management costs. Upto 2022, over 800 biomass power projects, bagasse cogeneration and non-bagasse cogeneration projects have been installed with an aggregated capacity of 10,632 MW for power generation and 140 TPD for compressed biogas (CBG) production. Ministry of New and Renewable Energy (MNRE) has notified the National Bioenergy Programme for a period April, 2021 to March, 2026 with an outlay of Rs. 858 crore under Phase-I. It comprise the sub-schemes such as Waste to Energy Programme, Biomass Programme; and Biogas Programme.

Concerted efforts

Looking ahead, the trajectory of India's bioenergy sector in 2024 and beyond hinges on concerted efforts to harness its vast potential while addressing existing bottlenecks. Realizing the full potential of bioenergy will require concerted efforts from policymakers, industry stakeholders, and the research community to overcome existing barriers and unlock its myriad benefits. The increase in private sector investment would prove vital for the sector to achieve the targeted growth. This would require developing strong supply chains,

> which can ensure viable longterm biomass sourcing for power plants and private sector use.

> Bioenergy represents a cornerstone of the transition towards a sustainable, low-carbon future. By leveraging it as a sustainable and inclusive energy source, India can not only meet its growing energy demands but also chart a course towards a cleaner, greener, and more resilient future for all its citizens. With determination and innovation, bioenergy can propel us towards a greener, more sustainable world for generations to come. ■



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