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Indian CHEMICAL News

March 2021

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Editor's Message

India has the potential to achieve its target of US $ 5 trillion economy by 2025 and the chemical industry will contribute around US $ 300 billion with the right combination of domestic and export tailwinds according to ICC and Boston Consulting Group (BCG) whitepaper "Making India A Global Chemicals Powerhouse: Vision for the 2020s".

With the Indian chemical industry doubling in the next five years, there was a need for an annual chemical industry compendium or handbook which focuses on the yearly progress of the Indian chemical industry. The handbook measures how different sub-segments within the chemical industry has performed and how close are we to reach the magical figure of US $ 300 billion.

Indian Chemical News (ICN) has taken the lead and has launched an annual handbook called **"Chemical Industry Outlook"**, a compendium in exploring new horizons of growth to give industry CXOs a 360-degree view about global trends, India trends, the market size for different segments, and industry outlook so that they are aware of the opportunities and the potential that is in store to position themselves to compete in the global market.

For reaching US $ 300 billion number, the Indian chemical industry needs to accelerate its production capacity, increase its focus and budget on R&D, needs financial support from the government, faster environment clearances from the ministry and collaborate with foreign counterparts. The close bonding with the government, research & academic institutions, and chemical industries will also act as a catalyst and provide momentum to the India growth story.

The **"Chemical Industry Outlook 2021"** covers four verticals - Chemicals, Petrochemicals, Pharmaceuticals, and Digitisation. Each vertical has three sub-segments – Overview, Column, and Interview. The overview provides key recommendations for each sector. The compendium also has guest columns from senior industry experts from diverse background to give us a holistic view. The guest columns have been taken from select industry leaders in the industry, academia, industry associations, R&D Organizations and others to give it a 360-degree view. The CXO interviews give an update on what is happening in the respective industries and how they have positioned themselves to tap the opportunities.

The compendium also has a section called InFocus which throws light on emerging trends in chemicals, petrochemicals, and pharmaceuticals. The topics covered are Green Chemistry, Sustainability, Responsible Care, Start-Ups, Hydrogen, and Gas.

The compendium focuses on innovation, better supply chain management, increasing domestic demand, enhancing global competitiveness, green technologies, leveraging exports, disaster management, and others. All these topics will make India globally competitive in the long run if we proceed collaboratively with the right intent.

The compendium will be released during **India Chem 2021**, the largest event of the chemicals and petrochemicals industry to be held from March 17-19, 2021. Indian Chemical News is the official media partner for the 11th Biennial International Exhibition & Conference which is being jointly organized by the Department of Chemicals and Petrochemicals, Government of India and FICCI. India Chem 2021 is being organised in a hybrid model where the conference will be physically conducted at Hotel Taj Palace, New Delhi and the exhibition will be conducted on FICCI Bike Platform virtually.

We hope that the compendium will offer a ring-side view of the Chemical Industry and we will be happy to hear from you.

Pravin Prashant
Editor
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MESSAGE

I am happy to learn that Sindhu Media Private Limited through Indian Chemical News (www.indianchemicalnews.com) is bringing out a compendium titled 'Chemical Industry Outlook 2021' during India Chem 2021 - 11th Biennial International Exhibition & Conference. The event is scheduled to be held from 17-19 March 2021 at Hotel Taj Palace, New Delhi.

The Indian chemical industry is at the threshold of rapid growth and Government of India is keen to provide an atmosphere of support and encouragement under "Make in India" initiative to leverage the existing potential and opportunities.

Indian Chemical News (ICN) is a credible information platform for Chemical, Petrochemical and Pharmaceutical industry, is trying to contribute to the growth of the Indian chemical industry by creating awareness about Ministry of Chemical and Fertilizers, Govt of India's initiative of making these industry segments Aatm Nirbhar. The Compendium is a collection of interviews and opinions dedicated to help specialist markets and industry communities exchange ideas and innovations in the field.

I am hopeful that the Compendium will highlight the emerging opportunities for all stakeholders of the industry.

I wish 'Chemical Industry Outlook 2021' all success.

(Amitabh Kant)

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Centre for High Technology
(Ministry of Petroleum & Natural Gas), Govt. of India

FOREWORD

I am happy to learn that Sindhu Media Private Limited through Indian Chemical News (www.indianchemicalnews.com) is bringing out a compendium titled 'Chemical Industry Outlook 2021' during India Chem 2021 - 11th Biennial International Exhibition & Conference. The event is schedule to be held from 17-19 March 2021 at Hotel Taj Palace, New Delhi.

The Indian petrochemical and energy sectors is at the threshold of rapid growth and Government of India is keen to provide an atmosphere of support and encouragement under "Make in India" initiative to leverage the existing potential and opportunities.

Indian Chemical News (ICN) is a credible information platform for Chemical, Petrochemical and Pharmaceutical industry, is trying to contribute to the growth of the Indian chemical industry by creating awareness about Ministry of Petroleum and Natural Gas, Govt of India's initiative of making these industry segments Aatmanirbhar.

The Compendium is a collection of interviews and opinions dedicated to help specialist markets and industry communities exchange ideas and innovations in the field.

The Ministry of Petroleum and Natural Gas, Govt of India has been focusing on promoting the growth of the Indian chemical, petrochemical and energy industry through various policy initiatives and I believe the Compendium will contribute to the efforts of the Government in creating awareness about the industry.

I am hopeful that the Compendium will highlight the emerging opportunities for all stakeholders of the industry.

I wish 'Chemical Industry Outlook 2021' all success.

Regards

12/03/2021

K.K.Jain

Executive director

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Foreword for Chemical Industry Outlook 2021

Asitava Sen

COVID-19 has been an unprecedented global crisis. The various steps taken by government during this pandemic time to address the agriculture sector have given the economy the much needed recovery and momentum. Covid-19, while challenging the agricultural industry, have provided stakeholders an opportunity to experiment, test, learn and implement innovative ideas.

Honorable Prime Minister of India has initiated new age agriculture market reforms, and emphasized on modernizing agriculture and adoption of new technological innovations in achieving the goal of doubling farmers' income.

Agrochemical sector plays a key role in doubling farmers' income and livelihood and ensuring food security. In India, crop yield losses range between 15 % - 20 % on account of weeds, pests, diseases and rodents. During the pandemic we have seen that the role of pesticides is not only limited to crop protection but also plays a significant role in improving public health and hygiene.

The changing pest and cropping patters as well as the impact of climate change do need **newer and better pesticide products.** India is the 4th largest producer of agrochemicals in the world after USA, Japan and China. Looking at the potential of the sector the Government of India has declared the Agrochemical sector **as one of the 12 Champion Sectors**, where India can be a critical player in the global supply-chain. Due to the unprecedented crisis of COVID-19, many countries are in the process of exploring to **diversify and de-risk their production bases and supply chains**, India has a distinct opportunity to make the best of this shift. However, if we have to become a global hub for supplies, **Indian regulatory processes must comply with the global regulatory ecosystem.**

Pesticide Management Bill 2020 (PMB) is a great opportunity to holistically address emerging needs of Indian agriculture through an enabling regulatory environment, incorporating the learning of ~50 years from the Insecticide Act, 1968 (implemented in 1972). Before the Bill becomes an Act, it is essential to examine whether the proposed Bill does address these critical issues and learning in a comprehensive manner. There are many provisions in the Bill which would need comprehensive consultation with various stakeholders. It is therefore requested that in the interest of Indian agriculture and farming community, the Bill should be referred to a Select Committee of Parliament for detailed consultation with concerned stakeholders.

CropLife INDIA
Representing the Plant Science Industry

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Use of Drones is one area which the government wants to focus on. In Asia, smallholder farmers are leading in the adoption of spray drone technology (UAV), with benefits of improved productivity (yield, efficiency), better crop access, and reduced operator exposure. India can be among first Tier of UAV adopters though facilitative regulatory and policy framework.

It is immensely pleasing to note that Indian Chemical News shall be releasing its maiden industry compendium titled "Chemical Industry Outlook 2021: Exploring New Horizons of Growth" during India Chem 2021 March 17-19, 2021, which is an event organized by FICCI and Department of Chemicals and Petrochemicals, Government of India.

Please accept my heartfelt wishes on this momentous occasion.

Asitava Sen
Chief Executive Officer
CropLife India

AGRO CHEM FEDERATION OF INDIA

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FOREWORD

ACFI would like to congratulate the Indian Chemical News (ICN) for regularly providing the Sector Overview on Chemical / Agro-chemical, Petrochemical, Gas, Green Energy, Hydrogen and Pharmaceuticals Etc. We heartily appreciate their efforts, focus and vision in this regard.

It's well known to all of us that, during the past decade, there has been a tremendous growth in the Indian Agro chemical Sector. Indian companies have progressed from the manufacturing of Agro chemicals to the point where they are producing more innovative Agro-chemical products which are helping the Indian Farmers to increase their farm yield. Side by side there's tremendous export volume has been recorded too.

Agro Chem Federation of India (ACFI) is committed towards promoting the safe & judicious use of Agro-chemicals and promotion of new technologies & products which are eco-friendly and provide the farmer greater crop protection solutions. We seek to achieve Sustainability in Agriculture for the benefit of the overall agri sector of India. Our main objective is to provide quality agri inputs to the farming community at affordable prices. There's a great synergy between ACFI and ICN's activities in the direction of Policy awareness and Interventions to strengthen the Agro Chem Industries.

Let's reiterate with pleasure once again that, ICN is plaguing the vital issues of the Indian Chemical sector. We wholeheartedly support ICN (Indian Chemical News) and wish them Good Luck in all their present & future endeavours.

Dr. Kalyan Goswami
Director General
Agro Chem Federation of India

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STRUCTURAL GROWTH TO RESUME

Resurgence in automotive and consumer segments should drive demand improvements in specialized polymers, polymer additives, rubber chemicals, and pigments

SWARNABHA MUKHERJEE
PRINCIPAL ANALYST – WEALTH MANAGEMENT RESEARCH, EDELWEISS BROKING LIMITED

The year 2020 was turbulent for the whole world – the sudden onslaught of the COVID-19 pandemic grounded economies with the emergence of countless challenges and miseries. As the pandemic ravaged the country and the world, Indian chemical manufacturers too felt the heat and were impacted in various ways, depending on how global and domestic demand in their end-user industries shaped up.

However, as economies opened up along with a resurgence in international trade, and more importantly, demand surging to higher-than-expected levels, the recovery witnessed in certain segments of the Indian chemical industry was nothing short of spectacular (as restrictions started to ease).

For manufacturers of products in the pharmaceutical, agrochemical, care chemicals, food additives and packaging value chains, the impact of the pandemic was mostly transient as demand was strong. These segments were largely unaffected due to: China+1 trend and focus on import substitution owing to supply chain de-risking strategies; the Indian government's focus on domestic self-

"We expect the industry to resume the structural growth trend with the speciality chemicals segment clocking early mid-teens growth"

sustainability; and demand bounce-back in key sectors.

In 2021, we expect heightened momentum in other segments as well. The resurgence in automotive and consumer discretionary segments should drive demand improvements in products in these value chains, e.g. specialized polymers, polymer additives, rubber chemicals, pigments, etc.

Over the last few years, Indian chemical manufacturers have been focusing on ramping up their respective niches through sustained capital deployment, building up of R&D capabilities and integration of manufacturing processes. These efforts have led to the capitalization of favourable trends at an opportune moment. Going forward, given the scale of potential opportunities, both globally (partly as a result of the shift from China) and domestically (in a bid to be self-reliant), Indian chemical manufacturers remain well-positioned to scale up their capacities to harness the structural growth trend.

Moving ahead

At end-CY20, most of the industry was ahead of pre-COVID levels. As COVID-19 cases are now more or less contained and the government's vaccination drive is gaining pace, we expect the sequentially improving trend witnessed in CY20 to sustain in CY21.

The first two months of CY21 is a testament to the same as the Indian chemical industry manoeuvred (and also capitalized on in certain instances) external developments (like container shortages and product-specific demand-supply mismatches), of which, a large part could be attributed to steps taken in the wake of the pandemic – sourcing strategy for key starting materials and efforts to widen customer base (including overseas customers).

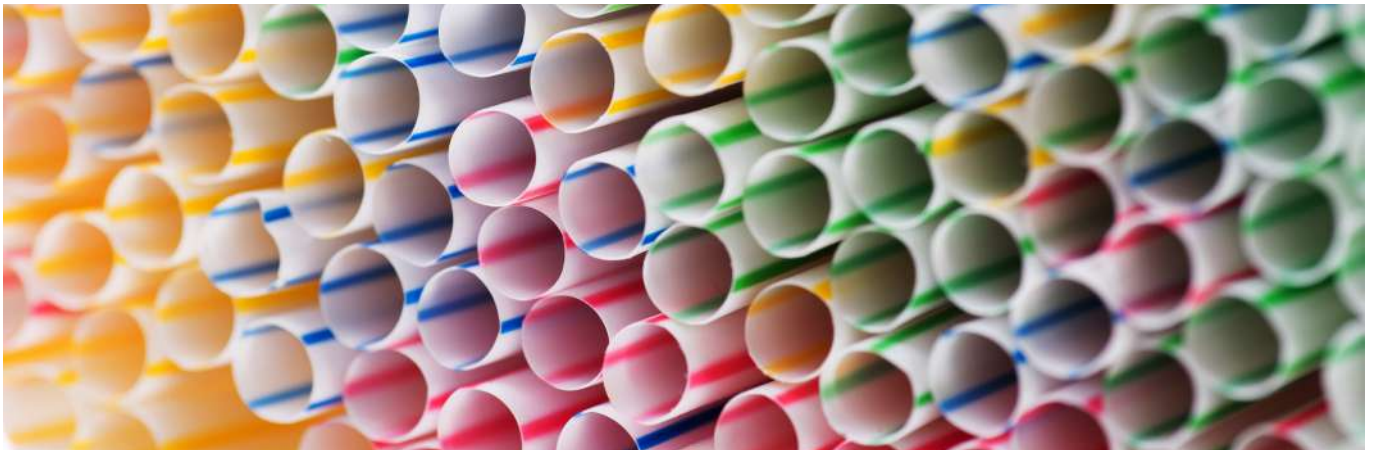
Government support

Overall, the challenging pandemic period was an enabler for the domestic industry in a way, as the need for de-risking product supply chains was strongly felt. The government's impetus was favourable for self-reliant manufacturing value chains, as production-linked incentive (PLI) schemes were announced in several sectors. We believe these initiatives by the government demonstrate a long-term approach, which has bolstered the confidence of industry participants.

As a raw material supplier to several industries – particularly key ones like pharmaceuticals, electronics and automobiles – the chemical sector is bound to benefit indirectly from these PLI schemes. With the intent displayed and the foundations put in place in CY20, we expect CY21 to be the year when granularities emerge in these plans. Further, PLI schemes in the chemical sector, if announced, could immensely benefit the sector.

Additionally, infrastructural support

"Infrastructural support would be a key area with regulatory impetus playing a big role in making India cost-competitive"



would be a key area with regulatory impetus playing a big role in making India cost-competitive (for instance, chemical parks with common infrastructure like power, steam, effluent treatment plants, etc.) and ensuring a seamless supply chain. For example, ramping up projects in the Petroleum, Chemicals and Petrochemicals Investment Regions (PCPIR) would go a long way in addressing feedstock availability, reducing logistics/operating costs and ease of transport due to proximity to ports.

Opportunities galore

Several segments in the chemical industry are expected to see double-digit demand growth over the next few years, which includes domestic markets for personal care ingredients, fragrances, water treatment chemicals, construction chemicals, etc., and also several bulk chemicals in the petrochemicals, polymers and Chlor-alkali space. Over the last two fiscals, imports of chemicals and agrochemicals (excluding pharma, paints, varnishes, cosmetics and fertilizers) clocked a run-rate of around Rs. 2 lakh crore – the amount stands at around Rs. 1.6 lakh crore till January '21 in the current fiscal. These figures, in themselves, demonstrate the opportunity that import substitution provides.

Exports – Playing to the strength

India's exports of chemicals and agrochemicals (excluding pharma, paints, varnishes, cosmetics, and fertilizers) is much lower than imports (Rs. 1.2 - 1.3 lakh crore over the last two fiscal years, and at Rs. 1 lakh crore for the first 10 months in FY21). However, our exports contain a larger share of value-added products with speciality chemicals contributing more than half of the pie (a large contribution comes from intermediates for Active Pharmaceutical Ingredients and Active Ingredients for agrochemicals). Thus, we expect the trend to remain robust in CY21 owing to the continued strong demand from pharmaceutical products and agrochemicals.

Therefore, CY21 could be a year of further growth. Players have demonstrated an appetite for new product development and collaboration with global partners, which could result in amplified benefits in terms of increasing mandates. Owing to cost competitiveness and availability of manpower with strong technical and R&D capabilities, India could potentially turn into a 'go to' destination for global chemical manufacturers for not only contract manufacturing but also for partnerships starting at the product development phase.

Capital availability

Investor interest has surged for the sector due to the robust operating performance of chemical companies over the last few years and the tailwinds that it enjoys. While listed players have seen a surge in their stock prices, fundraising through public offerings/private placements have also seen considerable success in CY20. Similar trends are expected in CY21, with funds raised playing a key role in capacity expansion for the sector.

CY21 – A pivotal year

We expect the industry to resume the structural growth trend, which should significantly outpace global growth, with the speciality chemicals segment clocking early mid-teens growth. As we move ahead, by addressing key areas of feedstock sufficiency and infrastructure development, and further ease of doing business, along with progressive capital deployment, India should be able to catapult itself as a hub of chemicals globally in the years to come. ■

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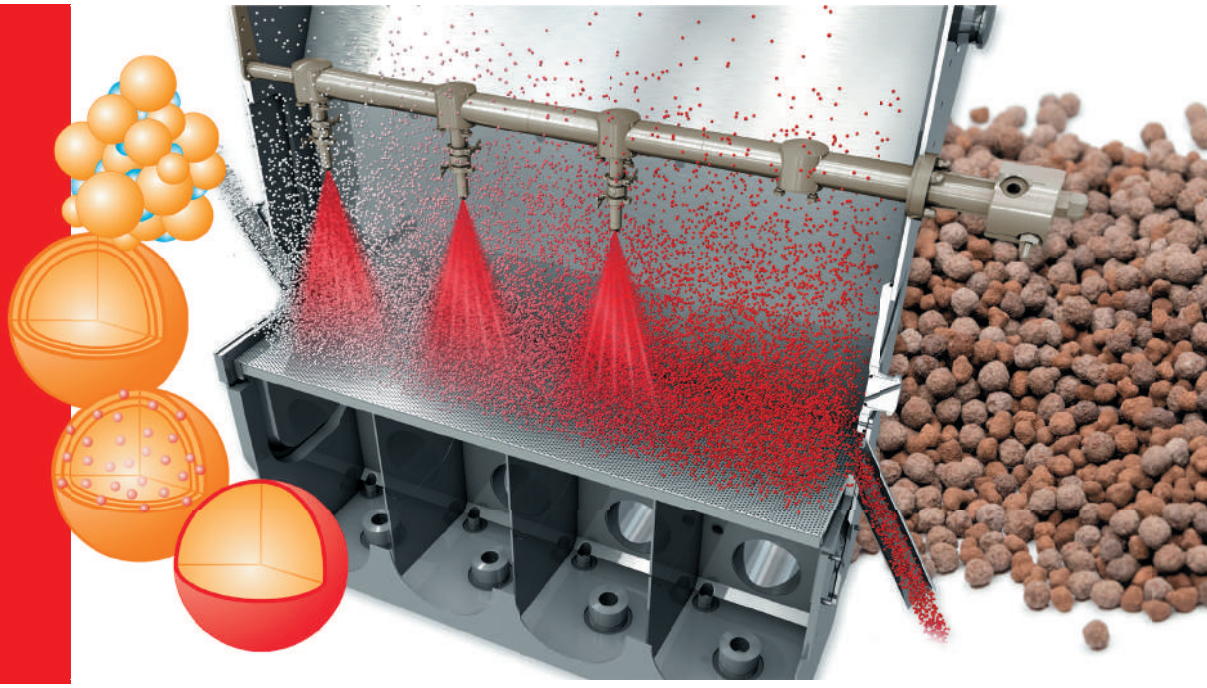

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SIMON WIEBUSCH
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CROP SCIENCE DIVISION OF BAYER
FOR INDIA, BANGLADESH & SRI LANKA

EMERGING CROP SCIENCE SCENARIO

Creating end-to-end crop value chains and strong linkages to farmers and farmer collectives will expand its global competitiveness

The COVID-19 global pandemic and the resulting challenges have highlighted the role of farmers in providing health and nutrition for all and the importance of agriculture to ensure food security worldwide. The pandemic affected everyone but developing nations and rural farming communities faced far greater risks and challenges. While nations imposed stay-at-home quarantine orders, farmers across the world continued to go out and farm to enable adequate food production. Most of these are smallholder farmers, who farm on less than 2 hectares of land each, but together comprise nearly 80 per cent of the world's total food production (Source: FAO).

The Indian Subcontinent comprising of India, Bangladesh, Pakistan and Sri Lanka and a current population of 1.78 billion is driven by smallholder farmers with limited access to resources and modern agricultural inputs and technologies. By 2050, the world will have around 10 billion people, with India alone accounting for 1.73 billion, up from its current population of 1.38 billion (Source: United Nations). While the population is increasing, arable land is decreasing, and farmers are grappling with limited natural resources and climate change. Extreme weather conditions such as cyclones, floods, droughts and poor rainfall are lowering crop productivity and farmer incomes. This is especially detrimental to smallholder farmers.

Access to safe, nutritious and affordable food is a basic human need and farmers work hard to grow their crops in ways that make the production of safe and nutritious food possible. To do so, they use seeds, fertilizers and, at times, crop protection to defend their crops against pests, weeds and diseases. Though modern science has helped develop innovative ways to manage agricultural pests over thousands of years, evolving threats still present an ongoing challenge for farmers around the world. The Indian Subcontinent is no different. Farming in this region is primarily rain-fed and that makes farmers dependent on favourable weather conditions. That's why at Bayer, we are exploring new ideas that can help farmers with tailored solutions to protect their crops and develop in-built resistance to withstand varying climatic conditions.

"Digital tools in agriculture are already helping farmers produce more with less resources and make data-driven decisions in real-time"

Bayer's interventions in crop science

Bayer offers a broad range of hybrid seeds as well as chemical, biological and data-driven digital solutions to help farmers safely and responsibly protect their crops from pests such as weeds, disease, harmful insects and fungi. Our diverse and growing portfolio provides farmers with the latest technologies

The growth and success of agriculture is important for long-term economic growth of the Indian Subcontinent

> "Innovations in modern crop protection and biotechnology have helped change the face of agriculture, offering farmers the benefit of efficiency, productivity and sustainability"

and a wide range of choices for their growing farming needs. These include innovations such as disease and insect-tolerant seeds, pesticides, herbicides, agricultural biologicals such as microbial and digital farming tools. We also work collaboratively with farmers to offer tailored solutions – including agronomic recommendations based on the specific needs of their fields, crops and soil to help ensure productive harvests, defend against pests and improve soil health, all while protecting our natural resources.

The Indian Subcontinent has a significant opportunity to improve productivity and quality of agri-produce both for domestic and export markets. Creating end-to-end crop value chains and strong linkages to farmers and farmer collectives (such as Farmer Producer Organizations) will enable the region to expand its global competitiveness in agriculture.

A viable model is the global, multi-stakeholder Better Life Farming (BLF) alliance, which works with partners across the agri-value chain to support smallholder farmers in developing economies to increase crop yields and farm incomes and promote self-reliant agri-entrepreneurship. The BLF alliance has global partners that include Bayer with its expertise in seeds, crop protection and agronomy; IFC, the development finance institution for impact assessment; and Netafim for drip irrigation technologies.

The BLF alliance works with additional local partners in India, including Yara Fertilisers for soil and nutrient management; DeHaat, AgriBazaar and Big Basket to enhance market linkages; Tata Trusts for expanding reach to farmer collectives; and Axis Bank for financing. Similarly, in Bangladesh, the BLF alliance works with Bayer, IFC and ACI to create awareness about balanced crop nutrition, soil health and precision irrigation.

In India, the Better Life Farming initiative has led to a doubling of crop yields and tripling of farm incomes among participant farmers while keeping an eye on water usage and integrated farm management. It has created price transparency in the marketplace, increased the bargaining power of smallholders and promoted clusters of rural agri-entrepreneurs. It has also created opportunities for women farmers to be integrated into mainstream farming operations and emerge as rural agri-entrepreneurs.

The BLF alliance's agri-entrepreneurship model functions through Better Life Farming Centers run by local agri-entrepreneurs. These centres open up economic opportunities for smallholders by enabling knowledge and technology transfer on good agricultural practices (GAP) and delivering services such as market linkages, access to agri-inputs, financial solutions and mechanisation services as well as crop advisory. Currently 475 Better Life Farming Centers are operational in India and Bangladesh. By 2025, the Better Life Farming initiative aims to empower 2.5 million smallholders in the Indian

Subcontinent through access to modern agri-inputs and better public health. These smallholders will be served by five thousand agri-entrepreneurs across horticulture, corn, and rice crops.

Need for sustainable agriculture

The practise of sustainable agriculture can help ensure safe, affordable & enough food and overcome farmers' challenges around low productivity and income, while conserving natural resources. Digital tools in agriculture are already helping farmers produce more with fewer resources (water, land and energy) and make data-driven decisions in real-time. New technologies like drones are revolutionizing farming. Drones can help identify weeds, pests and diseases and localize the application of crop protection chemicals. Farmers in China and South East Asia have started using drones to reduce their risk and improve profitability. Once drones are approved for use in Indian farms, they can provide farmers with significant benefits including targeted and timely use of crop protection chemicals to reduce crop risks.

The industry and government are already supporting the shift to sustainable agriculture by popularizing the use of science-based good agronomic practices (GAP) that are climate-smart and financially viable. The enhanced collaboration will play a critical role to transform agriculture in the region.

Drones can enable safe, precision-based spraying of crop protection chemicals

Innovations in modern crop protection and biotechnology have helped change the face of agriculture, offering farmers the benefit of efficiency, productivity and sustainability. The innovation lies at the core of transforming food production. That's why the Indian Subcontinent needs to accelerate the introduction of new technologies in crop protection to match pace with other big agricultural regions. This means shortening product registration timelines and fast-tracking critical innovations for timely response to emerging threats like the Fall Army Worm impacting corn cultivation. In the case of biotech regulatory reforms, they need to be introduced in conjunction with reforms for crop protection. This requires a holistic regulatory regime starting with breeding, crop protection to biotechnology to mitigate risk and improve yields significantly.

For the Indian Subcontinent to become a globally competitive manufacturing hub for crop protection products, we need enhanced data protection measures to safeguard the investment towards innovation and R&D of new products. With accelerated use of digital technologies and open knowledge platforms, there's a great opportunity to scale up our regulatory capacity including strong alliances for knowledge transfer with other leading countries. This again will be a strong foundation to accelerate regulatory reforms on a real-time basis.

> "The industry and government are already supporting the shift to sustainable agriculture by popularizing the use of science-based good agronomic practices"

Conclusion

Science and innovation will not only help progressive farmers, it will completely transform the lives of smallholder farmers, who hold the key to ensuring an even more resilient food system. Enabling smallholders will help feed the region's growing population, address the challenges of poverty and hunger, as well as help make agriculture part of the solution to climate change. As we think about what lies ahead, we know there are still problems to solve and room to improve. Modern Crop Science will continue to provide a range of innovations and we believe it can help us achieve a better tomorrow for farmers, consumers and global food production.

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SANJIV LAL
MD & CEO,
RALLIS INDIA LIMITED

AGRICULTURE: FRONTRUNNER IN ATMANIRBHAR ASPIRATIONS

Infrastructure investment and adoption of technology can make India "Aatmanirbhar" and emerge as an important player in the global agriculture value chain

The world in the recent past has not witnessed a crisis as disruptive and widespread as the COVID-19 pandemic. While no sector has remained immune to the impact of the pandemic, one sector that has been an exception is the agriculture sector.

Agriculture contributes 17 per cent to India's GDP and more than 60 per cent of rural households in the country depend on the agriculture sector and allied activities. Enhancing the allocation to the Rural Infrastructure Development Fund to Rs. 40,000 crores and the recent proposal to double the Micro Irrigation Fund corpus by another Rs. 5,000 crores in the Union Budget 2021 will provide a major boost to the sector.

The government has set the food grain production target at 298.3 million tonnes for the 2020-21 crop year, up 2 per cent from the record output achieved in the current year. To achieve this target there are multiple challenges and opportunities ahead of this sector and these can be resolved or leveraged only with the collaboration of the industry, farmers and government policymakers.

"Adoption of digital technologies like AI and agricultural robots will further accelerate the growth and attract educated workforce to the sector"

Challenges

Agriculture is a high priority sector in terms of meeting the national demand and sustenance of farmers. Major roadblocks to the growth of agriculture in India are the deficiency of investments in infrastructure, food processing, implementation and adoption of modern technology. The recent announcements in the Union Budget where Rs. 11,588 crores have been allocated to Pradhan Mantri Gram Sinchai Yojana will benefit the farming community enormously.

Some of the key challenges in the downstream agriculture value chain are losses in the food chain, scarcity of resources and multiple intermediaries, and lack of transparency and traceability. Every year, 20-30 per cent of food produced by farmers, worth about Rs. 45,000 crores are damaged by pests and crop diseases in India. Pre-harvest losses can be addressed through the adoption of appropriate crop protection and seed technologies. This will also help in increasing the quality of farm produce which will fetch more income to farmers.

Food safety is an area of major concern for farmers. They need to be aware of the potential for contamination as they work in the fields and as food is transported from one place to the next. Another invisible challenge that impacts the sector most is the

"Continuous investment in innovation and R&D will drive agricultural productivity and yield enhancement, and offer an entire suite of agri-inputs to the farmer community"

unforeseen environmental crisis. Poor knowledge and inadequate infrastructure further add to the crop wastage and sometimes resulting in the poor quality of produce. This year we also witnessed locust attacks that were not heard of in the last decade. It is important to mitigate the impact of the pandemic and tackle short-term issues even as the industry keeps working towards doubling farmer income over the medium to long term.

Opportunities

The agriculture sector has a high correlation to the non-agriculture segment that drives demand for other sectors including retail, FMCG, and E-commerce among others, which are dependent on the agriculture sector for inputs. There is enormous scope to improve yield, to support this initiative. In the last half-decade, the government has launched forward-looking policies and initiatives that aim at doubling the income of farmers by 2022.

The ambitious Jal Jeevan Mission announced by the government will play a crucial role in addressing the water irrigation challenges. To add to that the National River Conservation Plan will aid the farmers in access to water facilities for their crop and livestock. Another important initiative is the Rural Infrastructure Fund will create more platforms for this segment.

On the investment side, the Government of India plans to attract new investment in the rural agriculture sector and enable the formation of 10,000 new Farmer Producer Organizations. India is blessed with a diversified agro-climatic condition which helps us in growing almost all types of agriculture produce indigenously for meeting the diversified culinary preference of domestic consumers. With appropriate investment in infrastructure and adoption of technology, we can make India even more Aatmanirbhar (self-sufficient), and emerge as an important player in the global agriculture value chain.

Adoption of digital technologies like AI and agricultural robots will further accelerate the growth and attract an educated workforce to the sector. Currently, it is only rural India that is inclined towards farming and related occupations but the younger generation needs to invest in technologies and adapt to newer ways of farming to achieve the desired qualitative and quantitative yield.

Policy intervention

As per the Government of India, post-harvest wastage represents 16 per cent in fruits and vegetables and 10 per cent in cereals, pulses and oilseed. Major reasons for these wastages are lack of quality storage, food processing facilities and appropriate transportation. Because of certain regulations and market practices, private sector participation was limited in the direct procurement of agriculture produce. In the current Union Budget, the government is focused to support the sector with cutting-edge resolve and also elevate the infrastructural assets of rural India. These reforms will help the sector and the farming community together to progress.

Another area we need to look at is how information can be used to change the current model of "selling what we produce" to "produce what is needed". This is very important in short cycle perishable agro produce where appropriate adoption of seed and production technology can off-set dependence on production seasonality. This can overcome adverse price volatility impacts of farmers as well as customers and provide stability across the value chain.

Way forward

Agriculture remains a central pillar of the Indian economy. The sector serves the food consumption needs of the whole country, while also placing it among the top exporters of agricultural produce in the world. It offers extensive potential for industry participation which will not only provide the industry with opportunities for innovation but also modernization and growth with a public-private partnership.

Science and technology will shape the advancement of the industry. Continuous investment in innovation and R&D will drive agricultural productivity and yield enhancement and offer an entire suite of agri-inputs to the farmer community. The success of the agricultural sector will also create opportunities for the agrochemicals industry to provide inputs for crop nutrition and crop protection through innovative products.

The agriculture industry needs a transformation, from being a traditional business to an agile and dynamic industry, which not only accelerates farmer prosperity but also ensures economic stability and addresses concerns about about sustainability.

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NON-EXECUTIVE DIRECTOR & HEAD INNOVATION, GALAXY SURFACTANTS LIMITED

FUTURE OF SPECIALITY CHEMICALS

Ensuring sustainability across the entire value stream of the product is critical and will be the core of every products' development and operations

A top segment in India's chemicals exports, speciality chemicals play a key role in defining our country's export-import balance and have been a value creator for the economy. And with COVID-19, the demand has only been increasing.

The Home & Personal Care market globally as of FY 2019 stood at approximately US $ 520 billion and the Speciality Ingredients market stood at approximately US $15 billion.

COVID-19 has transformed many aspects of this sector, specifically hygiene and health care. It has changed the supply chain scenarios, business methodology, and re-aligned business priorities.

COVID-19 has changed the entire paradigm. It has re-programmed the market and the consumer of the future.

Health, hygiene, and safety have become the consumers' priority, emphasizing the importance of these behaviours like never before. And so is nature care & sustainability, as emphasised and made conscious by lockdowns when the human activity was cut down.

COVID-19 has also displayed that consumer behaviour, needs, and preferences can have a 360° shift in a concise span, as short as few weeks to few months. Thus, the brands and ingredients manufacturers have to be agile and ready to deal with such ad-hoc situations in the future. This shall drive product innovations, supply chain rewiring, and manufacturing process re-designing.

Digitisation has exponentially sped up information dissemination, exchanging ideas, and shaping consumer expectations, thus sharpening their demand to specificities. Consumers are looking for customised solutions for their skin & hair care routine and won't mind paying a premium. Various small, local, and niche brands are gearing up to cater to this demand. This puts up the additional impetus to come with Value for Money, 'More from Less,' multi-functional, multi-purpose products and ingredients design with unique positioning that solves critical consumer problems.

It is, therefore, in the industry's best interest to align and plan for the next decade of transformation where the product value proposition, aspects of sustainability, safety, and hygiene will be at the core of the design.

Safety – Safe products & practices

'Made-Safe' products, i.e., containing non-toxic, harmless, safe ingredients, are the consumer's right. The expectation is justified considering the products come in contact with human skin.

Innovative ingredients and their process design, as we advance, will be critically evaluated on their safety - Safe in use and design.

"Manufacturers of ingredients for the Home and Personal Care segment need to innovate processes for minimal impurities in their products"

Manufacturers of ingredients for the home and personal care segment need to innovate processes for minimal impurities in their products.

This can be best understood considering preservatives in home and personal care products. Traditionally, the preservation systems contained Formaldehyde releasing molecules, Halogenated molecules, Parabens & Isothiazo-

linones. Although at a relatively minimal concentration in the formulation, scientific reports have proven their harmful health effects over the use of products containing these ingredients. The industry has been on the lookout for a broad spectrum, highly effective, safe preservation system for all its home and personal care products. Galaxy's Galguard range of Non-Toxic Preservative Systems satisfies that need.

Sustainable ingredients, operations & products

Ensuring sustainability across the entire value stream of the product is critical and will be the core of every products' development and operations. Home and personal care brands want to assess their product's impact on the environment and society and strive to have products made with plant-derived or recycled, sustainable, biodegradable ingredients.

The major component of cleansing products are Surfactants (8 per cent to 50 per cent) hence ensuring that they are Nature-derived, sustainably produced, and provide value benefit, fulfils a major part of the objective. Mild Surfactants – a series of Amino Acid Surfactants, goes beyond just meeting these indices. They are prepared with relatively less or no use of petrochemical-derived ingredients than known performance surfactants. These are high-performing ingredients that provide a luxurious, creamy lather, good cleansing, mild, gentle, & moisturizing to the skin. They have a very high RCI (Renewable Carbon Index) between 80-100 per cent. Innovative ways exist to manufacture them sustainably, as with the use of nature-friendly catalysts, processes involving zero discharge, and close loop technology. Galaxy has developed one such ecosystem.

Technologies are evolving to harness and capture Carbon from Air, Marine, and any recyclable material, to prepare speciality chemicals & allied materials for the industry – a Carbon Renewability concept that aims to address climate change concerns.

On similar lines, initiatives like sustainable sourcing, traceability, etc., give direction and medium to follow eco-friendly practices for doing business. As we advance, ingredient traceability will be a norm, and manufacturers should put the same in practice as early.

> "As we advance, ingredient traceability will be a norm, and manufacturers should put the same in practice as early"

Sustainability at scale

Sustainability will not be in practice if the 'good for earth' products are only adopted by a minuscule proportion of the massive population. The concept should be within reach of all, logistically and by affordability. Only when several FMCG companies promise such initiatives and transform their ways of working, the real mass scale impact happen. This determination by key players shall put the piece of logistics and reach in place. This has already triggered recalibrating Innovation & New Product Development Strategies, supply chains, and various ingredient manufacturers' investment plans. Understand and estimate the new ingredients market's scope when most of the 12.6 Million tonne market of powdered detergents transforms.

Thus the scale and value benefit - 'More from Less' are needed for being transformational. This presents a significant opportunity for all players, directly and indirectly, to come up with their out of box thinking, invest in this growth transformation journey and create a mark in the industry.

New trends

Come COVID-19; hygiene has found a renewed importance and place in the conduct of consumers. Below are some of the trends that will shape the HPC Industry's future, thus providing derived feed to the Speciality Chemicals players.

Concentrates, refills & solid formats

FMCG players are exploring the idea of providing the product in more concentrated formats, thus delivering more quantity to the consumer in every buying cycle, reducing the required packaging in proportion. Refills & solid formats with the option of dilution at consumers end nearly eliminate plastic use and reduced water consumption.

Ingredient manufacturers' scope lies in identifying complexities, including formulation stability and regulatory aspects, that arise while formulating these concentrates and making formulations convenient for consumers—these present opportunities for suppliers to innovate and provide a solution to the industry.

The emergence of Bio-Technology-based raw materials and surfactants

Bio-sourced ingredients like Bio-surfactants, Biobased Ethanol, etc., are gaining traction to provide a complete ecosystem for the development of products. This allows to capture carbon completely from the atmosphere and transform it into ingredients, thus driving the circular economy.

Opportunities in allied segments of the HPC industry

There are also implications on the trade and nature of allied materials like packaging, fragrances, etc. For example, plastic recycling systems and water-soluble plastics will now be mainstream. Hence, speciality chemicals addressing the challenges in these product and process developments will have demand and more commercial scope of innovation.

Transparency & regulatory controls

We see transparency as a key attribute of brand personality going forward. Consumers will be expecting brands to share complete information about product composition and afterlife of the product post use. Objective information like % naturality, carbon footprint, renewability index, etc., will be desired. Life Cycle Assessment can soon become a reporting parameter. This compliance should lead to the Home Care segment getting more organized, streamlined, and transparent on its label disclosures.

Regulatory bodies have initiated implementing compliance rules with regards to the concentration of various ingredients in the formulation. A recent example being New York's regulation on limiting the Dioxane content in HPC products to less than 1 ppm by 2023. One can expect more such regulations across different markets. Speciality Care manufacturers need to take advanced steps in developing technologies that eliminate or reduce any such harmful ingredients.

Speciality ingredients & Indian industry

Buoyed by the domestic demand, the speciality chemicals industry has a good platform to grow and scale-up further. COVID-19 has pushed the global MNCs to diversify their supply chains, resulting in a demand rise for Indian supplies. Infrastructure push and policymaking provide a favourable environment for a competitive player as a supplier to overseas markets.

The industry players also need to be confident of the sector's growth and invest in Research and Development while building an agile implementation system.

The SpecialIty Chemicals sector is, therefore, set to grow. Still, they have to make themselves ready with forward-looking solutions focused on Sustainability, Simplicity, Safety, Value for Money, and effectiveness.

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BALANCED USE OF PESTICIDES

The role of pesticides is not limited to protection from pests and diseases that threaten food supply but it also helps in yield enhancement

India is the second-most populous nation in the world having a population of 1.35 billion which is approximately 18 per cent of the global population. Agriculture is the backbone of the Indian economy as it employs over 50 per cent of the Indian workforce.

As far as India is concerned, India ranks 2nd in agricultural production in the world with a value of US $ 459 billion. India is also the largest producer of multiple agriculture products. It has ranked first in the production of spices, pulses, milk, tea, cashew, jute, mango and banana. India is the second-largest producer of wheat, rice, fruits, vegetables, sugarcane, cotton and oilseeds. Production of horticulture products (mainly fruits, vegetables and pulses) during FY 2018-19 has been estimated at a record 313.9 million MT. However, India significantly lags behind many countries in terms of crop production per unit land area. India's yields in four major crops around the world mainly wheat, rice, maize and soybean are lower than average yields across OECD countries by 20 per cent, 108 per cent, 47 per cent and 200 per cent respectively.

> "In India, the annual crop losses due to pests and diseases amount to 15 to 25 per cent of the total output"

Every year in India pests eat away one-fourth of the food produced by the farmers and annual crop losses due to pests and diseases amount to 15 to 25 per cent of the total output of the country. This necessitates more emphasis on crop protection and judicious use of pesticides that can cut down these losses that occur at multiple stages of crop growth. The role of pesticides is not limited to protection from pests and diseases that threaten our food supply but they help in yield enhancement as well. Major agrochemicals/pesticides are insecticides (used for managing insects), herbicides (used for managing unwanted plants), fungicides (used for managing fungi), biopesticides (biological or biologically derived pesticides) and plant growth regulators (used for improving plant growth and yields).

Pesticides Ensure Food Security

Judicious use of pesticides is essential to ensure food and nutritional security. Push for sustainable agriculture, increasing global population, rising food security and shrinking arable land propel enhanced use of agri-inputs like pesticides.

The increasing agricultural productivity of a nation is essential not only to ensure food security of the nation but also to increase the country's agricultural produce exports, thereby supporting the world's food supply requirements which also help support the nation's economy from gaining valuable foreign exchange. India's agriculture sector has immense potential to steer the growth of the Indian economy through the value of increased output, as India has the 10th largest arable land area in the world along with 20 agro-climatic condition regions and 46 out of the 60 soil types found globally.

Being one of the key agricultural inputs, balanced and judicious use of pesticides is important and necessary to protect crops from ravages of pests and diseases, thereby minimising crop losses. Pesticides are one of the important agri-inputs for farmers for protecting their crops and thereby play a significant role in increasing crop yield and improving profit margins of farmers. There are also challenges due to increasing pests and disease problems in agriculture, invasive pests, locust attacks

and climate change which also cause disruptions leading to crop losses and food price inflation.

Considering the challenges faced in Indian agriculture and concerns over trends in the income of farmers, the government of India has been taking steps to double farmers income. Farmers play a critical role in meeting the food requirements of our nation which has the second-highest population in the world and is expected to surpass China sooner than later. If we use technologies and agricultural inputs like pesticides in such a manner as to generate savings for the farmers, it can contribute to increasing farmers' income. One of the most important solutions to increase farmers' income is to help farmers cut down crop losses especially those occurring due to attacks by pests and diseases and improve the productivity of their crops which will in turn help multiplying farmers' revenues.

> "Average consumption of pesticides in India is one of the lowest in the world with 0.65 grams per hectare"

However, it is equally important to maintain soil fertility considering ever reducing farmland due to urbanization and housing needs which force conversion of agricultural land to non-agricultural land. It is therefore essential to ensure that application of pesticides on the right crops at a time in approved doses against pests for which the pesticides have been approved. Injudicious and indiscriminate use of pesticides is likely to have health hazards to humans, contamination of soil and residue problems in the production. The label and leaflets of every pesticide formulation product provide all information and directives concerning its use on approved crops, pests and diseases, doses etc.

Judicious Use of Pesticides

Pesticides are biologically active chemicals that control a range of insects and vertebrate pests, diseases and weeds and they are the most cost-effective way for controlling infestations. Pesticides are the results of more than 50 years of research, development and field trials around the world by the plant science industry. Before pesticides are brought to the market, they are thoroughly tested for their safety and efficacy.

Pesticides are one of the major tools to protect crops and are used during both pre-sowing and post sowing stages of farming. To increase their profitability, farmers need to use pesticides judiciously across both these stages. The use of pesticides across the value chain can increase the overall yield of crops, not only resulting in a rise in income for the farmers

but also boosting their profitability with a significant cut down in crop losses. Pesticides as one of the major crop protection solutions are designed to protect crops from insects, diseases and weeds. Pesticides control pests that infect, consume or damage crops. Un-controlled pests significantly reduce the quantity and quality of food production.

Integrated Pest Management: Need of the Hour

There are 30,000 species of weeds, 3,000 species of nematodes and 10,000 species of eating insects with which crops are to compete with. Invasive pests and locust attacks also add to the problems. Without the use of crop protection technologies like pesticides, annual crop losses will multiply.

The importance of pesticides needs to be viewed in the context of improving agricultural yields as their judicious use can lead to approximately 20 to 25 per cent improvement in agricultural productivity. To achieve higher yields, agrochemicals/pesticides are expected to play a significant role. At the same time, it will also be critical to use them judiciously to maximize benefits and minimize the impact on non-targeted species. Integrated Pest Management (IPM) is a targeted approach in pests and disease management which play a critical role in improving agricultural activities in doubling farmers' income. IPM improves crop profitability owing to better pest control measures and balanced use of crop protection solutions helping in achieving stable, reliable and good quality crop yields. IPM helps reduce the potential for problems of pest resistance and resurgence.

The average consumption of pesticides in India is one of the lowest in the world with 0.65 grams per hectare in comparison to the world average of 3.0 kg per hectare (consumption of pesticides in countries like U.S.A. 7.0 kg/ha; U.K. 2.8 kg/ha; France 3.7 kg/ha; Korea 7.00 kg/ha; Japan 12.0 kg/ha; and China 13.0 kg/ha). The main reason for the low consumption of pesticides in India is due to the low purchasing power of farmers as a majority of farmers in India are small landholding farmers with 1-5 acres of land, lack of awareness among farmers and limited reach.

Development of the agriculture sector is key for the country's economic growth for which maximising the use of technologies and inputs are essential. The agrochemical/pesticide industry has contributed substantially to the improvement of agricultural production. However, challenges like small land holding, low awareness and low usage of pesticides have reduced agricultural productivity due to the high volume of crop losses to pests and diseases. Bringing maximum farmers under the crop protection umbrella can only save crop losses.

As a key agricultural input, making available pesticides at the most economical prices to farmers is essential. Unlike other agricultural inputs, pesticides attract high taxation by way of GST at 18 per cent. Policy decisions should be taken to avoid high taxation on agrochemicals/pesticides which can help low-income farmers to have access to these products.

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MELT GRANULATION IN THE CHEMICAL INDUSTRY

Melt solidification can be carried out in many different ways but one of the most efficient processes involves the melt being cooled on a steel belt-based processing conveyor

Modern-day life is built around chemicals and often in ways that may not be immediately obvious. From the moment we wake up, processed chemicals are at the heart of virtually everything we do. The toothpaste that cleans our teeth, the oil that fries our meals, the polish that shines our shoes, the pills that keep us healthy, the fuel that powers our buses and cars ... all need chemical ingredients to do their job.

Some chemicals are desirable, others less so. In materials like crude oil, chemicals have to be removed and added and both tasks present their challenges. For example, H_2S is an undesirable gas that needs to be extracted and the sulphur content separated, cooled and solidified.

Chemical industry in India

All this is extremely important to India's economy. In terms of output, India is Asia's third-largest chemical producer and currently ranks sixth in the world after the USA, China, Germany, Japan and South Korea. This growth is expected to continue in a post-COVID-19 world, with India being seen as the preferred location for world-leading companies planning to invest in new manufacturing facilities.

The Indian speciality chemical industry is already one of the fastest-growing industries in the world. Over the five years up to 2019, it experienced a CAGR (Compound Annual Growth Rate) of around 11 per cent, a figure that is expected to increase further over the next couple of years. In just a decade, India has risen from eighth to sixth place in world rankings, a clear indication of the significant potential for further market growth and innovation in this field. Achieving this is likely to involve either some new plants or expansions or even relocations.

One of the major challenges faced by this sector is the large number of unorganized producers catering to the needs of smaller, similarly unorganized customers in their respective sub-segments. In some sub-segments like base ingredients, the market share of the unorganized market is more – substantially more – than that of the organized market. If this unorganized sector can be backed by systematic process interventions and R&D support, there is a huge potential to grow at a faster rate. This will require good government policies and support.

6.4%

"Globally, the speciality chemicals industry is predicted to grow at 6.4 per cent over the next five years and reach US $1.2 trillion in value by 2025"

India's advantages in a global market

Low cost of manufacturing with skilled labour: India has the competitive advantage of being a country with low-cost manufacturing capabilities, a skilled workforce and an abundance of human resources. This leads to lower operating expenses and other costs in comparison to other nations, making India one of the preferred manufacturing destinations for companies across the globe.

Growth potential of the domestic market: India still lags behind the major

developed nations in terms of chemical consumption on a per capita basis, but increasing urbanization is leading to growth in end-user segments like paint, personal care, home care, textiles and adhesives. This has been one of the significant contributors to the top-line growth of speciality chemicals in India.

Potential for improvement in R&D: Many major players in India spend less than 3 per cent of their revenues on R&D activities, significantly less than the 6-10 per cent typically invested by their global counterparts. The domestic speciality chemical industry is basic in operation and has considerable scope for improvement as there are only a handful of companies developing innovative and unique products.

Indian government's initiatives for growth: The GOI has initiated actions like mandating BIS-like certification for imported chemicals to prevent the dumping of cheap and substandard chemicals into India. Furthermore, the government has allowed 100% FDI under the automatic route in the chemicals sectors, excluding hazardous chemicals. The Indian government has proposed a draft National Chemical Policy where it aims to increase the share of the chemical sector to 6 per cent of the GDP within the next 10 years.

Demolishing the strong entry barrier: Earlier government policies were extremely complicated in terms of company registration, product registration/approval, statutory clearances etc. More recently, the Ministry of Corporate Affairs (MoCA) has introduced a single-window clearance system for company establishment and statutory compliances. This has encouraged a large number of new players to enter the competitive market, resulting in the creation of a good value chain in the field of speciality chemicals, which in turn is boosting our export economy.

> The entire system from receipt of the melt, through solidification, to downstream storage and handling must therefore be designed to achieve the desired capacity

The China effect

Globally, the speciality chemicals industry is predicted to grow at 6.4 per cent over the next five years and reach US $1.2 trillion in value by 2025. The past couple of decades have seen a significant shift in the manufacture of chemicals from Europe and North America to Asia, in particular China and India.

One of the most prominent trends in the global chemicals industry has been the emergence of China as a dominant player. This is reflected in the increase in China's share of the global chemicals industry from 6 per cent in 2000 to around 25 per cent in 2020. However, with China's shift from basic chemicals, India is likely to emerge as a prominent player in this space in the foreseeable future.

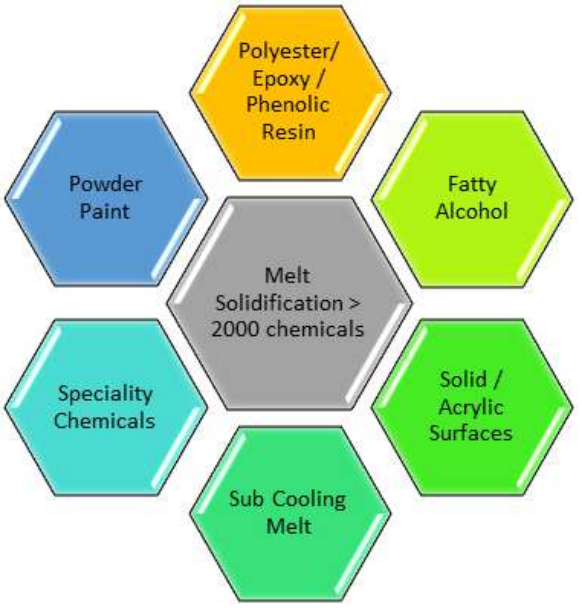
China's government implemented stringent laws for the protection of the environment in January 2015. They have made it compulsory to build effluent treatment plants and have levied a green tax on them to keep pollution under a certain level. This has hit their bottom line and the chemical companies now need Capex to scale up their production and build such plants.

The Chinese government had also made it compulsory for small to mid-size chemical companies to relocate to dedicated chemical parks far away from protected habitat by the end of 2020. These factors have led to the slowdown in the growth of China's chemical industry.

Further, COVID-19 has contributed to the cause of international players seeking India as their alternative destination for the manufacture of speciality chemicals.

Growing market for speciality chemicals

A combination of a growing population and greater disposable income is driving



increasing demand in India for products that make use of speciality chemicals.

The tyre industry is one example. While car ownership in the USA is at a level of 850 per 1000 people, here in the emerging Indian market, vehicle ownership is just a fraction of this figure – 50 cars per 1000 people – and this represents tremendous potential for growth. The tyre industry is expected to grow by 9-10 per cent over the next five years, including an 8 per cent increase in the heavy commercial vehicle segment and 14 per cent in Light Commercial Vehicles (LCV). How does this impact the speciality chemical market? Tyres are made of rubber, a natural product that requires the addition of chemicals to provide the necessary durability and wear resistance. The chemical additives required for this present a particular challenge in terms of processing in that they are 'subcooling' melts. This means that they remain liquid even when cooled below their melting point and have to be processed on a specially designed supercooling system.

Another common speciality chemical product is fatty alcohol, widely used – along with microcrystalline wax – in soaps, shampoos, detergents and cosmetic products. These too are processed in the form of a melt.

India's growing population, economic growth and changing lifestyles are also driving demand for products used across the construction and real estate industry, such as decorative products, modular furniture, solid/acrylic surfaces, LVT tiles and paints. And, whether directly or indirectly, these products all make use of speciality chemicals such as polyester, phenolic and epoxy resins.

Continuous melt solidification

All these chemicals have one thing in common: they need to be transformed from their melt state into a solid form for easier downstream storage, handling and subsequent reprocessing. Melt solidification can be carried out in several ways but one of the most efficient processes involves the melt being cooled on a steel belt-based processing conveyor.

This technique uses indirect cooling methods in single or multiple temperature zones carefully controlled to meet specific process parameters. Successful solidification depends on a range of factors including the properties of the chemical itself (e.g. its amorphous or crystalline nature), ambient temperatures and associated dew points, and the process needs precision control of every aspect, including timings. These conditions can best be guaranteed through the use of state-of-the-art continuous steel belt-based cooling technology that has been designed, manufactured and installed.

Once the melt has been solidified, it then needs to be stored, bagged and/or bulk transported. As with the solidification process, this requires specific expertise and the integration of storage and handling systems to enable automated bulk production. Some of these melts are extremely expensive, others less so. Depending on the product type, throughput levels can range from around 500 to 15,000 kg/hour per single unit.

The costs of storage, packing and transportation all have a bearing on the overall cost of the speciality chemical so factors such as the type and size of the packaging, feed rates and storage capacity are all parameters that need a long-term view. Similarly, it is important to consider the need for production flexibility and potential for future growth, again requiring a long-term perspective. The entire system from receipt of the melt, through solidification, to downstream storage and handling must therefore be designed to achieve the desired capacity.

With so many different factors at play, there is no such thing as a standard solution. Every project is different and the answer will depend on everything from product type and throughput rates to the needs of downstream re-processors and even the ultimate customer – the consumer.

One other important consideration is the environmental impact of the solidification process and this is another area where the steel belt cooler can deliver significant benefits. The efficiency of this indirect cooling process results in short processing times, no risk of cross-contamination with the cooling water, extremely low emissions and a virtually dust-free environment. This, combined with the integration of peripheral equipment, enables the production of high-quality products without risk of contamination to the environment either through the air, water or soil..

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ASHISH MISTRY,
DIRECTOR, MOTT MACDONALD PRIVATE LIMITED

GOING ABOVE AND BEYOND

India to step up efforts to meet global demand in the chemical industry

Today, India ranks 6th in the world in chemicals sales and contributes 3% per cent to the global chemical industry. For the past decade, the demand for growth in the chemical industry has risen in line with the evolution of our needs, wants and desires as a society – at a compound annual growth rate (CAGR) of 10% for the past decade.

Covering more than 80,000 products, the chemical industry is currently worth around US $ 178bn and is projected to reach US $ 300bn by 2025. A huge initiative for growth is 'Atmanirbhar Bharat', or 'self-reliant India', a long-term policy initiative from the Indian Government which infused about US $ 280bn into the economy, encouraging industries, businesses and people to play an inclusive and collaborative role in reshaping the nation.

"We have designed and installed some of India's largest chemical manufacturing facilities"

Like many sectors, the global chemical industry has been adversely impacted by the COVID-19 outbreak, which led to disrupted supply and plant closures. Its recovery is still uncertain, with the US and parts of Europe still under the grip of the pandemic. The turmoil in these markets is likely to be felt globally, including in India. But the pandemic has also compelled leaders and businesses to execute measures to safeguard livelihoods and improve resilience to future pandemics. This presents India with an opportunity to grow and step up to meet the mounting global demand in the chemical industry.

For over 50 years, Mott MacDonald has been at the forefront of management, engineering and development consultancy in India, shaping its chemical sector through our world-leading expertise in management advisory services, concept and basic engineering, detailed design and procurement advice, construction management and project management consultancy services. To date, we have designed and installed some of India's largest chemical manufacturing facilities and we have lent our skill to everything from organic to inorganic chemicals, paints to resins, speciality chemicals to agrochemicals, ink to dyes, and petrochemical products to tank farm terminals.

Over time, we moved from an engineering service provider to an integrated, solution-driven firm. Creating value is about understanding the technical aspects of underlying risks and making engineering decisions that lead to safe and smart solutions. This leads to production efficiencies with improved return on investment. Our mission is to add value at every stage of the project, for our customers and the lives they touch every day, and to be recognised as a responsible and reliable partner to our customers.

We understand our client and their client's expectations, even when they are not able to differentiate between their needs and wants. Our approach goes beyond compliance, to provide the most sustainable and cost-effective solutions, all while mitigating risks and hazards. These solutions are always informed by the right project data and knowledge, helping customers to set up new benchmarks and be a leader in their domain.

Producing more from less

One of India's leading chemical companies approached us for its upcoming speciality chemical plant expansion project. After a visit of to its existing facilities, we realised the client was facing ample challenges in process capacity, operability, maintainability, safe operation, man-material movement and facility design that complies with its own brand.

We looked at these challenges as an opportunity for improvement. We were

given inputs to design two chemical plants for different products with 100 tonnes per month (TPM) capacity. We studied the existing process, production steps and unit operations involved, analysed the peak load demand of utilities and then performed batch mapping.

For more than 30 years, the client had been relying on conventional batch processing at its facilities. After a suite of simulations and trials, we advised the adoption of new technology which converted batch processing to continuous unit operations. This doubled the production capacity from 100 to 200 TPM, drastically reduced the size and the amount of equipment needed, while also making the overall process more flexible. The conversion was backed by test runs in the pilot plant before implementing it into commercial operations.

The outcomes were:

- doubled production capacity, from 100 to 200 TPM
- 40% reduction in equipment used
- energy saving for both production lines
- 60% reduction in project capital expenditure (CAPEX) and operation expenditure (OPEX)
- increased flexibility of the production lines

Engineering equipment the right way

A client appointed us as the design engineering consultant to prepare process and mechanical data sheets for its heat exchangers. During our evaluation of input data, we spotted a larger opportunity: the heat exchangers were over-designed in many locations and under-designed in a few others. Better materials could also be used to build the new heat exchangers required.

We redeveloped the process and thermal design of the heat exchangers and suggested using a different type of material for their construction. In many instances, we were able to reduce the heat transfer area by 20 to 60%, resulting in smaller heat exchangers. This also helped us lower the utility consumption through the effective use of the heat exchanger coefficient.

Overall, our team converted a simple datasheet preparation job to CAPEX and OPEX savings, leading to a more sustainable solution for our client.

Key focus areas

At every stage, we focus on achieving more from less. Our deep understanding of India's chemical industry spans different segments of the sector and a wide range of stakeholders, but our key areas of focus are:

- Safe by design approach
- Expertise in batch and continuous process
- Evaluating the integration of batch to continuous process
- Innovative batch mapping solution for optimal utility consumption
- Analytical evaluating and debottlenecking
- Modern modelling and simulation software for advancement
- Scaling-up from lab to commercial
- Recovery of valuable chemicals and products from effluents

We are excited to support our clients in achieving the vision of a "self-reliant India.

> "We are excited to support our clients in achieving the vision of self-reliant India"

DR. MICHAEL JACOB
HEAD OF PROCESS ENGINEERING, GLATT INGENIEURTECHNIK GMBH, WEIMAR

FASTER TO MARKET

Thanks to its technology and process-oriented innovation competence, Glatt is the "one-stop-shop" as the development partner for research institutions and industry

India is no longer an Asian country in the background noise of the world news. It is at the forefront of achievements in the land, water, health, space, and digital segments.

In an environment of global uncertainties, on account of the current pandemic, the way India responded to the crisis and became a major supplier of drugs, medical devices and now vaccines show how Indian professionals coupled with the government's effective policy measures have ushered the country towards new horizons. It is not surprising that the Indian economy is expected to record double-digit growth in the next fiscal.

And there is no denying that the chemical industry is going to play a major part in its success story.

Chemical Industry provides the building blocks and raw materials for many industries including dyestuff, textiles, paper, detergent, agrochemicals, and fine/speciality chemicals. With a diversified manufacturing base and a pool of skilled personnel, India is poised to become a consistent value creator, a contract manufacturing hub and an R&D centre for existing and novel technologies.

Global companies seeking to de-risk their supply chain could further lead to near-term and long-term opportunities for chemical companies in India. But for the Indian chemical industry to fulfil its potential, the companies need to benchmark themselves to international quality, safety and sustainability standards.

Global companies seeking to de-risk their supply chain could further lead to near-term and long-term opportunities for chemical companies in India

Glatt – Your partner for challenging requirements

We at Glatt keep our finger on the pulse of the market and seek partnerships in research-intensive future projects. Which properties of raw materials need to be optimized to work for one specific application? How can this quality be achieved and economically adjusted on an industrial scale? How do we bring new ideas faster from the laboratory to the industrial scale? These are the questions that drive Glatt in their technology centres every day. We support the customers from start-up to scale-up.

One-Stop-Shop with innovation competence

Thanks to its technology and process-oriented innovation competence, Glatt is the "one-stop-shop" as the development partner for research institutions and industry. Established in 1991, Glatt's Technology Center in Weimar is the hub for particle design.

Process experts at Glatt are always one step ahead when it comes to the processing of powdery substances into attractive, dust-free, easy dosing and easily soluble granules and agglomerates for food, feed, fine chemicals and pharmaceutical applications.

Fast track from laboratory to production scale

In this journey towards excellence, Indian companies will need partners to bring advanced manufacturing processes, the gold standards of research and technology to their industry and the key term here is "Scalability". What works in the laboratory should be ready for use as early as possible, brought to scale and tested under real conditions.

Among numerous Glatt success stories of "Lab to Market Ready" processes, one such is for the recovery of valuable phosphorus from sewage sludge ash to produce new plant-available fertilizer

granules. The process became industrial in a short time to be brought to the market. That was possible by a smart combination of process steps that have been correspondingly tested and optimized. So far unique.

> "In India, Glatt has established comprehensive engineering expertise at Delhi and the world-class manufacturing capabilities at Pune"

Thinking out-of-the-box for the entire production

But innovations require more than just the mastery of technology to develop tailor-made particles. It is the upstream and downstream process that create a functioning model: these concepts are critical, and we discuss them openly with our customers. The influence of every step to achieve the desired product quality requires broad knowledge across the entire process chain.

With the help of feasibility studies, pre-engineering phase and out-of-the-box thinking we aim to get the basics right, from the start, which ends up saving a lot of time later. The integration of upstream and downstream procedure and interaction with Glatt technology, whether fluid bed, spouted bed or powder synthesis, is of particular importance.

Customised and modular concepts

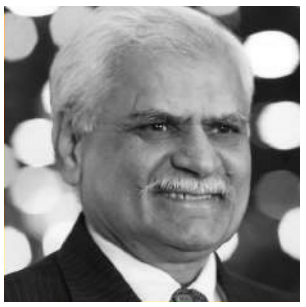
Drawing on its extensive experience in the process development field, engineering specialist Glatt helps manufacturers take advantage of the cost savings arising from modular plant design. By using proven planning modules and making use of solutions used in similar reference projects, it is possible to shorten the planning phase. Glatt offers a growing number of modular solutions, that can be pre-installed and pre-assembled to save customers an enormous amount of time and money.

Global thinking - local implementation

In India, Glatt has established comprehensive engineering expertise at Delhi and the world-class manufacturing capabilities at Pune. The Indo-German partnership has already resulted in successful projects in the fields of fine chemicals, agro-chemicals and detergent components to produce quality products.

"Creating the future will be a joint effort."

The balancing act of product and process development, from laboratory scale to large-scale production requires experimental sensitivity, material know-how and procedural expertise. We are highly motivated to think outside the box and work in tandem with the customers, to deliver innovative concepts. ■



PROF. DR. RAKESH KUMAR KHANDAL
PRESIDENT, R&D AND BUSINESS DEVELOPMENT, INDIA GLYCOLS LIMITED

MAKING CHEMICAL INDUSTRY "AATMANIRBHAR"

India's strengths are its talented human resource and sound knowledge of exploiting renewable resources. Hence, policies must be framed keeping this in mind

"Aatmanirbhar" is a term in Sanskrit which cannot be easily translated into English. Unless the philosophy of being Aatmanirbhar is understood, it is difficult to appreciate as to what all it envisages. It is not just sustainability that is time-dependent it is self-sustainability which means sustainability forever. This can be possible only if local and renewable resources are used for products for global use. A millennium ago, India was Aatmanirbhar because chemicals for all applications were derived from renewable resources. Then came synthetic chemistry and it's for all to see what it has done to mankind. It is time to get back to golden days and adopt them in the industry but of course by deploying modern technologies like India Glycols Limited (IGL) did; a perfect example of being Aatmanirbhar and the Indian chemical industry must exploit renewable resources to the maximum.

"There must be a separate Ministry for Alcohol Chemicals (renewable chemicals) and should not be clubbed with petrochemicals"

Four decades ago, when everyone was maximising the exploitation of petroleum-based chemicals, the founder of IGL M. L. Bhartia, choosing to opt for renewable chemicals, showed the way by setting up a world-class facility in the Terai region of India, adjacent to the Himalayas. He was a visionary industrialist, ahead of his times, as evident from the way IGL has established itself as a role model of self-sustainability with an installed capacity of 500,000 MT of chemicals derived from renewable resources. Today, many companies, in the world, aim to walk on a path that's traversed, all these years by IGL.

My experience of having 360° exposure to academics followed by industrial research to technology development to production including working with IGL, I have tried to bring out the gaps to be bridged to make the Indian chemical industry Aatmanirbhar.

The need for the role of Research and Development (R&D) in the growth of any industry cannot be overemphasized. Without R&D, industry will not be able to survive and grow because the chemical industry is the source point for new materials required for the development and growth of society, it is imminent that their R&D set-up is state-of-the-art. In times to come, it will be of utmost essential for the Indian chemical industry to focus on strengthening their research and innovation.

Look at the way corporations and countries across the globe are planning to change the way they work. Everyone is focusing on factors essential for their sustainability. One common strategy that is being adopted is to put in place tools to mitigate global warming and climate change. The shift from petroleum-based resources to renewable-based feed-stocks seems to have already taken centre-stage; reducing the carbon footprint of each activity is the goal now. Most multi-nationals have targeted to bring their carbon footprints down in several ways including the redesign of their consumer products with green ingredients in place of those derived from non-renewable

resources. Accordingly, they have made changes in their vision statement. At the national level, several developed countries have also made policies to minimize dependence on petroleum resources. All this will require a paradigm shift in approach to R&D. Preservation of environment and ecology would be the goal while avoiding the use of persistent chemicals. Since it is a transformational change, the role of R&D would be huge to develop alternatives (green).

> "The way public-funded R&D institutions have been working, it must change by attaching them directly to industries"

Indian chemical industry

As per McKinsey report on Indian Chemical Industry published in February 2020, it may be noted that during 2006 and 2019, the compound annual growth rate (CAGR) in total return to shareholders for India's chemical companies was 15 per cent—a figure much higher than the global chemical-industry return, with a CAGR of 8 per cent, and the overall global equity market, with a CAGR of 6 per cent. Even between 2016 and 2019, when India's economy faced headwinds, the chemical industry maintained a CAGR of 17 per cent. An incredible performance by the Indian chemical industry.

A long-term perspective indicates that India has averaged an annual GDP growth of 7 per cent for the last 30 years and now it aims to become a US $ 5 trillion economy. This long-term optimistic scenario bodes well for chemical companies.

Post-pandemic, it's expected that the following growth-oriented trends will shape things for the better:

- Global oil and gas majors are turning their sights on opportunities in downstream oil-to-chemicals; bringing higher investments and easing feedstock challenges to boost self-sufficiency.
- Changing dynamics of the chemical industry in China is due to stricter environmental norms and Indian companies will benefit. Plus, several global companies would shift their base from China to India.
- Established digital technology in India would be a lever to enhance the efficiency and productivity of the chemical industry.
- Chemical companies would prioritize projects for sustainability which is imperative and no longer a buzzword.
- India's chemical trade deficit of US $15 billion would drive investment for building self-sufficiency in petrochemicals to plug the shortfall of domestic supply of 52 per cent (by volume) in petrochem intermediates of US $11 billion.
- Possibility of capturing a global share of exports of speciality chemicals.

It may be noted that the future of the Indian chemical industry would be completing 360° of its lifecycle; being on the top three centuries ago will come back to the same level very soon. Exporting speciality chemicals, green chemicals and

healthcare products will make that happen. R&D will have a big role in it. The chemical industry has always been driven by knowledge and innovation and it would need it more in the future. Therefore, policies will have to be made such that innovators are nurtured and "local for global" would mean the exploitation of renewable resources to produce green products.

Path Forward

Policymakers must keep the following points in mind while drawing policies:

Ministry of Renewable Chemicals: India is not blessed with petroleum resources but there is enough here that can produce renewable chemicals. Alcohol-economy will be the key. The Bio-fuel policy 2018, followed by incentives for alcohol production is good but it is only the tip of the iceberg. Millions of tons of stubble, burnt each season, if converted to 2G ethanol will pave the way towards self-reliance. Further, a range of speciality chemicals from stubble will boost the export of high-value green chemicals while reducing the carbon footprint. For this, there must be a separate Ministry for Alcohol Chemicals (renewable chemicals) and should not be clubbed with petrochemicals. If there is a Ministry for Renewable Energy, Petroleum and Natural Gas then why not have one for Renewable Chemicals as well?

Incentives for renewable chemicals: Industries manufacturing renewable chemicals must be given incentives just like it is done in the developed world. Not only financially but also facilitation of technology-support must be done. They must be treated as special as they help raise the income of farmers; distilleries are vital for sugar industries which are essential for sugar cane growers. Waste from agriculture and several vegetable oils, crops like guar etc., can be exploited to produce a whole range of base materials for speciality chemicals. The governments in China, USA, EU etc. don't just aim for the numerical growth of the industry but they also support industry rendering technology interventions and give incentives for the manufacture of renewable chemicals. Why can't we replicate that here?

Inspired by Science

R&D support: There must be direct support to industrial R&D in renewable chemicals. The way public-funded R&D institutions have been working must change by attaching them directly to industries. Why shouldn't Niti Aayog handhold distilleries in India adopt 2G ethanol technology by sourcing technology for it? The recent case of import of bio-ethanol is a perfect case where government support would not only have saved foreign exchange but it would have also avoided shut down of distilleries in the wake of NGT order. To mitigate global warming and climate change, solar parks of mega-size are being put to reduce greenhouse gas emissions. Renewable chemicals from agri-waste must also be treated in the same way. Thus, government support for distilleries to adopt technology for 2G ethanol as a policy-support would serve a big deal for the environment, ecology and farming. Support should be in the form of R&D or the sourcing of technology.

Import substitutes: There must be a directory of all chemicals being imported and an assessment be made as to why they cannot be manufactured here? Niti Aayog must have a team of technology experts who must be given this task. Further, R&D support must be provided to drug and pharmaceutical industries to make them self-reliant for their requirements of intermediates and basic materials; not to depend on imports.

Export-oriented R&D: India should aim to export high-value chemicals derived from renewable chemicals. Trends indicate that demand for green speciality chemicals will rise and India must aim to become a hub of such chemicals, instead of petrochemicals.

Centre of excellence: The present system of funding research in universities, publicly funded research institutes etc. must be changed. The Centre of Excellence of Chemical Technology must be set up in universities involving research institutes and industries. Funding must be for the development of the process, technology, products etc. It should be done jointly from inception rather than searching for an industry partner.

Conclusion: India's strengths are its talented human resource and sound knowledge of exploiting renewable resources, therefore, policies must be framed accordingly. Treat availability of huge stock of agri-waste as a resource for renewable chemicals same as crude oil reserves for petrochemicals!

Keep Your Biggest Hazards And Risks From Turning Into A Nightmare

No one intends an accident to happen! Yet the recent months have witnessed multiple catastrophic accidents at too close an interval for comfort.

How sure are you that such an incident will not happen with your company?

Key Questions Leaders Need to Ask

Do I know where my biggest risk exposure is in the company today?
(Inherent risk exposure understanding)

Do we have adequate controls in place for each of those risks?
(Adequacy of risk controls design)

Are the risk controls really effective (i.e. they work well)?
(Effectiveness/integrity of risk controls to reduce risk to acceptable level)

How do I know that those controls are effective?
(Assurance on risk exposure and management system effectiveness)

Are we learning enough and continuously improving?
(Continuous improvement – risk-based)

Are answers to any of these questions not giving you enough confidence or comfort?

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SETTING UP COMPLETE VALUE CHAINS IN INDIA

Rajendra V. Gogri, Chairman & Managing Director, Aarti Industries Limited shares his views on global trends on Speciality Chemicals and pharma, plans for FY 2021-22. Excerpts of the interview:

RAJENDRA V. GOGRI
CMD, AARTI INDUSTRIES LIMITED

What are the global trends in speciality chemicals in 2021 and how will it impact India?

The global trends in speciality chemicals are a well-known combination of global companies diversifying their supply chain with a China+1 strategy, as well as the US-China trade issues and China's environmental policies driving many opportunities and interest in sourcing from India.

The speciality chemicals story in India is quite attractive with three drivers - growing domestic demand, the substitution of imports and harnessing export opportunities. Within speciality chemicals, there are many segments such as agrochemicals, dyes and pigments, flavours & fragrances, water treatment chemicals, polymer additives, etc. Each segment will have its growth trajectory driven by end-user demand and also differing industry-market dynamics. Some of these segments were negatively impacted by the COVID-19 disruption whereas others were quite resilient or even registered growth in the pandemic year.

In 2020, as the US and Europe were hit by multiple waves of COVID-19 infection, China emerged as a key export destination for Indian chemical players. Going forward, as countries and economies return to the growth path in 2021, this is expected to reverse and some speciality chemical segments may see a strong revival in demand. I think this period may see major disruptions in global supply chains as demand for some products may rise very sharply and may be accompanied by a corresponding rise in prices. As crude prices continue to move upwards, there would be further inflationary pressures on chemical prices across the board.

We believe Indian companies are at a good inflexion point and are well poised for high growth in various end-user applications. On an overall basis, we are entering the golden era for the Indian chemical industry and much more is to be achieved in this decade.

"Continue building and commissioning Phase-2 of Navi Mumbai R&D centre with double manpower while adding new capabilities and create a dedicated state of the art infrastructure"

Global trends in the Pharma industry in 2021 and how it will impact India?

According to the IQVIA's 2019 Global Use of Medicine in 2019 report, the spending will exceed US $1.4 trillion by the end of 2021. The growth is driven primarily by new products and innovative technologies in leading pharmaceutical markets, such as India, China and the United States.

This trend will likely continue through 2023 despite the pandemic. There is an opportunity for the Indian pharmaceutical industry to play a larger role in global drug supply-security. As per a McKinsey survey report, from a market size of US $12.6 billion in 2009, the Indian pharmaceutical market grew to US $ 55 billion by 2020, with the potential to reach US $ 70 billion in an aggressive growth scenario very soon. India's domestic pharmaceutical market turnover reached US $ 21.5 billion with a growth of 9 per cent y-o-y in 2020. The advantages of Indian pharma companies are cost efficiency, innovation, economic drivers, policy support, and increasing investment.

Key milestones achieved by Aarti Industries in FY 2020-21 and what are your plans for FY 2021-22?

During the year, the company commercialised a few of its critical projects for instance the expansion of Chlorination capacity from 110,000 tpa to 175,000 tpa. There are various other projects

such as projects for long term contracts, Expansion of USFDA approved facilities, etc. are lined up for commissioning and commercialisation which will drive the growth of the company for the next 3-5 years.

We have a strong project pipeline and based on the opportunities available, we firmly believe to drive the growth forward while continuing onto the growth momentum. We expect to continue investing over Rs. 1,000 - 1,200 crore annually for various such growth initiatives over the next five to six years and create a stronger presence of the company in the global speciality chemicals space.

Dspite the challenges faced during the lockdown, Aarti Industries has honoured every offer that we had made and hired more than 700 people in the last year. In addition to 700 employees coming on-board, we also on-boarded 150 management trainees from various colleges and universities across the country. We also announced brownfield and greenfield expansion, and this will require additional manpower which will be hired.

> "Digital levers like AI, ML, IoT, and Cloud Technologies will be the underlying foundation to derive Real-Time Manufacturing Insights"

Company's performance expected in terms of revenue and profit during FY 2020-21 and what is the forecast in FY 2021-22?

Aarti Industries has a high brand position in areas such as reliability, productivity and reduction in the total cost of ownership to customers. Our strategy has expanded PAT from around 7 per cent to 10-11 per cent. The Group has been growing phenomenally at a CAGR of approximately 13 per cent over the last six years.

Our financial performance in Q3 showed continued improvement and we have forecast a stronger turnaround in the second half of the financial year. The sustained strong momentum on both operating and financial parameters during the third quarter is based on improving visibility across all end-user markets. During Q3, we reported a revenue of

Rs. 1,311 crore, which was higher by 7.6 per cent Y-o-Y, driven by a turnaround in demand for our regular markets and established relationships. The company also recorded its highest-ever quarterly EBITDA, PBT and PAT for the company in Q3 FY20-21.

Our long-term ambition is to further embrace open innovation and create a fit-for-purpose and sustainable organisation. We will continue to expand our manufacturing base; launch new products; and invest in R&D, product and process development. We are also geared to benefit from the trend of global supply chains favourably looking at strong Indian chemical companies to establish long-term strategic supply arrangements. We see multiple avenues for growth, in expanding our existing value chains, getting into new value chains, co-developing new products with our customers, forming strong partnerships for tapping manufacturing outsourcing and pursuing available opportunities in the pharmaceutical sector.

How has the company performed internationally and what are your plans for exports? Are you focusing on any new geography internationally?

Direct exports account for about 40-45 per cent of the total revenues. However, a bulk of the company's products sold in the domestic market is value-added by its customers and exported for global market requirements. Thus in a way close to 65-70 per cent of the company's produce is directly or indirectly exported.

Aarti Industries has a de-risked portfolio that is multiproduct, multi-geography, multi-customer and multi-industry. Its 200+ products are sold to 700+ domestic and 400+ export customers spread across the globe in 60 countries with a major presence in the USA, Europe and Japan. Its speciality chemicals and intermediate products find usage in pharmaceuticals, agrochemicals, polymers, pigments, printing inks, dyes, fuel additives, aromatics, FMCG and various other industrial sectors. Presently, the company continues to focus on various opportunities in the end-user applications of pharmaceuticals, agrochemicals, eng polymers & various other speciality products.

The company is planning to increase its efforts towards R&D and innovation. Please take us through key R&D initiatives that the company is focusing this year and your achievements in 2020?

Aarti Industries has evolved from being a vendor to becoming a partner of choice. Our four state-of-the-art R&D centres located at Dombivli and Navi Mumbai in Maharashtra, and Vapi in Gujarat, are continuously researching to develop new products and finding a way to make the by-products marketable. Equipped with modern machinery and dedicated laboratories, these research centres promise to further enhance the product portfolio and improve the manufacturing process.

We have a clear strategic focus to become a reference in speciality chemicals and pharmaceuticals the world over. Our long-term ambition is to further embrace open innovation and create a fit-for-purpose and sustainable organisation.

Bodal Chemicals Ltd.
COLOURS. INTEGRATION. INNOVATION.

Key R&D initiatives that the company is focusing on in 2021: Continue building and commissioning Phase-2 of Navi Mumbai R&D centre with a further doubling of manpower while adding new capabilities and dedicated state of the art infrastructure for process safety and scale-up data generation facility; Setting up state of the art Bio-fermentation laboratory to support Bio innovation aspiration of the organization; and Scaling-up of several molecules from lab to pilot scale, which are critical raw material and intermediates for agro, pharma and special application.

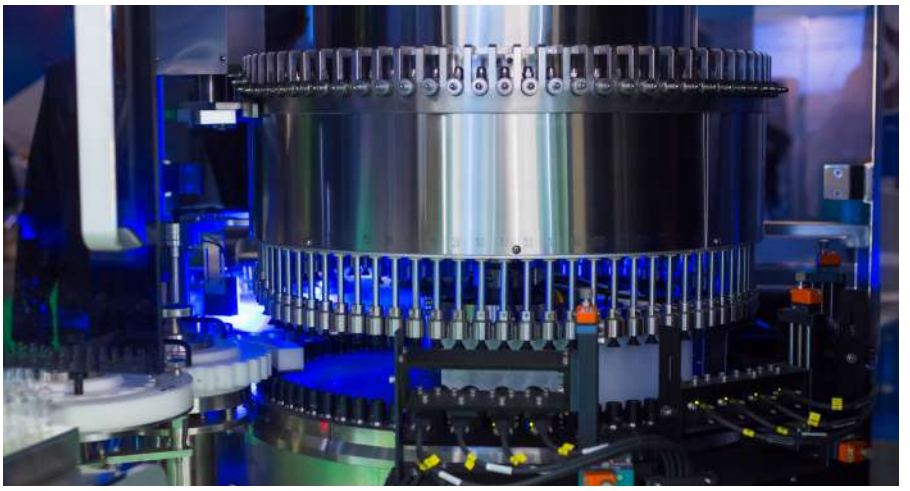
What's your plan on speciality chemicals expansion and products which you are planning for expansion?

In line with our value chain approach, our focus is to set up complete value chains in India with no dependence on imports for key raw materials. We set up the nitrotoluene value chain in 2016, which created an opportunity for setting up metolachlor manufacturing by UPL (since the key intermediate of MEA became locally available). We are now working to expand our nitrotoluene value chain as well as set up a value chain starting with chlorination of toluene over the next 3-5 years. This value chain has a current import bill of nearly US $ 300 million and also a sizable export potential. Besides, the availability of early intermediates is expected to spur downstream investments in India. While we work to set up new capacities in new and existing value chains, we are building our capabilities in new chemistries and setting up multipurpose plants to improve our speed to market going forward. We are also actively seeking opportunities to work with global chemical majors to set up manufacturing facilities in India to leverage the India advantage in terms of cost of manufacturing and investment, technical capability, improving regulatory environment and sizable domestic market.

What's your plan on API, Intermediate and Xanthene expansion?

Our Pharma business continued to deliver growth in revenue with positive operating leverage on increasing volumes. Segment revenue grew by 32 per cent Y-o-Y during Q3 FY21 to Rs. 232 crore, which is the highest ever topline achieved historically by the pharma business. Based on the higher utilization, continued throughput from our regulated market and higher contribution from value-added products and a growing pipeline of new introductions, the segment margin is seeing structural improvement.

Currently, Aarti Industries manufactures various commercial APIs with



30 US Drug Master Files (USDMF), 12 Drug Master Files (DMF), of which seven are under assessment, and 18 Certificates of Suitability (CEP), two of which are under assessment. The growth in the Pharma segment is expected to sustain as additional capacity for API and intermediates are getting operationalized soon. We are also seeing the benefits of India's improving position in the global value chain. Going forward, we will continue to drive deeper penetration in therapies such as Antihypertensive, Cardiovascular, Oncology, Corticosteroids etc. We have a strong pipeline of approval and visibility to maintain our growth. Over the years, the pharma segment has grown to a substantial scale and size, having significant further growth opportunity for it to continue with a growth rate of about 20-25% for the next 4-5 yrs.

Capex invested in FY 2020-21 and what is the plan for FY 2021-22? Plans related to automation and digitalization?

Capex for FY2020-21 is expected to be around Rs. 1,200 crore and we expect a similar range in the next financial year as well.

We at Aarti believe in constantly evolving and transforming ourselves and we have gone through transformation journeys in the past however now we are at the cusp of our next wave of business transformation which will be primarily driven by digital technologies.

Sustainability is our topmost strategic dimension and we plan to leverage AI/ML-based video analytics for contextual intelligence to improve safety and perimeter security etc. Digital levers like Artificial Intelligence(AI), Machine Learning (ML), Internet Of Things (IoT), and Cloud Technologies will be the underlying foundation to derive Real-Time Manufacturing Insights. This will empower each of our employees to make faster business decisions and help the organisation achieve data-driven excellence across the value chain of operations, expansion, R&D, strategy, people and governance.

Chatbots and Robotic Process Automation will amplify organisational productivity and improve scalability and provide 365 days of 24x7 experience to stakeholders. In the areas of operational technology, we have taken efforts to inculcate technology across all levels of Aarti Industries. The latest innovation and technologies were adopted for Digital Control Systems (DCS), Programmable Logic Controller (PLC), Foundation FieldBus, Wireless Networks, e-logbooks and SCADA systems.

We will continue to leverage advancements in cloud and information/cyber security to ensure reliability and data security.

How is the company striking a balance between environment-friendly policies and sustainable growth?

We strongly believe that sustainability and business must go hand in hand. For us, sustainability is more than just countering risks. It is a path to generating inclusive growth while reducing our ecological footprint along the value chain. Sustainability, therefore, underpins our core principles and is our driver for growth, innovation, and productivity.

Since its inception, we have strived to provide responsible solutions to our customers. And we are doing this in a manner that balances the short- and long-term interests of our stakeholders and the business, and that integrates economic, environmental and social considerations into decision making.

All our operating processes and manufacturing facilities reflect our strong commitment to environmental protection. We are constantly on the lookout for energy-efficient systems and systems that sustain air and water quality or reduce or eliminate waste. In 2020, we achieved ZLD status for two additional divisions, making 14 out of 17 manufacturing sites ZLD.

Future business outlook for Aarti Industries in FY 2021-22?

Aarti Industries, with its integrated value chain and diversified product mix, strong technical capabilities, robust track record and cost-efficient operations, forms an ideal fit for entities looking for alternate suppliers independent of China. Aarti Industries is a knowledge-driven organisation, where we strive towards converting today's knowledge into tomorrow's chemistry. We

PI: AMONGST TOP 5 PLAYERS IN THE AGRO CHEM CSM SPACE

Mayank Singhal, Vice Chairman & Managing Director, PI Industries Limited shares his views on trends on crop protection chemicals, R&D, production capacity, CSR activities, outlook, and much more. Excerpts of the interview:

MAYANK SINGHAL
VICE CHAIRMAN & MANAGING DIRECTOR, PI INDUSTRIES LIMITED

What are the global trends in the Crop Protection Chemicals industry in 2021 and how will this impact India?

This year we expect the global crop protection chemicals industry to grow at 2-3 per cent. LATAM and Asia markets will be the growth regions and the same will be the case in India. COVID-19 may have distorted the global supply chains but overall there is minimal impact. Stringent regulations causing some products to go off the market and diversification of the global supply chain will be the major trend.

How do you look at R&D Services, CSM Services and Distribution Services concerning Crop Protection Chemicals?

Although historically there has been a limited opportunity in R&D services, this has considerably changed. Global majors find space (Field trials, toxicology studies, etc.) to outsource to Indian CROs and we expect this will grow. Growth in CSM Services is a major success story and for PI in particular. Major factors including geopolitical tensions, cost advantage, respect for IP, and accumulated expertise will make select Indian players continue to grow in this space, provided safety and sustainable practices are stringently followed.

With a large Indian agriculture space and a limited number of registered agro chem products, we see plenty of opportunity in distribution services in India. COVID-19 accelerated the move to online marketing and reaching out to farmers directly but there is still a long way to go.

"There are 5-6 pipeline molecules at various stages of development to be commercialized during 2021-22"

What is the company's production capacity? How is it spread across the world? How do you plan to increase the market share?

Overall, we have 15 multi-purpose plants across various locations in West India. We have invested in Capex over the years and continue to invest to meet the growing demand from customers. Domestically, PI operates in a limited set of products and enjoys a significant market share and leadership position in those products. PI also figures amongst the top 5 players globally in the agro chem CSM space, particularly in the early stage molecules.

Please take us through key R&D initiatives in 2021?

PI is known for its R&D capabilities across the globe. We continue to make significant investments in our Process R&D and various technologies to cut down costs. This year, we are focusing more on scaling up products through sustainable green initiatives.

Key milestones achieved by PI Industries in FY 2020-21 and what are the plans for FY 2021-22? New products where you are focusing and how will it impact PI Industries?

Key milestones during FY 2020-21 include integrating Isagro with PI thereby maximizing synergies and capacity utilization. We created a differentiated focused strategy on horticulture crops through Jivagro and integrating the manufacturing operations with that of PI's CSM business. We commissioned four molecules at the Isagro site. We successfully scaled up Awkira, launched Londax powder, and completed recertification audit for ISO 17025 at PNL & JMB and (QMS) IMS audit. We raised Rs. 2,000 crore via QIP route (which generated 6x interest) to pursue inorganic growth opportunities (diversification into adjacencies, including pharma).

For FY 2021-22, we have 5-6 molecules at various stages of development and ready to be commercialized. Anoth-

er is that MPP to be made ready besides high visibility of sustainable growth. We are actively evaluating pharma assets and continue building a strategic roadmap of diversification, leveraging on existing strengths. We are looking at new IP for deepening our technological capabilities, de-risking current operations, and opening up newer opportunities We aim to demerge the B2C business of Isagro to Jivagro and merge Isagro's manufacturing business with PI CSM.

Company's performance expected in terms of revenue and profit during FY 2020-21 and in FY 2021-22?

For our 9M FY21, our top line has grown by around 35 per cent YoY and PAT has grown by around 61per cent YoY and we expect to exceed our original guidance to grow by around 20 per cent on a YoY basis. For FY 21-22, while our business plans are still in the process of finalization, we aim to maintain the growth momentum and achieve PAT growth of around 20 per cent.

The demand for key commercialized molecules remained strong. There has also been an additional contribution from Isagro and robust momentum in PI's leading brands. We have also managed to have strong control on overhead costs accompanied by healthy collections.

> "In FY20-21, we have invested capex to the tune of more than Rs. 600 crore. In FY21-22, we will continue to invest in new MPP, technologies, and pharmaceuticals"

Capex invested in FY 2020-21 and what is the plan for FY 2021-22? What are the plans related to automation and digitisation?

In FY20-21, we have invested Capex of more than Rs. 600 crore. In FY21-22, we will continue to invest in new MPP, technologies, and pharmaceuticals.

To give you examples of our digitisation initiatives, during this year, we have deployed sales order applications across all zones, allowing mobile and web-based order placement by sales force and channel partners. The automated Fleet Management of Application Spraying services and ARIBA sourcing platform are being planned as well.

How is the company striking a balance between environment-friendly policies and sustainable growth? Are key CSR initiatives being undertaken by the company?

With a firm conviction in the business case of sustainable development, we have been steadily imbibing it with increasing investments in social and environmental aspects. We undertake various initiatives on clean technology, energy efficiency, renewable energy, and water conservation to address global environmental issues such as climate change and global warming. Our manufacturing facilities are also equipped with the amenities that help recover, recycle and preserve and reduce water consumption, which in turn, contribute to our Green Initiatives.

Empowering local communities is the foremost constituent of PI's sustainability policy. Our efforts at water conservation through community programs won us CII's National Award for Excellence in Water Management 2020.

Our CSR strategy consists of the integrated and all-around development of the communities in which we operate. Over the years, we have worked on propagated Direct Seeded Rice technology amongst farmers; mobile Healthcare Vans around our plant location, facilitated through PI's Swasthya Seva initiative and Blood Bank services; women empowerment programs; learning enhancement programs for providing quality education to school children; and 1,800+ youth gained employment post completion of, free of cost, employability linked skill training and market initiatives at our skill development centre in Bharuch.

INDIA AS A HUB FOR CHEMICAL MANUFACTURING

Maulik Mehta, CEO, Deepak Nitrite Limited shares his views on global trends, company's performance, R&D plans, supply chain plans, plans of DPL and DNL, expansion plans ,and CSR activities. Excerpts of the interview:

MAULIK MEHTA
CEO, DEEPAK NITRITE LIMITED

What are the global trends in the chemical sector and how will it impact India?

The chemical industry across the globe is undergoing a strategic shift in the supply chain from China to India as a source of raw materials. This presents an opportunity for India to be the global hub for chemical manufacturing.

There is an increased focus on down-stream value-added products. We expect govt to promote the setting up of new Naphtha cracking units to meet the growing demand for building block chemicals for down-stream industries.

China's commitment to be Carbon Neutral by 2060 is one major reason for stringent environmental norms and tightening of financing options for polluters. This evaporates their erstwhile advantage and now brings such companies on par with Indian environmental and financing benchmarks. If Indian manufacturers can supply quality material in the desired quantity, then this shift of sourcing from China to India will become sustainable.

Post-Covid, countries across the globe are focusing on China+ 1 Policy, we expect the Government to extend the Productivity Linked Incentive (PLI), scheme to the chemical sector to capture the global market efficiently.

Trade conflicts across major economies present an opportunity for Indian chemical manufacturers to consolidate their position as a supplier to the global chemical market.

India's growing per capita consumption and demand for agriculture and pharmaceutical-related chemicals offer a huge scope for the sector. The government has promised to bring PLI in agrochemical manufacture but the government should also include AI (Agro-ingredients) manufacturers for Agrochemicals to complete the value chain and lower our dependence on AI import from China.

With the increase in upward mobility and per capita GDP, Indians will not only increase consumption of bulk chemicals that eventually go into end segments like consumer goods and automobiles etc. but it will also consume more of personal care products, Agro-chemicals and in-turn speciality chemicals.

Key learnings for the company during COVID-19 and how are you planning to deploy these learnings in 2021?

COVID-19 challenged a lot of preconceived notions of business. The company decided to double down on its responsibility for protecting both the safety and livelihood of its employees during the pandemic ensuring that nobody was let go and salaries and wages were not only paid in full but even increased to tide them through a difficult period. The company prepared for worst-case scenarios and created 'safety bubbles' where critical employees would be housed in safe zones and transported between pre-booked houses/hotels and the factories. It also ramped up social outreach to improve health and nutrition in villages surrounding all our facilities. Safety of men, material, and equipment was taken as a top priority which helped us avoid accidents that could arise from limited manpower and mitigate potential damage from Cyclone Nisarg that ravaged the coastal areas in Maharashtra in July'20.

We studied the challenges of the lockdown and the reopening of the economy in China and chose to prioritise local employment in contract labour and forward booked container and shipping rates in anticipation of shortages.

"Deepak Nitrite has recently acquired 127-acre land in Dahej, which will be developed over the next couple of years. Further, it has plans for medium to large investments each year for the next 2-3 years"

Company's performance in terms of revenue and profit during FY 2020-21 and what is the forecast in FY 2021-22? What are the growth drivers?

For FY 2019-20, consolidated revenue stood at Rs. 4,265 crore while Profit was at Rs. 611 crore. For the quarter ended Q3 FY21 Revenue was at Rs. 1,240 crore, up by 9 per cent YoY and profit stood at Rs. 217 crore, up by 38 per cent YoY.

Our major growth drivers are a consistent focus on production, productivity, and a customer-centric approach.

In production, we focus on opportunities such as Brownfield expansion of key products; downstream production in existing value chains; and new product development for new platforms.

In productivity, our focus is mainly on: Process before product; Value from waste initiatives; and Improvement on SHE scores and asset integrity.

In a customer-centric approach: We ensured timely delivery and good quality products to our customers when demand for an end application returned, and offer innovative solutions to customers to help them reduce their Opex.

> "On the lines of Aatmanirbhar Bharat, DPL aims to make India self-reliant on Phenolics and explore various value-added, downstream products from Phenolics and Acetone"

What are the upcoming research initiatives at Nandesari R&D centre and any plans of adding manpower in the R&D division?

We focus on 2 channels: product development and process intensification. The company has quadrupled investment into R&D with a mix of talent, instruments, and software and plans to set up a new R&D centre at the outskirts of Baroda.

How is the company developing robust supply chain infrastructure and logistics? What are your plans for 2021?

To monitor a vast network of logistics and vehicles covering raw materials, finished products, including spent, we have implemented a GPS enabled tracking system, monitored 24/7. This system has been implemented by one of the best-in-class vendors, LCS. Further, Deepak Nitrite Limited (DNL) is a Star Export House and Authorised Economic Operator (AEO) holder.

How has Deepak Nitrite performed in 2020 and plans for 2021? What is the current manufacturing capacity and

how do you plan to scale it up and make India self-reliant?

We follow lean manufacturing concepts and work on sweating our plants to maximise plant utilisation. Our asset turnover is more than 2.5 (Net sales/ Gross assets). The company has begun site development of its newly acquired land parcels in strategic locations that will house new products from DNL and its subsidiary Deepak Phenolics Limited (DPL).

How has DPL performed in 2020 and plans for 2021? What is the current manufacturing capacity and how do you plan to scale it up and make India self-reliant?

DPL witnessed revenue increase by 37 per cent q-o-q to Rs. 747 crore in Q3 FY21 compared to Rs. 545 crore in Q2 FY21. Initiatives such as elevating plant efficiency have resulted in utilization above 115 per cent of stated capacity. Growth in EBITDA at 36 per cent was in line with revenue growth and the EBITDA margin was stable.

The current manufacturing capacity of Phenol is 200 KTPA, Acetone 120 KTA, IPA 30 KTPA. Further, IPA capacity will double within the first two quarters of FY22.

On the lines of Aatmanirbhar Bharat, DPL aims to make India self-reliant on Phenolics and explore various value-added, downstream products from Phenolics and Acetone.

Our Phenol and Acetone and upcoming derivatives project are all - a step towards building India's chemical security. At full capacity, we anticipate that Deepak Phenolics will save close to US $400 million in the value of imports for the country. Besides, many SMEs will also benefit due to the local availability of Phenol and Acetone.

Deepak Group has six manufacturing facilities. Does the company plan to set up any new manufacturing plants or expand into new territories?

Deepak Nitrite has recently acquired 127-acre land in Dahej, which will be developed over the next couple of years. Further, it has plans for medium to large investments each year for the next 2-3 years.

We are looking at creating value by backward integration, export substitution as well as exploring possibilities in new territories of speciality chemicals. We are aggressively investing in R&D to build in-house product development capability. This will help us to create a pipeline of products to drive future growth.

How is the company striking a balance between environment-friendly policies and sustainable growth? What are the key CSR initiatives being undertaken by the company?

The company is accredited with Responsible Care and has taken targets for achieving TfS scores of 90+ for all its sites.

New products will be launched keeping the strictest effluent treatment norms in mind, with ZLD wherever possible. We will also enhance the focus on developing a circular economy with our value from waste initiatives.

As a part of building R&D capability, we have put up a treatability study lab to develop the most environmentally friendly treatment processes. Our investment in R&D will also help us develop and implement green chemistry to drive growth in an environmentally friendly manner.

"Our investment in R&D will also help us develop and implement green chemistry to drive growth in an environmentally friendly manner"

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"2021 WILL BE A YEAR OF CONSOLIDATION"

Madhav Prasad Aggarwal, Promoter, Sajjan India Ltd. shares his perspective on a range of issues that include expansion plans, R&D focus, government policies, and business outlook. Excerpts of the interview:

MADHAV PRASAD AGGARWAL
PROMOTER, SAJJAN INDIA LTD.

What is Sajjan India's plan to become a top contract manufacturer of speciality chemicals?

We have been in this space for the last couple of decades starting with dyes and pigment intermediates. For the last 20 years, we have been into custom manufacturing or contract manufacturing where we obtain technology from foreign partners and fine-tune it. We make it more efficient and competitive than it has been with the inventors, scaling it up as per current manufacturing excellence standards which also means automating the plants. Not just during the COVID-19 situation but we were always working on improving technologies and automation. Such activities continue on full-fledged mode and are the best way forward for the chemical industry.

We see encouraging opportunities, mainly for existing players who have a proven track record and who can handle complex reactions and hazardous raw materials which I would say is knowledge-based. With the experience, we have gained over time and the fantastic team we have created, we see ourselves being able to perform very efficiently to the satisfaction of our foreign partners.

Industry trends in 2021?

I think it will be a year of consolidation during FY 2020-21 and FY 2021-22 in the sense that Chinese industries have faced immense challenges in the last few years due to environmental and safety reasons. A lot depends on what happens vis-a-vis the Chinese industry as well. Having said that the Indian industry has matured quite a bit and all the new expansions which are being undertaken by the existing players are of very good standards.

"We are setting up a new manufacturing plant on a newly acquired 16-acre plot, diagonally opposite to our current site in Ankleshwar, Gujarat"

I think rather than new entrants coming in, existing players who have learned excellence in manufacturing during the last 20-30 years are in a better position to cope with the pressure and invest sensibly. There are a lot of entry barriers when it pertains to the IP situation as well as huge investment needed for the manufacturing of speciality chemicals besides technical know-hows, waste treatment plants, affordability etc. Therefore, I don't see too many new players entering this space but the existing ones will grow bigger as they are in a better position to take advantage of the business opportunities.

Would you like to brief us about your new manufacturing plant?

We are setting up a manufacturing plant on a newly acquired 16-acre plot, diagonally opposite to our current site in Ankleshwar, Gujarat. As such Sajjan India has been into chemicals since 1974 but the Ankleshwar plant was commissioned in 1997 and it has since grown steadily. We have more than 500 people on the site now despite the COVID-19 situation. Our team has done an exceptional job since April 2020, operating very safely with no surprises.

We hope to commence the manufacturing in the new plant by the end of 2021, as planned and this will be for some new agro-molecules to be produced for the first time in India, involving very complex chemistry and reactions. We are all very excited and hope to be market leaders in the product segments which we anticipate to be launching by the end of FY 2021 and FY2022 onwards.

What is the investment that you are planning?

In 2020, we have already invested Rs. 140 - 150 crore. Going forward in 2021, we are planning to invest Rs. 300 crore on expansion. I am glad to mention that we are the only company operating in this space with zero debt and we expect

to remain so.
This will be an agro-based molecule being developed in collaboration with foreign partners and a lot of fine-tuning by in-house process experts to make it efficient and cost-effective.

be helpful for customers in the spice and food business. However, the previous two partnerships are relevant to the chemical, petrochemical and related industries.

> "This will be an agro-based molecule being developed in collaboration with foreign partners and a lot of fine-tuning by in house process experts"

As far as ETIA is concerned, it is primarily into the products for steam sterilisation. It is most relevant for food products where there are pests that need to be eliminated using the steam sterilisation process. I feel that since RIECO caters to many industries apart from chemicals, this solution will also

What kind of processes is your R&D team working on?

We have a couple of PhDs in our team who are heading different verticals in our R&D department and there are well-qualified employees and some chemists who are working 24*7. With brainstorming internally and with foreign partners who are from top-line multinationals based in Europe and the USA, they try to make the process and manufacturing much more efficient besides trying to minimize very critical waste.

Revenue and profit forecast during FY 2020-21 and FY 2021-22 respectively?

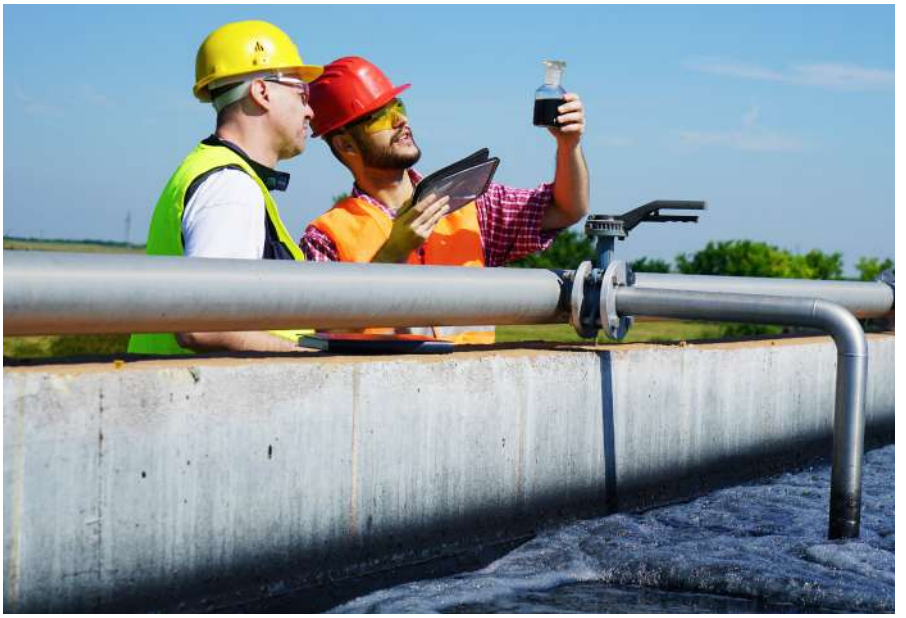
It is not actually out of design but out of default that somehow our revenues have grown more in the agriculture space contributing to more than 75 per cent and we think it will be in the same range, 75-80 per cent in next few years as well. In terms of numbers, up to March 2021, I think our top line will be around Rs. 1,100 - 1,200 crore. In 2022, we expect it to be more than Rs. 1,500 crore and this is entirely exports. We are a 100 per cent EOU and even though it permits a lot of sales domestically, a lot of products, close to 95 per cent are for exports only.

We are cautious in outlook. We don't want to grow just for the sake of numbers but it should be a win-win situation both from the top-line and bottom-line. As far as profitability numbers are concerned, these are more or less aligned

with industry trends. We beat the industry a bit because of zero finance cost and better cost structure. I think our numbers are better than the industry average.

Any specific reasons for not taking debt from the market?

Right from the inception itself, we have been very conservative about borrowing. We have never been comfortable with debt as we are cash surplus and always witnessed positive cash flow. Also being a 100 per cent closely held company, I don't see any reason to borrow so far.



Being an employee-friendly company are you looking at any role model companies to replicate their strategy?

Yes, of course, I think so. My grandfather who started our textile business and my father are my role models. I am proud that some of our employees who had been hired by my grandfather as early as 1957 when he bought a textile mill in Madhya Pradesh, remained with us throughout. One of them recently passed away after a long association with us. There are second-generation employees as well who are attached to us for a long time.

What I have understood and always believed in is that while no doubt qualification is important, discipline, dedication and loyalty are equally important too. That's what I firmly believe in and with the same spirit, we treat a large number of employees in a dignified manner, doing innovative things and helping them in ways that are not just standard but out of emotions. When we are doing a lot in the CSR space then why not begin at home and that's the spirit we operate with.

CSR activities planned in 2021?

So far what we have done is a lot more in the area where we exist in Gujarat and that includes Plant Technology Study Centre, Sajjan Lions International Academy, one of the modern schools in that area. We also promoted the Department of Chemical Engineering which is a part of SR Shroff Institute. I am glad to mention that we have a long association with the Breach Candy Hospital in Mumbai and now are also a part of their expansion plan. They are developing an eleven-storeyed building and for two floors we are contributing Rs. 22 crore that will host ICU and other ultra-modern facilities. We are also in process of such initiatives with new colleges and universities in Gujarat. Healthcare and education appeal to us most and we are committed to it.

Any comment on the upcoming PLI scheme?

My personal opinion is that while we have many disadvantages compared to other countries, we must learn to live within the limited resources and tackle the challenges. I feel one should not just rely on incentives but perform honestly and efficiently. At the same time, I am not saying that we are not entitled to schemes or these are not required but I feel these should be made more stable and we must increase their visibility. One major concern is that policies are issued at short notice and withdrawn at short notice therefore these schemes should be consistent and with enough notice so that plans can be made well in advance. I hope there is more timely clarity about such schemes and inconsistency gets addressed appropriately.

Sajjan Group has been predominantly into exports are there any plans to cater to domestic customers?

It's not that we don't want to sell domestically but the products we are manufacturing don't have any use for domestic customers. These are very specialized end-use applications for products that are by and large patented by the inventor companies. Sometimes we have seen that some product line from Germany and Switzerland has moved back to India and that is contributing to 5 – 7 per cent of our sales. We would be happy to cater to the Indian market if there is an opportunity.

From jute to textiles to chemicals, the Group has acquired a lot of new verticals? What is the success mantra?

For continuous success in any business, we have to follow a simple rule and that is to maintain financial discipline, stay honest, remain simple and delegate responsibility.

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"ENTERING INTO CHLOR ALKALI AND NEW SEGMENTS"

Ankit Patel, Executive Director, Bodal Chemicals Ltd. shares his insights on global trends, milestones achieved, growth forecast, R&D initiatives, expansion plans, Capex, and others. Excerpts of the interview:

ANKIT PATEL
EXECUTIVE DIRECTOR,
BODAL CHEMICALS LTD.

Global trends in Dyes, Intermediates and Dyestuff in 2021 and how will it impact India?

Indian dyestuff sector has been a consistent and strong supplier across the world for a few decades now. Bodal being most integrated and with large export and domestic sales network, it is going to benefit a lot from the fast-growing dyestuff demand from across the world. Dye Intermediates sector does not have much availability from Chinese players so Indian players are going to have a good run in 2021. Bodal is the largest dye intermediates player in India with 20-25 per cent capacity of India's total capacity.

In the current global Industrial trend, the entire world is seeing India as the upcoming second largest manufacturing hub of the world and it is obvious that all the manufacturing companies specifically chemicals will benefit from the same.

Global trends in Speciality Chemicals in 2021 and how will it impact India?

The COVID-19 has opened doors for many Indian chemicals companies. Now the world has started seeing India as an alternate and strong source for their chemical requirements and they are seeing companies who can provide a one-stop solution for many of their requirements and Bodal has that platform, where it can fulfil the requirements of different industries by our integrated ecosystem.

"In the coming year, we are looking at higher growth"

Key milestones achieved by Bodal Chemicals in FY 2020-21 and what are your plans for FY 2021-22? What are the new products that you are focusing on and its impact on the company?

If we see FY 2020-21, it will be a very challenging year for the entire world as the economical trend is down on all fronts. As per Bodal Chemicals focus, we are in acquisition mode for the last three years and in those acquisitions, few are strategic and has built our strength and helped us to enhance the overall ecosystem. Our expansion of business is not limited to India only but also at a global level in countries like China, Turkey, Europe, Indonesia etc. We are also focusing on new products like Benzene and its derivatives. We are now entering chlor alkali with the latest acquisition in North India so these new sectors will contribute to our existing business performance.

Company's performance expected in terms of revenue and profit during FY 2020-21 and what is the forecast in FY 2021-22? What are the growth drivers?

In the coming year, we are looking forward to achieving higher growth. The latest acquisition and new product development will help Bodal to grow big.

How has the company performed internationally and what are your plans for exports? Are you focusing on any new geography internationally?

We have acquired companies in Turkey, Europe and have a subsidiary in China so we can easily cater to the respective geographical territory. We are also planning to focus on other global territories, where we have a good customer base and demand. These business decisions will help us to enhance our export business and develop a global presence.

The company is planning to increase its efforts towards R&D and innovation. Please take us through key R&D initiatives that the company is focusing on in 2021 and your achievements in 2020?

"In FY2021-22, Bodal is planning to invest Rs. 300 crores at greenfield plants in Saykha GIDC"

We have a dedicated R&D lab for the Dyes & Intermediates and now we are focusing on Specialty Chemicals so keeping that goal in mind we are enhancing R&D capacity for the new products and derivatives. We continuously work with the chemical departments of prestigious universities of Gujarat.

What's your plan for Speciality Chemicals expansion. Areas where you are expanding?

The strategy for expansion is on two fronts - one is acquisition and another is a venture into new product manufacturing plants. We are now entering Chlor Alkali and also working on Benzene based speciality chemicals at Saykha GIDC, Gujarat.

What's your plan on Dyes, Intermediates and Dyestuff expansion. Areas where you are expanding?

We had expanded our production capacity last year in Dyestuff. We are planning to start VS capacity at our subsidiary SPS processors in the next few months.

Capex invested in FY 2020-21 and what is the plan for FY 2021-22? What are the plans related to automation and digitisation across all its operational facilities?

In 2020-21, Bodal invested Capex of around Rs. 10 crores and acquisition of Chlor Alkali complex will be done at around Rs. 145 crores. In FY2021-22, Bodal is planning to invest Rs. 300 crores for greenfield plants Saykha GIDC. In FY 2022-23, Capex will be Rs. 200 crores to finish greenfield projects and capacity upgradation and expansion.

How is the company striking a balance between environment-friendly policies and sustainable growth?

We have installed the world's best-advanced technology at the environment front, for that, we have a tie-up with Advent Envirocare at the technology front. We also have sustainability as one of the goals and to give focus input for the same we have restructured our safety function and enlarged their role as Environment, Health, Safety & Sustainability (EHSS) function. We are also participating in different certification programs and acquainted with ECO certifications like ISO, Bluesign, ZDHC and GOTS.

Key CSR initiatives being undertaken by the company and plans for 2021?

As an organisation, Bodal Chemicals believes in everyone's growth and success. During this pandemic period, we did lots of activities like distributing food to the needy; providing shelter to the migrants; extending and driving special support to the front runners such as police, medical staff, etc.

"WE SEE A HUGE GROWTH OPPORTUNITY FOR CHEMICALS"

Vikas Bhatia, Managing Director, RIECO Industries Limited shares his views on industry trends, number of installations, revenue and profitability numbers, partnerships, solution offerings, and others. Excerpts of the interview:

VIKAS BHATIA
MANAGING DIRECTOR, RIECO INDUSTRIES LIMITED

The year 2020 was not a good year for businesses due to COVID-19 pandemic. How do you see the industry trends in 2021?

It is an interesting question that is on every industry leaders' mind as there are apprehensions as to how 2021 would unfurl after COVID-induced shutdown and recession. The good news is that the Indian economy is looking very robust and demand has picked up for various sectors. And certain sectors that were resilient to the recession were performing even through the lockdown such as food, pharmaceuticals, intermediate chemicals. The industries which were hard hit are aviation, hospitality, and some related industries but overall, the forecast is that the Indian economy is robust. Similarly, for the chemical industry, we see a huge growth opportunity because the demand for both bulk chemicals and speciality chemicals continue to grow. That will fuel the growth of the entire industry.

Out of 5,000 installations completed by the company, how many installations are related to chemical, petrochemical, gas, energy, agrochemical, and pharmaceutical?

On average, we complete over 300 installations in a year and typically 40 to 50 per cent of this business is generated from industries such as chemical and petrochemical. The number would be anywhere between 100 to 120 installations. We work with all kinds of players in the market including big, medium, and small ones as well. Depending on the need, we have provided different kinds of installations, both in terms of grinding, powder conveying, and dust collection or air control pollution as we call it.

> "We are looking at recording a 5 per cent growth with profit margins remaining more or less intact, as we had witnessed during the previous year"

How many of them will get completed in a year or so?

Typically, the project timeline depends on the complexity but we would say that projects that are undertaken by us typically take anywhere between 3 to 6 months. Few could go beyond 6 months also. For companies that have placed orders at the beginning of last year, the execution has been happening and because of this, we haven't faced any revenue shortfall. We continue to hold the revenue numbers as we have done for last year. The momentum is expected to grow further.

In 2020, RIECO partnered with D-camp, RSBP, and ETIA. How have these partnerships helped the company in terms of solution provisioning?

We have added these partners in 2020, a lot of time was lost because of the ups and downs of the pandemic. However, our overall capacity to serve our customers has improved and so has our solution providing capability.

Let me begin with D-camp, a Spain-based organization that has built solutions for VOC abatement which means whatever volatile oil compounds are coming out of various processes are exhausted before the air is released into the atmosphere. Those solutions will be very helpful wherever the industry process is generating any kind of volatile compounds. E.g. oil and gas. So, any kind of gas that needs to be flared up can be passed through the RTO solutions. This way apart from dust control, we can also have a solution for VOC abatement which D-camp has to provide.

Similarly, RSBP is a global player in providing fire and explosion safety devices. Since most of the chemicals and petrochemicals are explosive or subject to fire,

risks are always present. Now containing those risks is important for any industry as we have seen many safety-related incidents happening. This will reduce the overall risk associated with such processes.

As far as ETIA is concerned, it is primarily into the products for steam sterilisation. It is most relevant for food products where there are pests that need to be eliminated using the steam sterilisation process. I feel that since RIECO caters to many industries apart from chemicals, this solution will also be helpful for customers in the spice and food business. However, the previous two partnerships are relevant to the chemical, petrochemical and related industries.

Please share revenue and profitability numbers in FY 2019-20? What is the forecast for FY 2020-21?

I cannot disclose the numbers fully as we are a private limited company. However, I can share that in this financial year, we are expecting to grow at a modest level because we have consciously understood the impact of lockdown and the pandemic. We have been taking orders consciously and wherever we feel that liquidity will be ensured for the execution of orders, we have been choosing those.

This year we are looking at recording 5 per cent growth with profit margins remaining more or less intact, as we had witnessed during the previous year. However, FY 2021-22, we are forecasting huge growth. We already have good enquiries from the customers, giving us enough confidence that we will be able to achieve more than 30 per cent growth over the current fiscal.

What would fuel this growth during FY 2021-22?

The growth would be because of pent up demand and that organisations that had kept their expansion plans on hold are back into the game. The second is that the economy is going to grow because the government is pushing local manufacturing in a big way and also working on various schemes. India is a huge manufacturing destination and with both the private sector and government working together on infrastructure and other areas, we are confident that the sector will witness huge growth in the coming years.

> "We are also offering remote diagnostic tools to customers. If they allow their equipment to be driven on IoT, we can diagnose and fix the issues remotely and ensure their optimal functioning"

What portion of your revenue is within India and outside India in FY 2019-20? What is the forecast for FY 2020-21?

RIECO on average gets 10-15 per cent of its revenue from export markets. However, this percentage is set to increase as we have consciously also focused on growth in the overseas markets. We have been participating in various international forums, conferences and trade fairs. Unfortunately, because of this pandemic, all the activities remain suspended for a year. However, on the virtual forums, we are doing a lot of push, expecting that during the coming year, 20 per cent of revenue will come from international sales.

Countries where you are active?

We are largely focused on South East Asia and Middle Eastern markets. We are also evaluating if the Africa market presents us the opportunities. We are looking at neighbouring markets like Sri Lanka, Bangladesh, and Nepal. We have already done business across these countries in 2020 and at the beginning of 2021 and are expecting that they will continue to offer growth opportunities in the coming years. We are also looking at the South East Asian markets such as Thailand, Malaysia, and the Philippines and then the entire Gulf market as it is a major petrochemical market.

Plans for FY 2021? Are there any plans for adding manpower?

In this financial year, starting from April 2020, we already have added 80 people to our organization. We recently hired 12 fresh engineers from colleges. We continue to expand and going further we have aggressive expansion plans to add another 80-100 people into various functions such as sales, engineering, and execution.

Notable achievements of the company in the last 45 years?

RIECO has been a pioneer in equipment and solutions where powders and bulk solids are concerned. We are the first to introduce the air classifying mill to grind fine powder and apart from developing such innovative solutions, we are also very pleased to have partnered with key government institutes such as ISRO and DRDO to develop equipment and solutions for advanced rocket fuels and missile fuels. We have also worked

with companies in the cement and power industries and done remarkable work in reducing air pollution load across sectors. In the last 45 years, we have executed several such notable projects that have contributed to the environment besides working on energy efficiency projects.

How are your solutions helping the chemicals and petrochemicals industry?

These solutions are applicable in the previous and current years as well. The new chemicals launched in 2020 will be applicable in the future too. These solutions help run various processes wherever powder handling is concerned. What can organisations expect from RIECO is that we will be able to produce world-class solutions for powder handling and dust treatment so that they have the highest quality products without any contamination, clean and safer workplaces, higher productivity, and hygienic handling.

Godavari Biorefineries Ltd

RIECO is a leading player in powder and bulk solid technology. What have been your notable deployments in 2020?

We have commissioned projects for several clients with the handling of speciality and hazardous chemicals. At the same time, we are providing a 200 horsepower air classifying mill which is one of the largest in India.

RIECO has done pretty well in the pneumatic conveying systems in the chemical and petrochemical industry. What are the recent achievements?

In 2020, we have done several projects involving big chemical players such as Hindustan Liver, Rallis Chemicals, and Henkel Chemicals where we have provided solutions for the chemicals that are typically difficult to handle or toxic. We ensure that the transportation of products from the tanker to silo or vice versa happens safely and without any contamination.

What are the innovative products you are planning to introduce for chemicals and petrochemicals during FY 2021?

In 2021, we have many product launches that are lined up. One of them is a first of its kind 200 HP Pulverizer that is used for pulverizing coarse powder into a fine powder. We are also developing a solution for fused compressed air consumption in pulse jet bag filters that to clean the bags compressed air is used. So, by way of a very efficient pressure monitoring based system, we will be able to reduce the air consumption which is used in bag hoses and bag filters. This will help reduce the energy footprint for the organizations that are using those devices. We are also developing more efficient grinding mills and also working in the area of mixing and blending. So, wherever there is a batch blending or continuous blending of powders, we are developing solutions. These too are expected to be made available to customers in 2021.

Do you see any change in business functioning in the next five years?

In the next five years, system integration is something that most customers are expecting and using more electronic, be it IoT or database systems. People are looking for efficient systems to run their businesses as manpower is hard to get and also in case of hazardous industries where utmost precautions are required.

We are also offering remote diagnostic tools to customers. If they allow their equipment to be driven on IoT, we can diagnose and fix the issues remotely and ensure their optimal functioning. We are also working on improving the capacity by working on processes by debottlenecking and also helping customers to get better yield and reduce the energy footprint per tonne. The customers are expecting better yield, lower energy consumption, safety, and automated systems that can be run remotely.

How is RIECO adding value to its customers for the solutions you are providing?

For customers, we are trying to reduce the downtime for the equipment and improve overall maintenance. We also are offering annual maintenance contracts wherever such equipment is concerned so that these are kept in the best working conditions and generate maximum yield for users. We are also providing Vendor Management Inventory stores at the customer premises for ensuring the availability of spare items all the time, thus keeping a high uptime for their equipment and plant. This is something customers always strive for.

"TARGETING A GROWTH OF 35 PER CENT IN FY 2021-22"

Priyamvada Bhumkar, Managing Director, Soujanya Color Pvt. Ltd. spoke about the global trends, R&D initiatives, manufacturing, capex, CSR initiatives, and much more. Excerpts of the interview:

PRIYAMVADA BHUMKAR
MANAGING DIRECTOR,
SOUJANYA COLOR PVT. LTD.

Global trends in Colorant in 2021 and how it will impact India?

The world is still grappling with the COVID situation and we are witnessing different scenarios globally. The demand in the emerging markets and particularly in India has seen an increased uptake. But on the supply side, there are issues of availability and crisis. Supplies particularly coming from Europe and China show a greater impact. Inflationary trends on prices of most materials are real and are putting a lot of pressure on companies top line and bottom line.

Soujanya Color is top 3 colorant manufacturers globally. Reasons for your success?

Soujanya Color's success globally is based on several factors. The key among them has been our unrelenting focus on the core business of colourants, technological strength, building vast operational and supply chain capability, deep understanding & commitment towards global customers and understanding the fine nuances of different global markets.

We are looking to sustain and grow our market share by entering new markets where we see significant potential and by expanding our product and service offerings for newer industries. For example, we have been able to make inroads into Latin American markets with the focus that we have had on that market, building a large footprint in the entire region including countries like Mexico, Costa Rica, Guatemala, Brazil, Argentina, Chile, Ecuador, Peru, Venezuela, etc. We will begin manufacturing in Mexico this year with a new plant for which we have already finalised a location. We propose to cater to the entire South and North American market from this plant.

"The Mexico plant will entail a modest capital investment this year and acquiring land for our further expansion in India will also entail some investment"

In terms of products and industries, we have etched out newer verticals for our business. In the past couple of years, we have developed products and colour solutions for the inks, personal care, construction and plastics industries. These strategies will allow us to move ahead and sustain and grow our market share.

Milestones achieved by Soujanya Color in FY 2020-21 and plans for FY 2021-22?

FY 2020-21 has been challenging for everyone but we have emerged well. We will see a growth in volume and value of 10-15 per cent despite the lockdown situation in the first quarter of FY 20-21 and the credit for this goes to our team.

For FY2021-22, we have set a 35 per cent growth target for our business. We hope to start our Mexico manufacturing plant this year. We plan to strengthen our global footprint by being closer to our customers in each region. During the past couple of years, we have established a subsidiary in Mexico and branch offices in Singapore and Brazil. This will allow us to be local in those regions and service the customers there well.

Company's performance vis-a-vis revenue and profit during FY 2020-21 and forecast for FY 2021-22?

We will close this year with volume growth of about 10 per cent and value growth of about five to seven per cent. We expect profitability to be more or less in the same range. We have yet to assess the impact of the surge in raw material prices but hope that these will be offset to some extent by some of the other costs being lower due to the COVID situation.

We are targeting a growth of 35 per cent for the next year and are confident of achieving it. Growth drivers for our business in the coming year would be as follows: Demand uptick from not only

the domestic markets, but we are seeing significant growth in our exports; focused marketing efforts for selected markets such as Latin America, Africa, the Indian subcontinent and South-East Asia; focus on new industries of inks and personal care, and strategies for an integrated supply chain to strengthen our cost and service advantages.

How has Soujanya performed internationally? Are you focusing on any new geography?

We have performed well internationally. Exports have been a strategic focus area, as we have built significant capabilities over the years to cater to global markets. We are looking at exports as a thrust area and have made plans to grow our exports by 80 per cent this year. In the past couple of years, we have established a subsidiary in Mexico and branch offices in Singapore and Brazil. We plan to start a manufacturing facility in Mexico in 2021. With all these plans on the anvil, we are looking to focus on Latin America, SEA, Asia and Africa. We also have plans to explore USA as a market for our industrial colourants and dispersions for inks products.

R&D initiatives that the company is focusing in 2021?

R&D and Innovation have been a key focus area for our business. The development of new products and complete solutions in colour have allowed us to be in sync with emerging market trends, technological changes and customer expectations. Our R&D function is integrated closely with our marketing teams which allows them to understand customer needs better. It is also integrated with our manufacturing process to quickly standardise and scale up new products seamlessly.

Our key achievements in 2020 have been the development of full range of colourant solutions for our printing inks customers and a line of colourants for the personal care industry. We have also successfully developed and standardised a system of industrial colourants for wood and industrial coatings for a leading paint company in Asia where we replaced European products. Establishing Soujanya in the LATAM markets has been another key achievement.

For 2021, we have charted out an aggressive R&D program: Consolidating product offerings for the ink and personal care industries with new developments in solvent-based and UV curable inks; consolidating market share in paint & coatings sector by doing customized developments of colourants for key customers; cost will be a major focus area and we look forward to doing a lot of work on cost optimization of formulations to combat input price increases, and green and sustainable chemistry will be another focus area to meet regulatory and environmental standards of global markets.

> "We are looking at increasing automation with end-of-line packaging solutions through robotics, etc. to boost productivity and efficiencies"

Are you planning for manufacturing expansion within India or outside India?

We are planning for both. In India, we are in the process of expanding our capacities by 30per cent to keep up with demand. We will be expanding not only constructed space in our plant but also installing new equipment for handling higher volumes. A new manufacturing facility is also on the cards in a two to three-year time frame.

Internationally, we expect to set up a new manufacturing facility functional this year in Mexico. This plant would cater to our markets in North, Central and South America. We are also looking at acquisition targets in the colourant space for speed of growth.

Capex invested in FY 2020-21 and plans for FY 2021-22? Automation and digitalization plans?

We do make Capex investments on an on-going basis to support our growth plans. The Mexico plant will entail a modest capital investment this year and acquiring land for our further expansion in India will also entail some investment.

As far as automation and digitalization are concerned, we operate a fully automated manufacturing plant on the PLC SCADA system which is the largest in Asia. We are looking at further automation in manufacturing this year with end-of-line packaging solutions through robotics, etc. to boost productivity and efficiencies. In 2021, we are working on integrating the PLC SCADA system with SAP S4 Hana 1610 on Google Cloud for seamless data transmission and better analytics.

Future business outlook in FY 2021-22?

The future business outlook looks bright, exciting and luminous with endless possibilities for growth, development and putting Soujanya as a dominant player in the field of colour. We are quite confident of achieving our target.

"AIMING TOP POSITION IN THE EPC INDUSTRY FOR H2O2"

A. K. Tyagi, CMD, Nuberg Engineering Limited spoke about industry trends, partnerships, installations in 2020, revenue and profitability in FY2020-21, solution offerings, R&D facility and IoT portfolio. Excerpts of the interview:

A. K. TYAGI
CMD, NUBERG ENGINEERING LIMITED

What are the industry trends in 2021?

The COVID-19 pandemic has brought an unprecedented challenge to the EPC industry. Undoubtedly, it has changed the way we think, live and do business. It has negatively affected both the demand and supply side of industrial projects and there are fundamental shifts that the EPC sector will need to navigate for a successful year. This includes increasing and ageing world population-based change in demand, changes by oil-based economies, enhanced digitization and increased need for environmental sustainability. Some of these shifts were already underway in the sector; now, there are added changes emerging out of the pandemic year including the move towards local production of essential products, realignment of supply chains and remote management.

While the changes may look daunting, the opportunities in the EPC sector are huge and the challenges are surmountable for players who commit to global leadership. The world will be a better place with the foundation laid by the EPC sector and 2021 looks to be the landmark year for the sector.

Installations related to chemical, hydrocarbon and fertilizer sectors in 2020?

We have quite a few projects currently running with large Indian PSUs. One project with Oil and Natural Gas Corporation (ONGC) is being completed in Karaikal. Following this, we have two other projects with ONGC in Uran and Hazira. There are also projects going on with Hindustan Petroleum Corporation Limited (HPCL) and High Explosive Factory (HEF). We are also working with Ordnance Factories Board (OFB) for defence requirements and have a project underway with the TATA Group. We have also won a Hydrogen Purification Dispensing plant project for Indian Oil Corporation Limited (IOCL) in Gujrat, India.

We have commissioned one plant in chemical and two plants in the hydrocarbon sector in 2020.

"We are working across various markets worldwide and hope to have new clients from Africa, Central Asia and Southeast Asia"

How have partnerships helped in terms of solution provisioning?

With an experience of over 25 years in the industry, we have worked all around the globe with almost all the technology licensers for products that we operate in. This makes it easy for us to get technological tie-ups and thus gives us an additional edge while pitching for a new customer. Association with various technology partners and licensers have helped Nuberg EPC hone itself into a globally excelling EPC and LSTK organization in the market today.

We have been able to position ourselves as the number one player in the EPC industry for Hydrogen Peroxide and Calcium Chloride. We are the number two EPC Company for Caustic Soda/ Chlor-Alkali Plants globally. We are amongst the world's fastest-growing EPC organizations with a specialized team of more than 300 engineers providing global competitiveness.

Share revenue and profitability numbers for FY 2019-20 and what is the forecast for FY 2020-21?

While the profit ratio in FY20 was robust with a CAGR of 30%, the year 2020 impacted the entire industry. We are likely to see a drop from the high growth rate in FY21. The situation has been volatile and we can only expect marginal growth in FY21.

What portion of your revenue is within India and outside India in FY 2019-20 and what is the forecast?

In FY 2019-20, 10 per cent of revenues

were from within India and 90 per cent from overseas markets. We are expecting the same ratio in FY21. We are presently executing projects in countries such as Egypt, Saudi Arabia, India, Oman, Algeria, Bangladesh and Morocco.

Are there any plans for adding manpower, entering new geographies, and increasing new processes for the company?

We are working across various markets worldwide and hope to have new clients from Africa, Central Asia and Southeast Asia. With expected business growth we will surely look at augmenting our talent base too.

Nuberg EPC provides multiple solutions. List some of your wins in 2020?

As a single point solution company, we provide services in chemicals, hydrocarbons and fertilizers from concept to commissioning. We make sure that experts and engineers can fully handhold every project to ensure completion safely and dependably. Clients get EPC and LSTK solutions from us that are not only cost-effective but also safe, reliable and environment friendly. It is this strength that helped Nuberg EPC win the Sprea Misr 500 TPD Sulphuric Acid Plant project on EPC & LSTK basis in Ramadan City, Egypt during the pandemic. Recently, we have also won a new project in Gujarat in association with Indian Oil. This Hydrogen Purification Dispensing Plant project is the first-ever fuel cell grade plant in India. Other recent project wins are from Assam Bio-Refinery and Rashtriya Chemicals & Fertilizers (RCF).

What are the innovative products/solutions that you are planning to introduce in 2021?

Apart from Chlor Alkali, Caustic Soda, Sulphuric Acid and Hydrogen Peroxide, we have delivered several other projects/products such as Anisole, Sulfolane and Sulfur Bentonite. With our R&D facility, which has been our speciality, we have pipelined products that are in process for the customers to experience.

How are you planning to leverage your R&D facility based in Sweden?

We have an R&D facility in Sweden to bring innovative process technologies to our customers. At present, we have developed and patented technology for Hydrogen Peroxide. In future, we would be developing other process technologies too that are cost-efficient in terms of process design and plant project management.

> "Nuberg EPC is fast incorporating the latest in digital technologies and work processes which includes IoT-enabled monitoring and maintenance of projects and commissioned plants"

Where will be Nuberg EPC placed in the EPC segment, and what is your USP? Do you plan to incorporate IoT based products/solutions in your portfolio?

We are already globally recognized as the number one player in EPC for Hydrogen Peroxide and Calcium Chloride. We are also identified as the number 2 EPC company for Caustic Soda/Chloro-Alkali plants globally. We hope to become global leaders in more product areas and proudly represent Indian excellence.

Under our USP's, we can proudly mention that we are the single point solution company that has been working for more than two decades to provide our clients with cost-effective and top-notch quality plants. We are a team of specialized engineers who have been dedicated to serving and delivering clients all across the globe with engineering, procurement, construction and commissioning.

Also, with over 60+greenfield project executions and zero accident in our history so far, we hold a global experience to provide safe, reliable and timely delivery of industrial plants.

Nuberg EPC is fast incorporating the latest in digital technologies and work processes which includes IoT-enabled monitoring and maintenance of projects and commissioned plants. We are also incorporating Big Data for smarter design and inspections, AI-driven intelligent automation, AR and VR for superior safety, communication, and training and 3D software for accuracy in delivery.

Automation in the EPC industry requires unique skill sets and technical capabilities and that provides a competitive edge when bidding for projects. Automation enables the development of the detailed initial design that is more than 95 per cent fit thus enabling real-world estimation of engineering resources, material and labour. Such automation also helps us to focus on construction execution and related supply chain at an earlier stage thus compressing timelines and costs.

Nuberg EPC is also moving towards skid-mounted plants which will drastically compress the time required to build plants, especially for small size plants. Nuberg EPC will also be able to provide clients with significant cost, timeline and modularity advantages.

"WE PLAN TO GROW OVER 50 PER CENT IN 2021-22"

Sunil Chari, Managing Director and Co-Founder, Rossari Biotech Limited shares his views on global trends on Performance Chemicals and Textile Speciality Chemicals, new products, company's performance, R&D plans, Capex investment, CSR plans, and others. Excerpts of the interview:

SUNIL CHARI
MANAGING DIRECTOR AND CO-FOUNDER, ROSSARI BIOTECH LIMITED

What are the global trends in Performance Chemicals in 2021 and how will it impact India?

In 2021, Performance Chemicals will increase by 5-10 per cent globally. The impact of COVID-19 will continue in 2021 and as a result travel restrictions would reduce travel. There will be fewer one-to-one interactions, digital meeting and wearing a mask is the new normal. In 2021, the raw material price trend shows that this year, the market will be more volatile because of the uncertainty of availability and new norms laid out by the government. It will impact India in the second half of 2021. The increase in raw material prices will impact the price of finished goods and this will lead to inflation. Presently, there is huge volatility in crude oil and hence the crude oil-based raw material price will increase. The focus is on being more sustainable and how it creates more value from every rupee spent on speciality chemicals, in short, we are talking about Chemistry 5.0.

Global trends in Textile Speciality Chemicals in 2021 and how will it impact India?

The global textile chemicals market size valued at US $ 23.62 billion in 2018 and is expected to grow at a Compound Annual Growth rate (CAGR) of 4.5 per cent from 2019 to 2025. Environmental concerns associated with textile chemicals have shifted the focus of major manufacturing companies toward green (bio-based) chemicals that are eco-friendly. Companies involved in the manufacture of bio-based chemicals offer cost competitiveness owing to the availability of low-cost feedstock.

There is an increasing demand for sports and activewear on account of the use of antimicrobial finishes for manufacturing such products. Textile chemicals help prevent odour and bacterial infection caused by the sweat trapped in clothing such as undergarments, socks, T-shirts, and other sports apparel. The rising demand for customized solutions is expected to significantly boost the overall product application.

In the Indian context, the fluctuating raw material prices of phenols and surfactants are expected to pose a challenge for the market players to achieve profitability and economies of scale. The majority of manufacturers in India have shifted their focus towards investing in product innovation supported by the Make in India scheme of the government.

"Majority of manufacturers in India have shifted their focus towards investing in product innovation supported by the Make in India scheme of the government"

Key milestones achieved by Rossari Biotech in FY 2020-21 and plans for FY 2021-22?

Few of the major key milestones achieved in the FY 2020-21 include setting up a Centre of Excellence at IIT, Bombay at Powai, commissioning of the Dahej project, tie-up with CSIA, Mumbai Airport, branded dispensers, and supply sanitisers for the use of passengers, foray into E-commerce by listing HPPC products on the Amazon platform.

Our key priority and strategic aim are to grow across all the areas of application in all our four core chemistry areas that we excel in. As we move ahead, we will continue seeding new businesses with the existing assets. We are working intensely on attaining more and more capabilities and building relevant infrastructure to foray into newer areas where we foresee sizable growth. We reaffirm our commitment to sustainable growth and enhanced value creation and remain resolute to

work towards building the 'Rossari' of tomorrow. This, in popular parlance, is termed as "Ross-Era 2.0" within our organization.

For the HPPC division in 2020-21, we are very much in control of COVID-19 and hence if we can sustain our business then it is the biggest milestone we have achieved. In the case of Rossari, we retain our customers, sustain the ups and downs due to COVID-19, and last but not least grow by approximately 20 per cent as compared to FY 2019-20. We have started our new plant at Dahej and successfully delivered goods from there. For FY2020-21 we have big plans. Apart from the soaps and detergent business this year we will focus more on paints and coatings; pulp and paper; cement and industry; water and wastewater treatment.

This year we plan to grow over 50 per cent this financial year compared to the last and give more time to new developments.

In the textile business, we manufacture over 1,500 products that find applications across the entire textile value chain. The target plan for FY2021 is to enhance focus on Health, Hygiene & Wellness products resonating with the current situation and increase in profitability. Another target is to add more product lines in Dyeing Auxiliary & Weaving Preparatory segments, such as Sizing and Yarn Lubricants. We also aim to expand the existing portfolio of sustainable and green products.

Company's performance expected in terms of revenue and profit during FY 2020-21 and what is the forecast in FY 2021-22?

Our revenue and gross profit till the period ended in December 2020 were Rs. 491.12 crore and Rs. 179.54 crore respectively. We are projecting 12-15 per cent growth for FY 2020-21. There is an uptick in our TSC and AHN division from Q2 and has started regaining pre-COVID levels. The HPPC segment has been our major growth driver. The revenue from HPPC business for 9 months is 59 per cent which we expect to grow considering the potential in this segment.

Company's performance internationally and what are your plans concerning exports?

Our total export revenue forms 10-12 per cent of our total revenue which we expect to continue. The domestic markets for the businesses we are in are very huge and it gives us tremendous opportunities to increase our share therefore the focus would be developing domestic markets by continuing the same levels of exports.

> "We are working on attaining additional capabilities and building relevant infrastructure to foray into newer areas..."

Key R&D initiatives that the company is focusing on in 2021?

Our new state-of-the-art certified R&D laboratory at Rossari Centre of Excellence at IIT, Bombay is fully equipped with advanced testing and research equipment. Engaged in innovative and developmental research, our R&D lab will become a game-changer in innovation, optimal efficacy, and indigenous technical prowess. It offers numerous benefits such as fruitful partnership and beneficial projects; facilitating alliances with leaders engaged in sustainability, new materials, and performance chemicals; and leveraging PhD projects to tackle long-term problems. These benefits will help us understand the ever-changing needs in the speciality chemical industry and help us in our long-term strategies.

With the new R&D lab, we aim to set-up a new ecosystem that boosts innovation with new technologies and sharper focus. This will help us in creating both sustainable and commercially viable solutions for our customers. The new infrastructure facilities will help us catalyse the faster commercialisation of innovations.

Capex invested in FY 2020-21 and what is the plan for FY 2021-22?

Our budgeted Capex for the Dahej facility is Rs. 108 crores of which we have already spent approximately 80 per cent to date. Instead of project Capex, there will be only maintenance Capex in FY 2021-22.

How is the company striking a balance between Environment-friendly policies and sustainable growth?

With regards to scalable and sustainable growth, we have grown our business sustainably – even in the face of formidable odds – and today we are reputed as a stable, sustainable, and robust organization. In addition to our rigid focus on sustainable chemistry, our enduring business is helping us build a sustainable future and deliver continuous value to all our stakeholders. Our customers, vendors, and employees have been equal participants in the journey we have embarked upon. Our strategy, execution, and agility speak for themselves. As the demand for sustainability rises and contributes to our competitive advantage, we continue to realize the value of our sustainability-minded investments. We move ahead with a clear strategic am-

bition of focusing on the main value to be generated from sustainability and a commitment to drive change.

How will the digital transformation projects initiated by the company be beneficial in the long run?

We at Rossari, thoroughly believe that the future is digital and we have already taken the steps in this direction. Our presence on prominent social media platforms like Facebook, LinkedIn, Instagram and Twitter can be seen with a good number of followers. This is backed by strong and relevant content which keeps the viewer's interest high.

What are the key CSR initiatives being undertaken by the company and plans for 2021?

In Surat and Silvassa, we granted rented scholarships for higher education, promoted girl child education, and contributed to educational institutions for the distribution of books and education equipment. We also contributed to the establishment of medical health centres. For relief and rehabilitation in Karnataka, the company contributed towards the rehabilitation of disaster-affected areas. Under community empowerment through pan-India activities, we contributed towards community empowerment projects, like setting up homes and hostels for women and orphans, shelter homes, and educational institutes. As India battled the COVID-19 crisis, we pledged our support to help the nation fight against the virus. To make people adopt stricter COVID protocols like wearing a face mask or washing hands, our Healthcare Heroes went above their call of duty.

We partnered with Lepra Society to deliver sanitisers to Bihar and Andhra Pradesh for leprosy patients. We are also associated with an NGO Salute2doctors to assist the medical personnel fighting the Coronavirus by distributing sanitisers and disinfectants to Tier 2 cities in southern India, including Bengaluru, Hyderabad, and Coimbatore, among others. We distributed sanitisers to various sections with our partner Bhilwara-based Prakash Dyechem. We also reached out to underprivileged children in 40 orphanages, childcare facilities, and observation homes in Mumbai, and supplied them with sanitisers and hand washes.

What is the future business outlook for the company in FY 2021-22?

We are excited about the opportunities that lie ahead of us. Our key priority and strategic aim are to grow across all the areas of application in all our four core chemistry areas that we excel in. Further, as the Dahej plant gets commissioned by the end of the year, our short-term goal will continue to attain higher capacity utilisation. we will continue seeding new businesses with the existing assets. We are working on attaining additional capabilities and building relevant infrastructure to foray into newer areas as we see a lot of promise.

Petrochemicals

Fuelling The Future Of Value Chain

WINNING IN INDIA'S PETROCHEMICAL MARKET

The market is projected to grow at around 8 per cent CAGR over the next 15 years and India will need more than 15 world-scale petrochemicals assets by 2035 to meet its domestic demand

SUDEEP MAHESHWARI
SR. PRINCIPAL, KEARNEY,
(MANAN SHAH AND NEIL MERCHANT)

The petrochemicals sector is projected to emerge as the primary driver of growth for the global oil and gas sector, accounting for more than a third of incremental oil and gas demand by 2030. This trend is being driven by the overall growth and profitability of petrochemical products and stagnating global demand for fuel. The global petrochemicals landscape has been facing significant uncertainties and volatility in the recent past — including the recent wave of global trade restrictions, growing environmental headwinds emerging from the circular economy mega trend and rising ban on single-use plastic as well as COVID-19 led demand shock. Over the next decade, growing Asian capacity, coupled with the significant expansion plans of select players in the US and the Middle East, is projected to create excess supply across select key petrochemical chains. This evolving supply-demand landscape could potentially disrupt traditional petrochemicals trade routes and market setups.

Amid this growing global volatility, India has emerged as an island of hope for petrochemicals. With significant

"A robust portfolio strategy for the Indian petrochemicals sector needs to build in flexibility for product evolution over time"

import dependence and high-demand growth, India is one of the world's most attractive markets for new petrochemicals. COVID-19 resulted in a short term demand shock but the market has recovered sharply since October 2020. The sector has shown significant resilience and the long-term growth story remains intact. The market is projected to grow at around 8 per cent CAGR over the next 15 years (see figure 1), and India will need more than 15 world-scale petrochemicals assets by 2035 to meet its domestic demand. Given this, India's petrochemical sector is now witnessing a significant investment boom, attracting capital from both domestic and international players, to set up several multibillion-dollar assets.

Six trends will shape the Indian petrochemicals landscape over the next decade.

Gold rush for petrochemicals: India's petrochemicals capacity is projected to grow by more than 30 per cent between 2017–2025. The number of domestic refinery-linked petrochemical assets is expected to grow from 12 in 2010 to 19 in 2030. Also, new refinery expansion projects and greenfield refineries are being built with an integrated petrochemical configuration, with HRRL, HMEL, and the West Coast refinery being notable examples. Availability of these petrochemical building blocks will create a snowball effect for downstream setups in India.

The dichotomy of oversupply and deficit: At an industry level, petrochemical demand is expected to outpace supply, leading to a continued net deficit across most molecular chains. However, this demand-supply picture is more nuanced for several key products. For example, India is a net exporter of benzene and butadiene. However, it continues to have a significant deficit in downstream products such as styrene, polycarbonates, and butyl rubber. Similarly, India is balanced to slightly surplus in polypropylene but the rest of the C3 chain (e.g. acrylics, oxo-alcohols, etc.) are largely absent. Even for products that are in surplus, select grades continue to be imported in significant quantities.

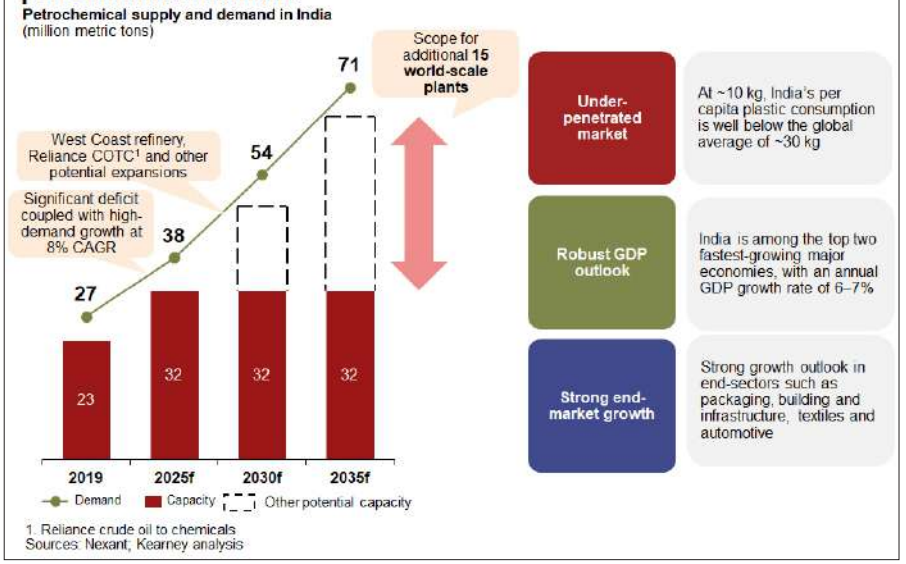
Choice of feedstock platform: Historically, naphtha has been the dominant feedstock in India. However, improving the availability of alternate feedstocks like shale gas is likely to challenge this status quo. Globally, several established players in the western world have upgraded their assets to increase flexibility in their production to improve long-term competitiveness. In India, Reliance has already installed an off-gas cracker complex of about 1.5 MMT with the capability to use both propane and ethane as feedstock. Going forward, Indian petrochemical players will need to carefully assess the Capex versus Opex implications of building feedstock flexibility in their existing and upcoming petrochemical assets to mitigate risks and build a long-term competitive advantage.

Partnerships to go far and fast: Indian petrochemicals industry has primarily grown through organic expansions. However, the industry is increasingly opening to mergers and acquisitions

"M&A activity among complementary players can help create world-scale businesses that are greater than the sum of their parts"

Figure 1 –

India's strong market fundamentals will drive rapid growth in petrochemical demand



1. Reliance crude oil to chemicals
Sources: Nexant; Kearney analysis

(M&A). First, global oil and gas, and chemical giants are targeting big-ticket investments in established domestic companies to pave their entry into India. Second, strategic partnerships are emerging between global and domestic players to leverage the former's technological expertise and the latter's understanding of the Indian market. For example, Indian public sector undertakings (PSUs), Saudi Aramco, and ADNOC are evaluating setting up a West Coast refinery/petrochemicals complex with a total investment of US $ 45 billion and a petrochemical capacity of 18 MMT. Finally, global players are also targeting niche manufacturers to diversify downstream, like DSM India acquiring SRF's engineering plastics business. The enhanced pace of M&A opportunities in the Indian petrochemicals market can potentially shift competition dynamics, with India emerging as the next frontier for growth.

The massive push to go green: The global sustainability megatrend, driven by changing consumer preferences, non-governmental organization (NGO) activism, and a push from regulators, is driving petrochemical producers to focus substantially on embedding sustainable practices across their business.

In India, environmental action has taken the form of state governments enacting stricter regulations to ban single-use plastics. A much-discussed nationwide ban on single-use plastics is projected to impact plastic consumption by 10 per cent. In the coming decade, we expect sustainability and the circular economy to drive steady disruption across the petrochemicals landscape, leading to the emergence of new stakeholders (for example, recyclers) and new partnership models in the value chain.

Dynamic regulatory environment for trade: We expect the evolving regulatory environment for trade to continue to be a significant driver of market dynamics in the Indian petrochemical industry. As the demand-supply situation continues to evolve across product categories, we expect the regulatory framework to also evolve in terms of change in tariff structures or other non-tariff mechanisms – e.g. recent increase in PVC duties from 7.5 per cent to 10 per cent in 2019. This could change the competitiveness of global imports vis-à-vis domestic players. Overall, incumbents and new entrants will need to factor in a dynamic regulatory environment as they prepare their business plans for India.

Five imperatives for riding the petrochemicals wave: The coming decade in India's petrochemical opportunity is likely to be characterised by substantial opportunities and disruptions. We see five key imperatives for players going forward.

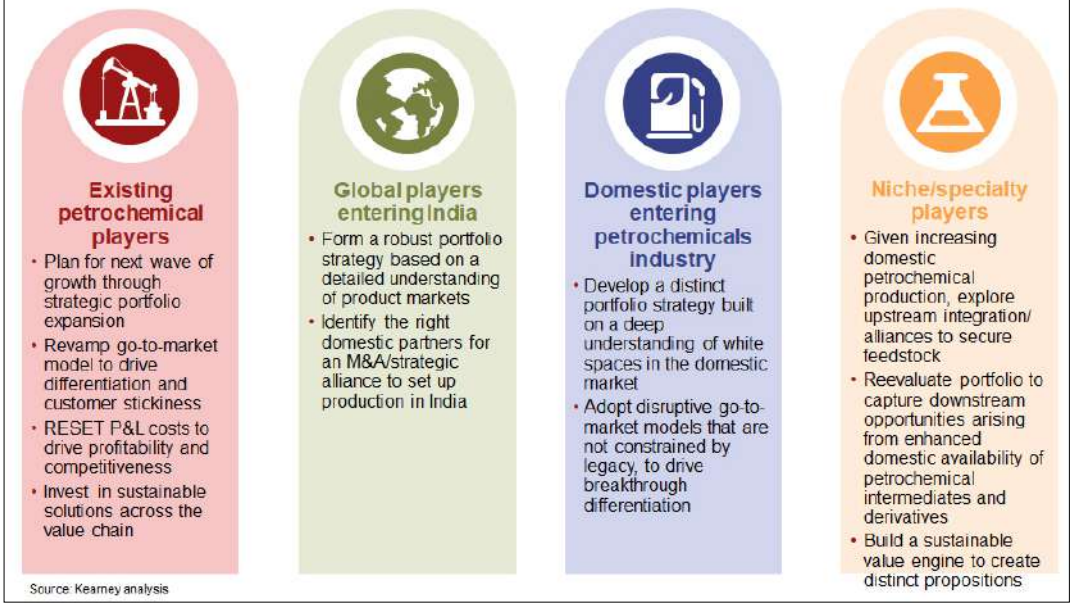
Place the right portfolio bets: Investing in the right molecular chains and evolving a robust product portfolio will differentiate players in the long-term. A robust portfolio strategy for the Indian petrochemicals sector needs to build flexibility for product evolution over time, product switches for netback optimization, and synergistic offerings for high-value propositions. Incumbents focusing on commodity products will need to identify downstream derivatives for their next wave of growth while ensuring healthy returns and synergies from existing portfolios. New entrants can enter one of the white spaces in downstream petrochemicals products or expand into competitive segments with a better value proposition. Finally, niche petrochemicals and speciality players that depend on large petrochemical facilities for feedstock need to re-evaluate the availability of intermediates and building blocks amid rising domestic petrochemical capacities.

Adopt differentiated go-to-market models: Indian GTM models have seen limited differentiation, and most channel partners have often added limited value beyond expanding customer reach and extending credit to customers. While these models have served well so far, we expect a significant evolution driven by three fundamental shifts.

First, with surging competition from export-oriented global capacities, margins in commodity products will increasingly be under pressure. As a result, Indian players will need to start moving towards low-overhead, no-frills, digital-first models.

Second, as end applications become more sophisticated, customers will demand more from suppliers. Petro-

Figure 2 –
The best way to ride India's petrochemicals wave varies by stakeholder



Source: Kearney analysis

chemical producers will need to invest in developing tailored offerings, such as joint application development, product testing, or other services that have a significant bearing on customer buying decisions. This will require building strong in-house technical capabilities and reorienting the salesforce towards value-based selling.

Third, while channel partners will remain important, the channel mix will need to evolve with market changes. Partners will need to evolve as digital adoption, improved supply chain infrastructure, and increased availability of formal credit make the traditional intermediaries business model redundant. Going forward, producers will need to rethink the channel structure and strike the right mix of small versus large channel partners as they diversify their product portfolio, grow volumes, and cater to evolving customer needs.

Undertake digital-enabled P&L RESET: Operational excellence will remain a key success driver for Indian petrochemical players. Given legacy cost structures associated with some incumbents' older assets, a focused enterprise-wide P&L RESET might be warranted. A successful P&L RESET begins with a bold, non-negotiable target (for example, 2x EBIT within 18 months). Senior leadership needs to energize the program through their total commitment and support it with the right capabilities, processes, and enablers.

Companies can leverage six levers as they embark on a P&L transformation journey.

1. Pricing excellence can provide 2 to 5 per cent improvement in the top-line and profitability: For chemical commodities, it is critical to identify a comprehensive set of price drivers, not just market-related, but also customer- and order-specific. Players need to move away from subjective "gut" calls to more analytics-driven processes to arrive at customer-specific target pricing. For speciality chemicals, it is critical to establish transparent costs and margins for stock-keeping units, and a value-based pricing approach to extract maximum value.
2. A zero-based approach is highly effective to drive leaner organizational costs. Starting from a zero-base challenges legacy costs, ties costs to specific functions and activities and establishes transparency to avoid blanket changes. Such an approach can drive 10 to 15 per cent improvement in sales, general, and administrative costs.
3. External spend on materials and services often represents more than 70 per cent of the total costs. Strategic sourcing levers combined with analytical enablers can unlock tremendous value within this spend. Players must take a business-driven approach and prioritize the right analytical enablers as they extract maximum value from their suppliers.
4. Digital-led efficiency improvements in manufacturing and supply chain operations present the biggest area of opportunity, which was not traditionally available. For example, petrochemical plants generate vast amounts of data, which can now be processed using machine learning-based advanced algorithms to drive yield improvements without Capex investments. Overall, players can reduce conversion costs by 5 to 10 per cent by embracing digital operations.
5. Working capital optimization represents another opportunity to derive value. Scientific inventory norms based on factors such as safety stock, cycle stock, and service level can help optimize raw material and finished goods inventory. Smart management of accounts receivables and payables is another area that can free up cash from the balance sheet.
6. With the upcoming wave of investment in petrochemicals, players

need tight Capex management to ensure on-budget and on-time completion of projects. Given high complexity, project management can be complicated with more than 61 per cent of the projects ending up above budget and approximately 40 per cent ending up behind schedule. A robust Capex management approach, with a strong focus on value generation and assurance, can result in a 4 to 6 per cent reduction in Capex cost and drive value via on-time completion.

Strengthen M&A and partnership capabilities: Strategic partnerships will be one of the winning themes for petrochemical businesses in India. M&A activity among complementary players can help create world-scale businesses that are greater than the sum of their parts. As incumbents and new entrants prepare their India partnership road map, we believe there are three key success factors. First, identify the growth objectives and identify internal and external capabilities required to achieve them. Second, on an ongoing basis, scout for potential partners that can support the growth ambition. Finally, set up a strong in-house team with robust M&A experience in deals of the projected size.

Embed sustainability into ways of working: Sustainability is bound to be high on the agenda for petrochemical manufacturers going forward. Forward-thinking companies will be stewards of sustainability and avoid business disruptions, such as a sudden demand decline because of a plastic ban. Four moves will be essential to building a sustainability value pillar:

* Develop a clear strategy, carefully considering where to play and how to win.
* Be willing to experiment to fine-tune and arrive at the right value chain play.
* Scout for partnerships rather than reinventing the wheel.
* Build a sector consortium to engage in positive public relations among key stakeholders.

The growth story continues

India's petrochemicals market has enjoyed strong momentum over the past few years, and we expect the growth story to continue. However, with growing domestic and global supply, increasing trade uncertainties, and a growing regulatory focus on sustainability and the circular economy, several disruptions could alter the petrochemical landscape. In this context, incumbents, as well as new entrants, will need to carefully assess their options and build a highly differentiated "Made for India" strategy to capitalize on the attractive opportunities and to overcome the unique challenges posed by the Indian market.

MILIND S. PATKE
EXECUTIVE DIRECTOR – BIOFUELS, BHARAT PETROLEUM CORPORATION LIMITED (BPCL)

USE OF ETHANOL IN FUEL BLENDING

Increasing usage of ethanol produced from domestically grown sugarcane can help India reduce its dependence on the import of crude oil

India, one of the fastest-growing economies, is heavily dependent on the import of crude oil to fuel its growth. Post-industrial revolution, fossil fuels have been the primary sources of energy in the transportation sector. As a cleaner alternative energy source to manage carbon imbalance in the environment, Biofuels have increasingly become indispensable for sustainable development towards Atmanirbhar Bharat with significant socio-economic benefits, while meeting growing energy needs.

India's National Policy on Biofuel - 2018 aims to tackle these twin challenges of emission and import reduction by encouraging increased use of biofuels in the energy and transportation sector.

The policy has given indicative targets to achieve 20 per cent ethanol blending in petrol and 5 per cent biodiesel blending in diesel by 2030.

Ethanol as a Fuel

Ethanol is a better blend component for petrol due to the higher Research Octane Number of 108.5 which helps in improved engine power and performance. It also helps in significantly reducing other pollutants (carbon monoxide, sulphur oxides, nitrogen oxides, hydrocarbon and particulate matter) in vehicle exhaust when compared with fossil fuels.

Ethanol has a lower calorific value of around 6,400 Kcal/Kg as compared to normal petrol (around 10,000 Kcal/Kg) which results in lower mileage per unit of fuel i.e. higher fuel consumption for a given distance. The issue can be resolved by suitable modification in the engine and tuning the engine for better mileage.

Lifecycle Analysis (LCA) of Ethanol produced using feedstocks derived from agriculture route indicates a significant reduction in Green House Gas (GHG) emission as compared to conventional fossil fuels.

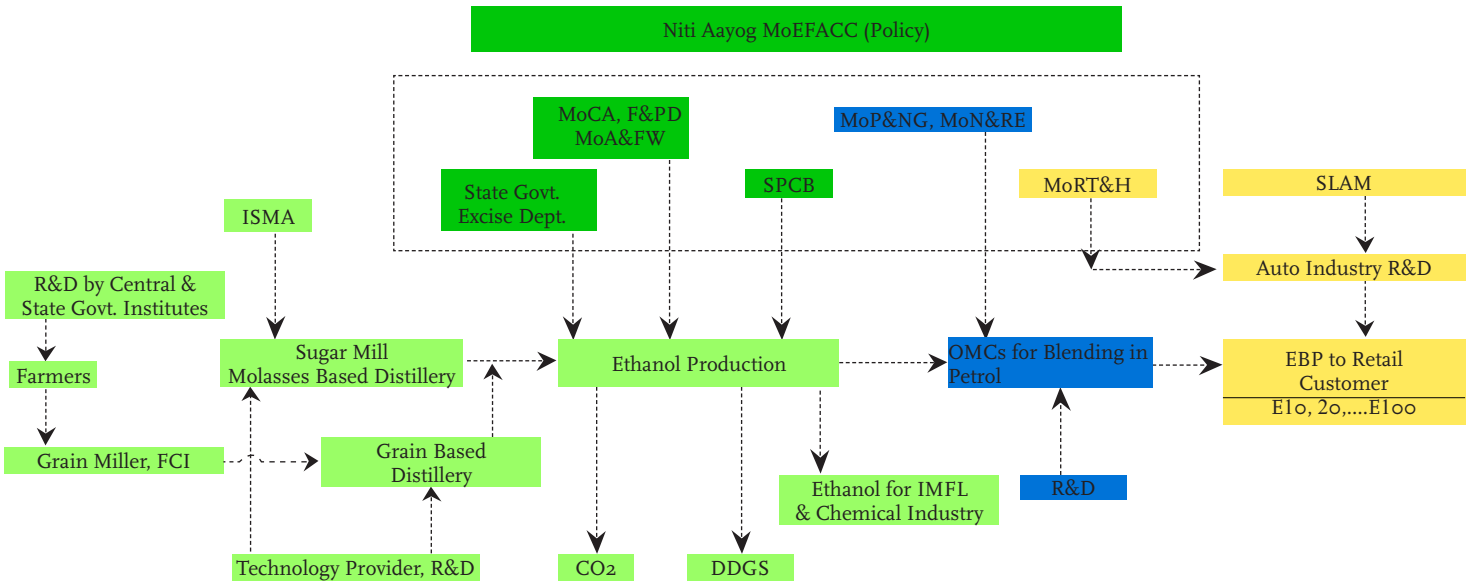
Ethanol Blended Petrol: India perspective

Globally, one of the most commonly used biofuels is ethanol. This is mainly produced from agricultural feedstock such as sugarcane molasses/juice, corn, damaged/surplus food grain etc. India is the 2nd largest global producer of sugarcane and hence there is significant potential to use domestically produced ethanol for driving biofuel usage in the country. Increasing usage of ethanol produced from domestically grown sugarcane can help India reduce its dependence on the import of crude oil. Additionally, ethanol production can help increase the total revenues for sugar mills and in turn for the farmers. This can help alleviate to an extent the current financial problems of the sugar industry that is faced with low sugar prices on account of adverse demand and supply situation.

500Cr

"Total installed capacity for ethanol production is around 500 crore litres wherein 80 – 85 per cent is from the sugar industry and 15 – 20 per cent is from grains"

After the success of pilot projects to



study the feasibility of ethanol blending in Petrol from 2001 to 2003, India formulated the Ethanol Blended Petrol (EBP) programme in 2003 signifying a shift towards a sustainable biofuel-based economy by allowing 5 per cent ethanol blending in 9 states and 4 union territories, which was extended to 20 states and 4 union territories in 2006. In 2009, National Biofuels Policy was released. From 2010 to 2016 various measures related to Ethanol pricing and transportation were taken, which resulted in an increased percentage of Ethanol in Petrol. As per the National Policy on Biofuels - 2018, the EBP programme aims to achieve a blending ratio of 10 per cent ethanol with petrol by 2021-22 and 20 per cent by 2030, which is likely to be preponed to 2025.

Ethanol blending percentage has increased from 1.5 per cent in ethanol supply year 2013-14 (ESY - December to November) to 5 per cent in ESY 2019-20 (170.5 crore litres) and 6.94 per cent for present ESY 2020-21 (as on 1st March 2021).

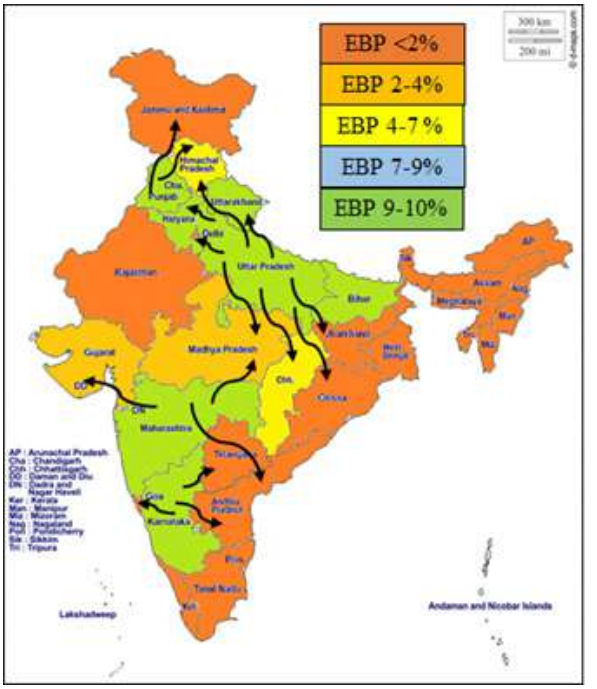
Ecosystem for First Generation (1G) Bio-Ethanol production from feedstocks to final consumption points is depicted through block diagram.

> "Further increasing ethanol percentage in petrol will require modification in engines and fuel handling systems"

All the stakeholders like various ministry and department from the Government of India (GoI), state government and their concerned departments, ethanol producers/sugar industry, Oil Marketing Companies (OMCs), automobile industry, associated Research institutes and respective industry associations are working in a coordinated manner to continuously improve blending percentage of ethanol in Petrol.

Challenges in achieving targets set under the EBP Programme

The majority of the ethanol production capacity is concentrated in the states of Maharashtra, Uttar Pradesh and Karnataka. As per BIS specifications, the maximum allowed ethanol blending percentage in Petrol is 10 per cent.



Hence to meet the 10per cent blending requirement nationally, the interstate movement of ethanol is being carried out, based on state-wise demand and supply scenario.

Fuel Grade Ethanol availability for ESY2020-21 is expected to be 325 crore litres (283 crore litres from the sugar industry and 32 crore litres will be grain-based). Based on the interstate movement, state-wise expected ethanol blending percentage is depicted in the adjacent figure.

Another major concern in achieving ethanol blending target is limited production capacity for fuel grade ethanol. Total installed capacity for ethanol production is around 500 crore litres, where in 80 to 85 per cent is from the sugar industry and 15 to 20 per cent is from grains. Almost 90 per cent of ethanol procured for blending in petrol is produced using sugar molasses/sugar juice and around 10 per cent is produced from damaged food grains not suitable for human consumption.

Ethanol requirement to meet 10 per cent EBP target for ESY 2021-22 is estimated at 412 crore litres. While ethanol availability is expected to be 360 crore litres (based on available information as of date). State-wise details of projected ethanol availability and the requirement for ESY 2021-22 and expected ethanol blending percentage after considering interstate movement are indicated in the following figure.

Notes:

1. Assam region includes Assam, Arunachal Pradesh, Manipur, Mizoram and Nagaland.
2. West Bengal region includes West Bengal, Meghalaya, Sikkim and Tripura.
3. The Punjab region includes Punjab and Chandigarh.
4. Gujarat region includes Gujarat, Daman & Diu and Dadra & Nagar Haveli.
5. Tamil Nadu region includes Tamil Nadu, Puducherry and Andaman & Nicobar.

To bridge the shortfall of ethanol for fuel blending, various measures are being taken up to increase the production capacity within the country and it is expected that we will be able to achieve the target of 10 per cent ethanol blending in petrol for ESY 2021-22.

There has been surplus production of sugar in the country during the previous decade (except in ESY 2016-17 due to drought) and the trend is likely to continue in coming years. In the normal ESY about 32 Million Metric Tonnes (MMT) of sugar is produced, against a domestic consumption of about 26 MMT. This surplus sugar of 6 MMT, which is being exported currently, will have to be diverted to produce 360 crore litres of ethanol post-December 2023 when the government is slated to withdraw export subsidy. Hence, the government of India has announced various measures to increase the distillation capacity for fuel-grade ethanol. The government is also encouraging the conversion of damaged/surplus grain available in the country to ethanol. These measures will serve various socio-economic and environment-related causes like higher income for farmers, better realization for the sugar industry, meeting EBP programme targets, employment generation. It will also help lower the country's energy import dependency resulting in a reduced crude oil import bill and strengthen the country's resolve towards fulfilling commitments made at COP-21, the UN Climate Change Conference held in France in 2015.

Apart from limited production capacity for fuel-grade ethanol, another major challenge in achieving 20 per cent and higher EBP target is the compatibility of vehicles (internal combustion engines and fuel handling system). At present, transport vehicle systems can handle 10 per cent ethanol-blended petrol. Further increasing ethanol percentage in petrol will require modification in engines and fuel handling systems. To resolve the concern, the automobile industry is working towards Flex Fuel Vehicle (FFV) and hybrid vehicles.

The government is also encouraging the use of E100 (100 per cent Ethanol) on an experimental basis and it is expected that after TVS, two-wheeler manufacturers may also launch models running exclusively on E100.

Another challenge for OMCs is to make E10 and E20 available simultaneously at the retail outlets during the transition phase as current models which are compatible with E0 and E10 may not be compatible with E20.

As a cleaner alternative energy source, biofuels are the way forwards for Sustainable Development towards Atmanirbhar Bharat and Net-Zero Carbon Economy with significant socio-economic benefits to meet the growing energy needs of the nation.

State / Region wise Projected Ethanol Supply / Demand balance for ESY 2021-22 for E10 (Cr. Litres)

Sr. No	State / Region	Petrol Demand	Ethanol		
			Required	Available	Surplus / Deficit (-)
1	Andhra Pradesh	183	18.3	1.3	-17.1
2	Assam	89	8.9	0.0	-8.9
3	Bihar	129	12.9	11.4	-1.5
4	Chhattisgarh	91	9.1	3.3	-5.9
5	Delhi	124	12.4	0.0	-12.4
6	Goa	26	2.6	0.0	-2.6
7	Gujarat	235	23.5	4.7	-18.9
8	Haryana	147	14.7	30.6	15.9
9	Himachal Pradesh	35	3.5	2.9	-0.6
10	J&K	45	4.5	0.0	-4.5
11	Jharkhand	76	7.6	0.5	-7.1
12	Karnataka	305	30.5	50.1	19.6
13	Kerala	214	21.4	0.0	-21.4
14	Madhya Pradesh	205	20.5	10.9	-9.6
15	Maharashtra	468	46.8	96.5	49.6
16	Odisha	114	11.4	0.4	-11.1
17	Punjab	149	14.9	39.5	24.6
18	Rajasthan	221	22.1	0.6	-21.5
19	Tamil Nadu	398	39.8	0.8	-39.1
20	Telangana	179	17.9	2.6	-15.3
21	Uttar Pradesh	463	46.3	100.4	54.1
22	Uttarakhand	44	4.4	3.6	-0.8
23	West Bengal	175	17.5	0.0	-17.5
	Total	4117	411.7	359.9	-51.7

SAMIR SOMAIYA
CMD, GODAVARI BIOREFINERIES LIMITED

BIOREFINERIES AND ALTERNATE FUEL

India is capable of producing 21 bn litres of Ethanol by 2025

India is facing various challenges such as climate change and energy security which needs to be addressed and being an agrarian nation with millions of small farmers, India needs to provide meaningful livelihoods to its population. Renewable energy can help address these three challenges.

India has an abundance of sunlight. This sunlight can help us generate solar power, but also help the crops we grow be a source of energy. Renewable energy, as opposed to energy derived from fossil fuels, helps combat and mitigate climate change.

Sugarcane is one such crop. India makes more sugarcane than it needs for sugar. The government has recognized this sugarcane surplus as a source of energy. Energy from sugarcane comes to us in three forms - ethanol as a biofuel, bio-CNG and bio-electricity. All three have tremendous potential to meet our energy needs for mobility as well as home needs.

The Ethanol Opportunity

India is expected to produce 31 million tons of sugar this year, that is 6 million tons more sugar than it needs for domestic consumption. If all this sugarcane were converted to ethanol, that would yield an additional 3.6 billion litres of ethanol (over and above the existing 3-3.5 billion litres that are budgeted to be produced using molasses (B and C) and also some amount of sugarcane juice/syrup directly). This would bring a total of 1G (first generation) ethanol from sugarcane to 7 billion litres.

Sugarcane is not the only source of 1G ethanol. The government has implemented policies to encourage the use of other feedstock to make 1G ethanol. Crops that can be used for this are maize, sweet sorghum, sugar beet amongst others. The government expects that 5 billion litres of ethanol can be produced using surplus grain.

Ethanol distilleries often work alongside the sugarcane crushing cycle. As a result, their capacities are not fully utilized. The addition of these crops as feedstocks to add to existing distilleries will enable distilleries to produce more ethanol by only adding some process steps to make the different feedstock ready for fermentation.

In addition, India is blessed with having large quantities of cellulosic biomass that can be also converted to ethanol (called 2G or second generation). Cellulosic biomass is available in various forms such as sugarcane bagasse, rice straw, maize stalks and more.

Every sugar mill generates surplus bagasse. The typical bagasse saving is 6% on cane crushed. If India crushes 320 million tons of cane, this is equivalent to 19.2 million tons of wet bagasse. Conservatively, this translates to 19.2 million tons of wet bagasse will approximately generate 1.92 billion litres ethanol @10 % of wet bagasse.

Today, India generates over 92 million tons of crop residues. Some of these such as rice straw are burned causing pollution in Northern parts of India. If this was also converted to ethanol, then by a similar analysis as described above, that would yield 9.2 billion litres of ethanol.

40%

"The government has set an aggressive target to produce 25 million tons of biogas by 2025 meeting 40% of India's gas requirement"

Combined, all the above efforts would add to 7+5+9.2 i.e. 21.2 billion litres of ethanol. The government estimates that to blend 20% ethanol into petrol and gasoline in 2025, 12 billion litres of ethanol are required. 21 billion litres would exceed 30% blending.

2G ethanol will not happen overnight. Certainly not by 2025, but it is important to note that this possibility exists, and this technology is being demonstrated globally. It will mature and then a greater blend, or more ethanol will be available as our energy consumption increases. It is also important to note that ethanol has a higher octane number, and therefore, when added to petrol, the combined fuel burns more cleanly having lower emissions than if other anti-knocking additives were used.

> "The possibility of 2G ethanol exists and this technology is being demonstrated globally"

Bio-CNG

India has many other sources of biomass that can be used to generate compressed biogas. It is estimated that over 62 million tons of biogas can be produced from various renewable sources. Through the SATAT programme, the government has set an aggressive target to produce 25 million tons of Biogas by 2025 meeting 40% of India's gas requirement.

One such source of biogas is sugarcane press mud. Press mud is produced in large quantities in a sugar mill and can be a source of generating biogas. The yield of biogas is approximately 5% on press mud. A typical sugar mill generates 4% press mud on cane crushed. At 320 million tons of cane crushed, this equals 12.8 million tons of press mud, which would generate 0.64 million tons of 96% methane containing biogas.

1 BCM (billion cubic meter) of compressed biogas is approximately 0.73 million tons of the same. India imports a large quantity of its gas needs (19.87 BCM in 2017-18). So the press mud from the sugar industry could alone meet 5% of the India gas imports.

Electricity

Every sugar mill makes surplus electricity as it generates steam to meet its process needs. This electricity is exported to the grid, and can be used to meet the growing power needs of the country, and be a source for mobility as cars move towards electric vehicles.

Every sugar mill generates electricity as a co-product by using efficient high pressure boilers and turbines. Each sugar mill can export about 30 Kwhr/ton crushed of electricity while crushing cane (excluding saved bagasse). 320 million tons of cane will mean 9.6 million Mwhr of electricity. An electric car can give mileage of about 7 km/Kwhr. This equates to about 67 billion km of distance travelled. Petrol gives on average 10 km/l. This translates to 6.7 billion litres of petrol saved. To put this number in context, India consumed 42 billion litres of petrol in 2019.

Hydrogen economy

Electricity also lends itself to make hydrogen via electrolysis of water. Hydrogen is a clean fuel and will play an important role in the future.

Climate Change

Finally, all the above are made using renewable resources. Crops consume carbon dioxide as they grow and mitigate climate change. Fossil resources are used in making inputs that are used in farming, but the use and development of drip farming alongside agroecological practices such as the use of Panchagavya and other traditional methods make for a still greater mitigation of climate change and carbon footprint.

Godavari Biorefineries is at the forefront of these initiatives. The company has recently expanded its ethanol capacity from 200 kLpd to 400 kLpd and is now targeting a further expansion. The company is also exploring the making of BioCNG to meet future energy requirements of India.

"WE ARE SETTING UP TWO VALUE ADDITION PLANTS - BUTENE-1 AND HPG AT DIBRUGARH"

Reep Hazarika, MD, Brahmaputra Cracker & Polymer Limited shares his insights on key learnings, achievements, revenue and profit performance, market share increase, agreement with GAIL, Capex plans, and business outlook. Excerpts of the interview:

REEP HAZARIKA
MD, BRAHMAPUTRA CRACKER & POLYMER LIMITED (BCPL)

Key learnings for BCPL during COVID-19?

For the petrochemical industry, what we learnt was to sustain our growth and existence even under stressed conditions.

The pandemic highlighted the true value of the internet and IT infrastructure that worked seamlessly to ensure business continuity.

Key milestones achieved by BCPL in FY 2020-21 and plans for FY 2021-22?

During FY 2020-21, the company has been successful in ensuring stable and sustained operation of the plant despite COVID-19 related challenges with skeletal manpower and complying with all the guidelines and protocols of the government. The plant is operating at more than 100 per cent capacity despite the challenges emerging out of COVID-19 related disruptions and economic slowdown.

The company has been recognised both in the national and international platforms for its performance towards workplace culture, business ethics, environment, health & safety and corporate social responsibility.

For FY 2021-22, our focus will be on enhancing our production capacity and maximizing sales in the North-Eastern region. We are in active discussion with the process licensors for capacity enhancement. We are also setting up two value addition plants - Butene-1 and HPG (2nd stage) at Dibrugarh.

Company's revenue and profit performance during FY 2020-21 and forecast for FY 2021-22?

The performance during FY 2020-21 has been encouraging despite COVID-19 related constraints. In terms of revenue, we have seen a sustained upward trend of polymer prices coupled with the low gas price during the year. We expect the same trend to continue during FY 2021-22. An increasing trend of polymer prices and reduced gas price will be the growth drivers in FY 2021-22.

BCPL's group refining/processing capacity per annum and what's your share nationally? Plans to increase market share?

BCPL's annual production capacity is 2.8 lakh tonnes of polymer. It is around 2 per cent of the national share however BCPL has the largest petrochemical plant in the Northeast and holds a market share of more than 90 per cent in the North-Eastern region.

We are planning to enhance our production capacity by 20 per cent through de-bottlenecking in the next two years.

We are also exploring the option of doubling our production capacity and product diversification based on the additional availability of feedstock in the NER. For that, we are in discussion with the oil and gas players in the region to ascertain the feedstock availability in the coming years.

90%

"BCPL is the largest petrochemical plant in Northeast and holds a market share of more than 90% in the North-Eastern region"

As a part of Hydrocarbon Vision 2030 for North East India, what role will BCPL play in increasing feedstocks to boost the polymer business?

Hydrocarbon Vision 2030 will open the doors of opportunities for BCPL. The

Northeast pipeline grid – Indradhanush Gas Grid Limited (IGGL) will make additional gas available for us in the future to facilitate our expansion. Expansion of the plant will increase our market share and margins.

The national per capita consumption of plastic is approximately 11 kgs whereas per capita consumption in the Northeastern region is still limited to approximately 4 kgs. This deficit will bring more opportunities for plastic industries in the NE region.

Expansion of the plant will spawn huge potential for entrepreneurial endeavours in the region through the setting up of plastic processing units utilising BCPL's products. The Government of Assam is also supporting this endeavour by setting up a Plastic Park at Tinsukia which will boost polymer consumption and attract investors. This would not only give an economic boost to this region but will also generate employment opportunities. Apart from incentivising the new entrepreneurs operating in the North East, we are also making cohesive efforts to assure a timely and continuous supply of raw materials, technical support and guidance to the interested entrepreneurs.

Annual processing capacity of BCPL's Petrochemical Complex at Lepetkata in Assam?

Our plant at Lepetkata, Dibrugarh has an annual production capacity of 2.8 lakh tonnes of Polymer. We have a dual feed (Gas and Naphtha) cracker unit and fluidized bed polymerization reactor for our LLDPE/HDPE swing unit and continuously stirred gas phased polymerization reactor for our Polypropylene unit.

The technology providers are - Lummus Technologies, USA for Cracker unit, INEOS, UK for LLDPE/HDPE Swing unit and Lummus Novolen, Germany for the Polypropylene Unit.

BCPL is also working towards debottlenecking of the plant which shall further improve the production capacity. We have also initiated dialogue with natural gas producers in this region for enabling additional gas infusion for capacity enhancement. We plan to scale up our capacity by 20 per cent within the next two years and double our capacity in the next five years.

LLDPE/HDPE Swing unit at BCPL's Petrochemical Complex produces 2,20,000 TPA of polymer grade Ethylene and 60,000 TPA of polymer grade of Propylene. How much does it contribute to the national requirement?

In the case of polyethylene, BCPL produces mainly LLDPE film grade polymers which are marketed all over India. Polypropylene is marketed in the eastern part of India, mainly the North Eastern Region.

> "We are also exploring options for doubling our production capacity and product diversification based on additional availability of feedstock in the NER"

How much is the annual processing capacity of Gas dehydration and compressor at GDU Duliajan?

The gas processing capacity of Gas dehydration and compressor at GDU Duliajan is 6.0 MMSCM per day. It is a glycol-based dehydration unit designed by Engineers India Limited. We have already initiated dialogue with natural gas producers for enabling additional gas infusion for processing in our Duliajan unit.

How much is the annual processing capacity of Lakwa Natural Gas Sweetening Unit Cum C2+ Hydrocarbon Recovery Unit?

The capacity of Lakwa Natural Gas Sweetening Unit Cum C2+ Hydrocarbon Recovery Unit is 1.0 MMSCM per day. The unit is designed by Engineers India Limited. The sweetening process involves a solvent media for removing CO_2 from natural gas and C2+ hydrocarbon recovery is done by cryogenic separation.

In January 2021, BCPL signed an MoU with Assam Gas Company for the supply of rich gas from Golaghat to the BCPL Lakwa unit through a dedicated pipeline.

Capex invested in FY 2020-21 and what is the plan for FY 2021-22? Plans related to automation and digitalization?

The Capex for this financial year is essentially towards the two new value addition plants which BCPL is undertaking.

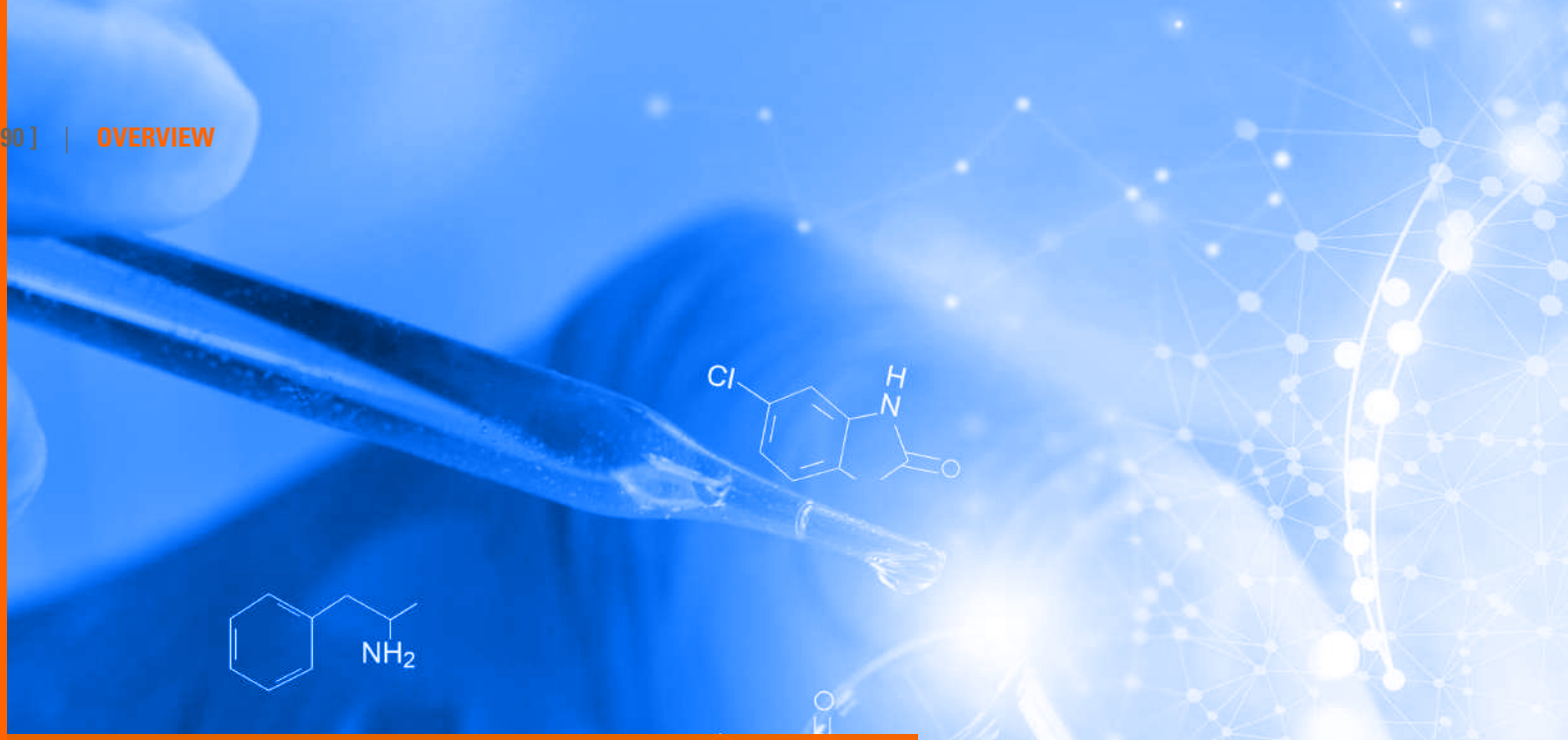
The operation of the plant is fully automated. BCPL is well equipped with Yokogawa supplied distributed control systems (DCS) for automated control and operation of the plant. The systems are also being upgraded as per the requirement from time to time. The company has also implemented SAP for day to day business requirements. BCPL is on the move to create a paperless culture in the organization.

What is the future business outlook for the company in FY 2021-22?

The future business outlook looks very positive. BCPL plans to scale up its production capacity and penetrate new areas in marketing and also further progress on exporting polymers to neighbouring countries.

Pharmaceuticals

Making Strides Globally With Care



POSITIVE OUTLOOK

COVID Vaccine, "China + 1", API Parks, API PLI scheme, cost-saving initiatives, and latest PLI scheme for the pharma Industry are good news

GOVIND K. JAJU
FOUNDING PARTNER,
SUINGORA CONSULTING LLP

As the largest provider of generics to the world, India's pharma industry contributes to over 40 per cent of the United States' generic demand, 60 per cent of the world's vaccine demand and 60 per cent of the world's HIV drugs demand. Moreover, the industry exports to almost every nation and has significant footprints in all the highly-regulated developed markets. The outlook of the Indian pharma industry for the year 2021 is very positive. This is one of the few industries which not only survived the COVID pandemic but had grown in 2020.

COVID Vaccine

India today has the distinction of being one among the five nations already manufacturing corona vaccine. The two vaccines now made in India are possibly the cheapest among those available globally and do not need special, costly storage and distribution. While these two vaccines are already in the market and being used by front line workers, senior citizens and comorbid patients, there are more in the pipeline to be approved soon. We expect 1/3rd of India's

"There should be investment by the government in education in life sciences to attract the best talent and train them to meet the increasing need for skilled manpower"

population will be vaccinated during the year. This is in addition to what is being exported to many developing and developed countries. Many countries have booked vaccines from Indian manufacturers.

India can expect to sell about 3 billion dosages during 2021 which will bring about US $10 billion in revenue. The recognition of the capability of our pharma industry to develop, manufacture and distribute complex formulations at affordable prices is now beyond any doubt in the global pharma scene.

Role of API

While the Pharma Industry's dependence on China for API, AI, KSM etc., grew from negligible in 1990 to almost 70% by 2020, COVID made the government and industry realise the extraordinary risk associated with this dependence it has created itself on China. While India is recognised as the `Pharmacy of the World', this pharmacy is hugely dependent on China for basic supplies. Tension on the India-China border provided the much-needed push to start thinking of making the pharma industry Aatmanirbhar. It is frightening to reckon that today even for the basic medicines required by masses for common ailments like Antibiotics, Analgesics, HIV, Vitamins, Cardiac medicines are majorly dependent on China. Even for the APIs made in India, we are importing Starting Materials, Key Starting Materials, Advanced Intermediates and Side Chains from China. Therefore, the formulations industry too is dependent on China and thus it may suffer a major backlash if we do not meet the gap in our API/AI manufacturing capabilities.

While India has talent, knowledge, in many places infrastructure, the main reason behind our competitive weakness is the low price of Chinese products, which is sometimes even lower than the base cost of Indian produce. The Chinese API Industry has the advantage of scale, government support in terms of export incentives, low electricity cost, low financing cost, the cheaper capital cost of assets, low pollution control related cost etc. While it may not be practicable to remove all these factors entirely in the immediate future, with the realisation of this risk, government and industry have now started working together on backward integration considering issues at hand. The government has taken concrete action by way of starting an API PLI scheme and API Parks.

The API PLI scheme gives a financial incentive to eligible manufacturers of identified 53 critical bulk drugs on their incremental sales over the base year for six years. Out of 53 identified bulk drugs, 26 are fermentation-based drugs and 27 are chemical synthesis-based drugs. There is a good response to the scheme from the industry with 215 applications from 83 manufacturers. The government has approved the first set of fermentation-based projects with a committed investment of Rs. 3,761 crores. 5 projects for the manufacture of Penicillin-G, 7 ACA, Erythromycin Thiocyanate and clavulanic acid have been approved. These projects are of Aurobindo, KAPL

3bn

"India can expect to sell about 3 billion dosages during 2021 which will bring about US $10 billion revenue"

and Kinvan as reported.

The central government has decided to set up 3 Bulk Drug Parks to make the API, KSM, AI and other chemical compounds for medicines and reduce their imports from China. The pharma parks offer a great opportunity to investors by a reduction in capital expenditure and operational expenses. These Bulk Drug Parks will be set up at Rs. 14,300 crore in partnership with states. Over a dozen states including Himachal Pradesh, Telangana and Andhra Pradesh are in the race to start these Bulk Drug Parks under this scheme.

Also, many API manufacturers have started backward integration exercises to reduce dependency on China. This cannot be achieved with small-time players trying to build sub-optimal capacities only to get some government subsidy. This can be achieved only by the large players in partnership with global players. And the time for that is now, not later. It is an opportune time for the Indian pharma players to look at creating sustainable competitive ability by working on ways to create alternate supply support for their formulations as well as API businesses keeping the long term in view. It needs to build capacities that bring suitable economic scale. And one must admit that support from the government, not entirely through subsidies but more from the availability of land and expeditious approvals, will indeed help the private sector to move forward in this regard more expeditiously.

"China + 1" policy

It is not that only India has now realised the risk of dependency on China for their API requirement but the global pharma industry has started working on a "China + 1" policy to de-risk their operations, thanks to COVID. Many global formulation manufacturers are now looking to add one more source where they have a single Chinese source. This opportunity should be utilised by the Indian pharma industry. Depending on regulatory requirements of the formulation importing country, the process of vendor addition takes from 6 months to 2 years and then the actual buying starts. So, you can see a positive commercial impact in 2021 and thereafter.

Other growth factors

There are going to be patent expiries of US $45 billion over the next three years allowing the Indian generic industry for incremental sales. Genericization of these molecules will help Indian manufacturers grow their sales in developed markets.

The world's biggest pharma market is the United States and 40 per cent of the US generic market is captured by Indian companies. This is the biggest achievement of Indian pharma companies. However multiple players and the cut-throat competition saw eroding of profits. We expect normalization of the price erosion in the US which will help in making the balance sheets of the Indian companies healthier.

There had been a rise in demand for certain specific drugs due to the COVID pandemic. This incremental demand is not likely to vanish completely and will remain high.

Better collaboration among industry, academia and govt.

There is a need to promote innovation for the development of complex and hi-tech products. That is where the partnership of industry, government institutes and academia can help. The government can help financially and also government institutes and academia can work together with the industry.

Actually, DST, DBT, CSIR, ICMR and industries are working together on some projects. Academia and industry are working on making the first vaccine of its kind which the world needs and so on, however, this is not enough. India needs to do a lot more in this area compared to what is already happening globally where industry and academia work seamlessly in priority areas with major patents coming from them. The major discoveries coming out from these partnerships are seen to have the potential for commercializing, industry and academia partnerships not only creates a synergy but has a multiplier impact to develop and scale-up solutions at a much faster pace.

We can also use industry and academia partnerships for working on APIs and AI to reduce their cost. One other point very relevant today is getting academia focused on key sciences. China has got where it is today, not only with govt funding but also with a sharp focus on advancement in academia. India is falling way behind. There should be investment by the government in education in life sciences to attract the best talent and train them up to meet the increasing need for skilled manpower. Not much was heard in this regard in the last few years.

To promote innovation for the development of complex and high-tech products including products of emerging therapies and in-vitro diagnostic devices as well as self-reliance in important drugs, the cabinet has approved PLI Scheme for the pharma industry of Rs. 15,000 crore for promoting the manufacture of high-value products in the pharmaceutical sector. It is also expected to improve accessibility and affordability of medical products including orphan drugs to the Indian population

Conclusion

To sum up, the outlook of the Indian Pharma Industry is very positive. COVID Vaccine, "China + 1", API Parks, API PLI scheme, cost-saving initiatives and the latest PLI scheme for the pharma Industry are good news. For the industry to retain its position as the largest generic drug supplier, it must continue improving regulatory compliance of manufacturing sites, as well as developing cost-effective and high-quality manufacturing processes, reducing the dependence on the imports of APIs, key intermediates and starting materials and work closely with governments on strict implementation of pollution control norms, Implementation of DPCO, lower import duties, Anti-dumping duties and coherent working with academia and Public research labs. This will be key to sustaining its global leadership position.

SUDARSHAN JAIN
SECRETARY GENERAL,
INDIAN PHARMACEUTICAL ALLIANCE

UNDERLINING THE CHALLENGES & OPPORTUNITIES

Pharma industry amongst five sectors aiding India's trade deficit reduction

In a world that is still recuperating from the ongoing COVID-19 pandemic that has claimed millions of lives globally and put millions more at risk, affordable and accessible healthcare has become fundamental. India has cemented its status as the pharmacy to the world, home to the third-largest pharma industry of drugs by volume. In these unprecedented times, the Indian pharmaceutical industry emerged as a dependable partner through its uninterrupted supply of life-saving medicines not only in India but across the world and demonstrated tremendous commitment towards patient welfare. The Indian pharmaceutical industry has been able to establish its footprint in the largest markets of the world through world-class formulation developments and entrepreneurial abilities, making affordable and high-quality generics widely available.

Standing at the cusp of growth, the post-pandemic world offers great opportunities for India. The Indian pharmaceutical industry has the potential to realise these opportunities by addressing current gaps and thus strengthening the whole ecosystem.

"There is a need for creating a holistic policy environment for the pharmaceutical industry"

Indian Pharmaceutical Industry - Making a Difference

The success of the Indian pharma industry is rooted in its ability to manufacture affordable, high-quality generic drugs. Advancements in drug formulations along with increased accessibility to healthcare services helped India drop the per person disease burden measured as Disability Adjusted Life Years (DALYs) by 36 per cent between 1990 and 2016 (after adjusting for changes in the population age structure).

Addressing the Challenges

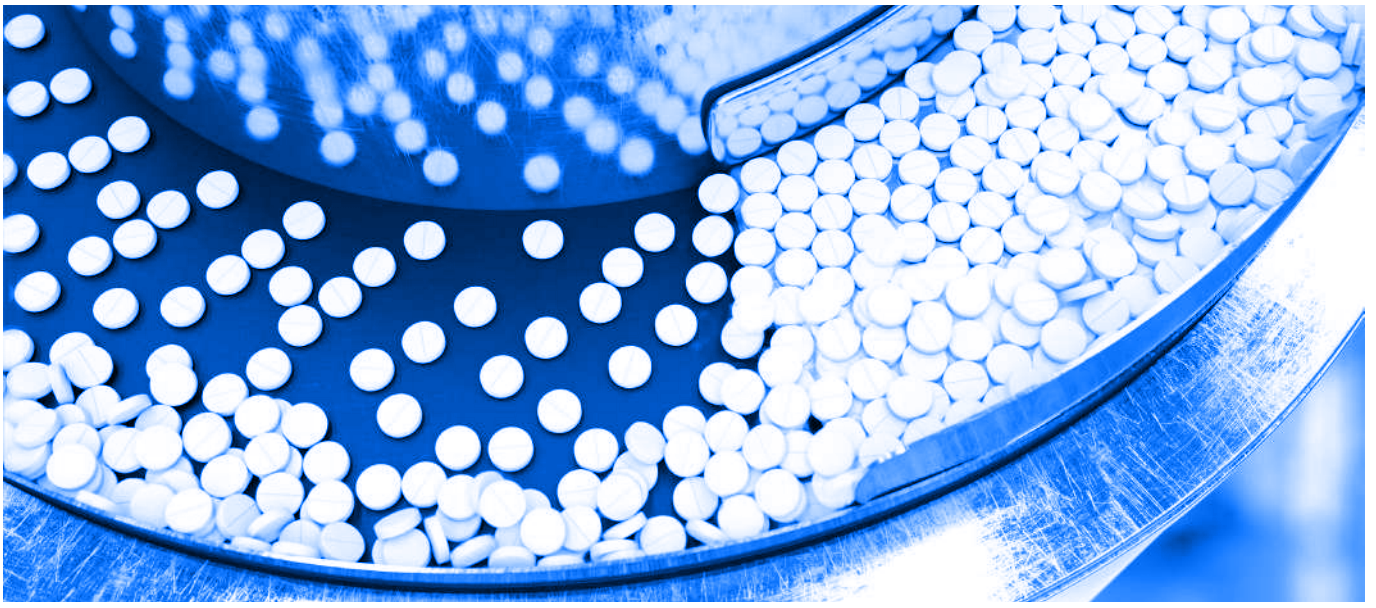
Road to universal health coverage

While Ayushman Bharat is aimed at providing affordable healthcare coverage to over 50 crore Indians, there are certain challenges to the accessibility of healthcare that need to be addressed. To begin with, there are only 29 skilled health workers for every 10,000 people in India. This is low when compared to China (41 skilled health workers), and about 111 in the United States. Whilst the standards set by the WHO are met, there needs to be more than a 40 per cent increase to achieve the unmet demand. Accessibility and affordability must walk hand in hand when addressing universal health coverage. India's healthcare spend is low i.e., less than a third of Indians have health insurance, which means that a major share of the population is dealing with high out-of-pocket medical expenses.

It is time for India to not only accelerate towards attaining the goal of universal healthcare, but also for the industry and the government to create a roadmap to ensure access to quality medicines at affordable prices.

Reducing the API dependence

The global Active Pharmaceutical Ingredients (APIs) and Key Starting Materials (KSMs) shortages as a result of disrupted supply chain due to the pandemic brought to fore, the need to develop APIs and KSMs in India to be able to fulfil the needs of the pharmaceutical industry going forward. This move will not only reduce import costs but also reduce market vulnerability due to unexpected price movements. Aiming to reduce import dependency and to attain self-reliance and drug security, the Indian government has decided to provide incentives



to the pharmaceutical industry. A Production Linked Incentive (PLI) scheme and scheme for Promotion of Bulk Drug Parks has been introduced with the expectation to attract substantial investments, increase domestic production of KSMs, DIs(drug intermediates) and APIs and reduce the country's import dependence to a large extent. Additionally, pre-approval of environmental clearance and relaxing other regulatory clearances will help domestic players set up utilities suitable for creating better API, KSM, and DI facilities.

> "The COVID-19 pandemic has highlighted the need for diversified supply chains for pharmaceutical products"

Investing in innovation

With the Indian pharmaceutical industry's role in the global pharmaceutical supply chain well established, there is a need for the industry to move up the value chain and focus on innovation and research and development which accounts for 2/3rds of the pharmaceutical market size. Given that large R&D investments are required to build and sustain an innovation ecosystem, it is important to adopt measures that will encourage these investments. Policies such as reintroducing the 200 per cent tax breaks for R&D investments, lower corporate tax rates for companies engaged in innovation hubs, the introduction of long term secured 'innovation bonds', and introduction of tax exemptions on research funding will provide the much-needed impetus for private sector participation. Additionally, the provision of direct research funding to academia, policy harmonisation, the introduction of innovation hubs, streamlining access to funding sources, etc. will also support and boost innovation in the long term.

Understanding the pharma economics

According to the statistics, not only does the pharma industry generate a trade surplus of over USD 13 billion each year, but it also employs over 2.7 million people. This employment is both direct and indirect, in high-skill areas such as R&D and manufacturing. Attracting over US $ 2 billion in FDI inflows, the pharma industry is one of the five sectors aiding India's trade deficit reduction. This will lead to potential breakthroughs in next-generation innovative products and help accelerate the growth of an industry that is aiding drug formulations but also help in generating employment.

Way forward

The future of the Indian pharmaceutical industry is dependent on its ability to capitalise on the opportunities presented to it. Innovation and research and development will continue to remain a pressing need to truly realise its true potential. Furthermore, while the Indian pharmaceutical industry has a significant presence in several countries, there exists a potential for growth in new markets such as South America, Japan, China and the African continent. Collaborations between the government and private sector players towards this common aim will expedite the realisation of the opportunities highlighted above.

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SKILLED MANPOWER CHALLENGES IN INDIAN PHARMA

Drug industry should provide appropriate training to personnel working as chemists in drug synthesis and analytical chemists

India has become a generic drug centre since it exports drugs to all countries. During COVID-19, India exported Hydroxychloroquine to Brazil, the USA and other countries. Presently, India is exporting COVID-19 vaccines to many countries globally but the Indian drug industry often complains they are not able to recruit skilled chemists as universities do not train students to make them industry-ready.

If we look at the curriculum of our universities with chemistry reference, they cover typical branches like organic, inorganic and physical chemistry. On the other hand, the Indian drug industry has to provide additional training in the concerned branches of organic chemistry like drug synthesis which includes practical experiments also.

Not only this, the drug industry should also form a consortium to teach additional subjects on the synthesis of drug development, name reactions, and literature search on experiments suitable for drug synthesis. Even if they recruit PhD's for the job, they have to be provided specialised training.

"Drug industry should make some kind of consortium to teach additional subjects on the synthesis of drug development, name reactions, a literature search on experiments suitable to drug synthesis"

Many of the drug industries have R&D laboratories but corresponding library facilities are lacking. Nowadays literature survey is being carried out via the internet - Reaxys, Scifinder, MedPub, Patent search. However, these internet surveys are supplementary but not complimentary to Journals. Bielstein, Gmelin, Dictionary of organic compounds and chemical abstracts from 1906's, standard monographs and books are a must for a library. Often these R&D laboratories are mere development laboratories for a trial synthesis of generic drugs before going to manufacturing/ production. And here also the research component is missing.

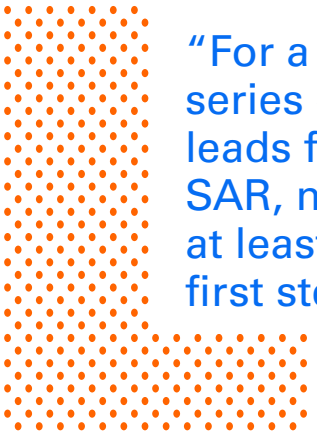
So far, no new drugs are developed in India nor industry has any plan for new drug discovery. Apart from the organic synthesis of biochemistry knowledge topics include DNA, RNA, proteins, enzymes, hormones, etc.

The challenges of new drug discovery involve medicinal chemistry which means a constant dialogue between chemists and biologists, including computational studies is necessary. On the web internet, the 3D-structures of many enzymes and proteins which cause diseases are available. A virtual study involving many organic molecules (generated on a computer) and at which docks protein enzyme. Thus by hydrogen bonding, docking studies or molecular modelling or receptor-ligand interaction will be the first step. Such studies in Indian drug R&D centres are not-existent besides regular laboratories necessary to conduct pharmacy and pharmacological, pharmaceutical studies. The recent pandemic revealed we don't have enough life scientists and biochemists, virology and epidemiology as unfortunately many universities don't have these courses.

For a new drug discovery laboratory, the assistance of life scientists is a must. For a new drug synthesis series of compounds taking

leads to form natural products, SAR, molecular modelling or at least a "Me Too Drug" is the first step.

drug. Such publications enhance the reputation of the drug industry or institutes. Usual procedures of international



"For a new drug synthesis series of compounds taking leads form natural products, SAR, molecular modelling or at least a "Me Too Drug" is the first step"

A good research paper, consisting of the synthesis of at least 60 compounds with biological activity must be generated for publication in "Journal of Medicinal Chemistry" or some other high standard journal. One of the compounds in that research paper may be a future

patents may be adopted. An eminent scientist of India remarked India has no expertise to discover new drugs that hold even today. With these deficiencies in the drug industry, it is not possible to discover new drugs.

In India, even generic drug manufacturing involves the production of the last two steps out of eight steps of drug synthesis. The drug intermediates (step 1 to step 6) are exported from China or some other European countries. Many drug industries give only coded compounds with procedures to perform further steps by different methods in their R&D laboratories. With such a scenario, the chemists have no opportunity to improve skillsets even after 10 years. Without basic research, a scientist cannot perform well in applied research, drug research and drug manufacturing and in fact, he cannot tackle any problems mentioned in this note. Pharmaceutical aspects of drugs are also other activity.

On top of it, the management includes R&D directors who put a lot of pressure on chemists to improve skillsets to demonstrate higher yields with 99.9 per cent purity. Vexed with the scenario, chemists change jobs to non-chemical sectors or some other drug companies.

Looking at the quality control point

of view they import sophisticated instruments like NMR, HPTC/MS etc. for USFDA requirement. The operators of the instruments lack enough theoretical knowledge, the intricacies and the theory behind the techniques. There is nobody to teach them, once again the exodus of analytical chemists start. There are no instances where the management sends their chemists to seminars/workshops but there may be some exceptions.

The Indian drug industry made a name in producing generics, but countries of this size must aim further to discover new drugs. The skillsets of chemists can be acquired as per the demand, provided appropriate training is given.

Skilled manpower challenges in Indian drug industry

The challenges are: Speciality chemicals production; Developing winning strategies in production; Developing high quality and low-cost pharmaceuticals; Reduce imports of raw materials, intermediates and APIs; Manage safety and regulatory aspects of chemical products; Knowledge of chemistry, chemical hazards and safety measures; Documentation of process activities; and Production of intermediates by following SOP.

Indian drug manufacturers need to relook at the performance, for example, everywhere there are complaints about pollution - leakage of gases, pollution of water bodies with traces of drugs, heavy metals like Cd, Pb, As, Hg, etc., and frequent fire accidents. Usually, unskilled labour is transferring chemicals from one place to another place, loading the reactor, with chemicals filtrations and washing. These are the places, where fire accidents are reported in the Indian chemical industry. Indian drug industry should provide appropriate training to their staff working as chemists in drug synthesis and analytical chemists.

In the very selection of sites for chemical/drug industries, the intervention of environmental engineers, environmental chemists are a must. The chemistry of industries should depend on wind direction. The nature of the soil is also important so that the effluents do not percolate into the soil. Of course, the selection of industrial estates should be far away from human habitation, but in course of time colonies sprung up strangely the industries never protest. Examples are many, Bhopal gas tragedy, Vizag styrene gas tragedy would not have happened, so severely if the human habitation were not there in Vizag the pharma city is near the sea, where cyclones are very frequent.

Environmental conditions are never considered. The course work on environment subjects must be strong at the university level and industries should employ them to predict environmental hazards otherwise the industries suffer and there is the closure of industries.

Pollution monitoring of air carbon dioxide, nitric oxide, water (pesticides and toxic elements) need to be the topmost agenda of chemical industries. The activities need to be guided by expert laboratories and scientists and methods to control pollution should be an important priority for industries.

Chemical Engineering and Technology division should undertake pilot plant studies, chemical designing of equipment reactors, heat exchangers, condensers, storage units, fire safety and environmental aspects so that the engineers can advise on chemical manufacturing be it project reports, production, turnkey, troubleshooting and selection of equipment. The real growth of industries lies in the development of indigenous synthesis and technology.

Universities should tie-up with industries and scientific institutes in the country. The role of the universities is to provide M.Sc. courses and provide conventional experimental training with the help of industries/scientific institutes. The role of industries is to develop New Chemical Entities (NCEs). The trained chemists when they join the industries will acquire skillsets of drug discovery and synthesis of many NCEs for new drug discovery which is missing in the Indian chemical industries.

DR PRABUDDHA KUNDU
CO-FOUNDER & MANAGING DIRECTOR, PREMAS BIOTECH PVT. LTD.

COVID-19 ACCELERATES PHARMA R&D AND INNOVATION

During COVID-19, the entire health care research got a big boost and shifted into hyperdrive

Technology and Innovation have been hallmarks of the global pharmaceutical and biotech industries along with being one of the most regulated industries. With competition evolving over the past few decades, blockbuster drugs were becoming increasingly difficult to deliver, given the fact that there were no new classes of antibiotics, nor other classes of blockbuster drugs being launched. The innovation had moved to different modalities of biologics, more evolved and niche technologies, CAR-T, stem cell therapies and custom medicines. Moreover, large companies were suffering from their inherent large size, which came with silos and internal bureaucracy. This led to innovation moving out to a burst of smaller tech companies globally who kept the innovation engine running. This contrasted with large companies who had strength in processes and regulatory insight, whereas the smaller companies gave space for innovative thinking and fertile grounds for newer exploratory technologies. Partnerships evolved with the larger pharma/biotech companies accessing newer tech via M&A strategy or funding at the onset, etc. The Venture Capitalists (VC) of the world understood this evolution and started putting huge amounts of investments in this emerging trend where the nascent technology would be incubated, till a certain time, where it was being sold off at a huge valuation.

With the advent of COVID-19, the entire health care research ecosystem got a big jolt in the right direction and shifted into hyperdrive in response to the pandemic. COVID-19 offered both an opportunity and risk simultaneously. This led to the unleashing of different forces, perhaps more asymmetric than anticipated. Unprecedented collaboration, rapid development, regulatory landscape change and breakdown of the silos were seen to promote a culture of a greater good. The economic and public health burdens that came along, demanded that we rethink our approach to developing new vaccines and therapies.

Pandemic pushed the boundaries

Researchers and business leaders in pharma and biotech companies are evaluating the lessons learnt in the past 14 months, and how we can utilize the learnings from these experiences and apply the lessons to the route to rapid development in the future. The major lessons and impact are technology; improving the clinical development path, and building partnerships.

For the technology route, there has been an enormous effort and spurt of the utilization of new technology to combat the pandemic, whether it is Medtech, biotech or vaccine tech. Initially, repurposing of the available drugs was done, like, anti-viral, anti-malarial, plasma therapy, anticoagulants, etc. Concomitantly, new modalities, like mRNA, DNA vaccines, monoclonal antibodies, RNAi and cell therapy have taken off, with several vaccines being approved under emergency use authorisation and other therapies being rushed through large scale human trials.

> "Researchers and business leaders in pharma and biotech companies are evaluating the lessons learnt in the past 14 months"

As of March 4, 2021, there were 1,084 drugs and vaccines in develop-

ment targeting the Coronavirus disease (COVID-19). Comparing this to June 2020, where there were about 415 therapies and vaccines being developed. The vaccines that are approved are mostly mRNA and DNA modalities. Whole viral vaccines and Virus-Like Particles (VLP) are on the fast track developmental path, and with the new strains and mutations surfacing, there are multiple opportunities and possibilities as well.

Hence, it is very evident that technology has made an enormous push on the development and acceleration of the potential therapies and vaccines into clinics. That brings us to the second point that has undergone robust innovation and rapid change in the design, implication, and outcomes of the clinical trials. And here it is very important to mention that this would not have been possible without the wholehearted involvement of the regulatory agencies globally. Regulators acted and are acting in an advisory role, empowering biopharma to apply judgement to their clinical trial conduct and enable progress, trial by trial, depending on the data being presented and the outcomes demonstrated. Clinical trial design and outcomes were pegged at 10.5 years from entry to Phase 1 to commercial approval and launch. The present COVID-19 trials are predicting outcomes in months and this has been possible due to a continuous engagement with the regulators and biopharma companies. Within silico R&D design, characterization, data predictions becoming a norm, IND prioritization, overlapping phase trial designs, early indicators or surrogate endpoints, real-time reviews and conditional approvals became part of the clinical trial and regulatory innovative steps taken during this pandemic.

The widespread adoption of telehealth services enabled due to social distancing measures was a step towards a novel thought process, as it allows geographically diverse patients to access trials where clinical sites aren't available. Cloud-based technologies saw a massive spurt in their utilisation and deployment. We must capitalise on their potential.

> "For the technology route, there has been an enormous effort and spurt of the utilisation of new technology to combat the pandemic, whether it is medtech, biotech or vaccine tech"

An approach taken by Lilly offers an example of rethinking clinical trials in the age of Coronavirus. Given the pressing challenges caused by the pandemic, Lily needed an innovative solution to fast-track potential COVID-19 treatments. So, as they launched a trial for their lead investigative neutralizing antibody against the novel coronavirus, they did so in a way that did not require residents to travel. The first-of-its-kind study design relies on mobile labs built from custom retrofitted recreational vehicles that can be brought directly to residents and staff, while trailer trucks transport the supplies needed to create on-site infusion clinics. Such paths would not have been possible unless we were in a pandemic situation.

Way forward

Competition, innovative ideas and intellectual property remain a critical and vital point for potential friction and material right amongst companies, it is very necessary to fuel the innovation engine that enables the collaborations to take place along with meaningful discussions. Positions taken by the pharmaceutical industry to help address this and other crises during the pandemic has been highly commendable. The pandemic is catalyzing conversations amongst the smaller tech players and the pharma companies. It is about expanding partnerships in ways that can mutually benefit both the players involved and this is the biggest gain from the pandemic of COVID-19. It is that we stand as a team against the virus or we will fail as humankind. That would indeed be a large price to pay. As they say – A rising tide lifts all boats.

PUSHPA VIJAYARAGHAVAN
DIRECTOR,
SATHGURU MANAGEMENT CONSULTANTS PVT. LTD.

STRONG FOUNDATION

Industry rests on a foundation of sustainable scale and is now embarking on a journey of transformation

The most poignant "Make in India" success story, the Indian pharma industry has truly embodied the possibility of global impact with Indian manufacturing. The industry rests on a foundation of sustainable scale and has expanded access to quality drugs across the world and is now embarking on a journey of transformation to replicate this success across next-generation drugs and healthcare solutions.

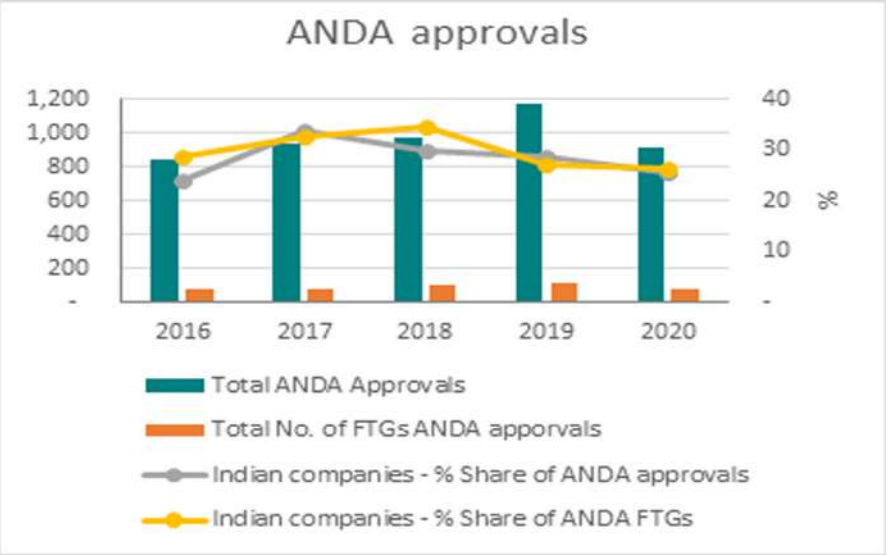
Scale with a foundation of quality and research

With leading Indian research institutions such as IICT Hyderabad, NCL Pune and ICT Mumbai providing early support on process development for high volume production of chemicals with application in global pharma, the industry forged a presence across the value chain. While India is no longer a leading API exporter to the world, route code chemistry and competitive API production still power the large base of backward integrated pharma companies at the forefront of the country's formidable growth story in generics. Our analysis points to leading Indian pharma companies enjoying backward integration into API for ~ 70 to 80 per cent of their ANDA portfolio compared to an average of ~40 per cent for global counterparts with comparable scale. Of the 616 Drug Master Files filed with USFDA in 2019, Indian companies contributed to more than 50 per cent (~331). The vertically integrated presence has powered not only cost competitiveness in global markets but also the overall engine of product development. Timely access to in-house developed APIs has also implied high participation in first-time generics. Similar to our contribution to total ANDA filings, our overall contribution to first-time generics (FTGs) has also remained at the 30 per cent threshold. This has been a driver of economic value given the relatively lower level of competition in FTGs and participation at the beginning of the price erosion curve. This high contribution to FTGs has also been a strong enabler of access to drugs due to enhanced affordability. Several of these FTGs have included complex chemistry as well as para IV filings with non-infringing claims or patent invalidation. Industry's capability around both API route code chemistry and complex formulations have progressively expanded to enable India to today stand tall as the largest supplier of pharmaceutical drugs to highly regulated US and EU markets.

"vertically integrated presence has powered not only cost competitiveness in global markets but also the overall engine of product development"

Extending global health priorities

India's impact on expanding access to medicines and delivering on the promise of affordability is apparent in the most regulated markets of the world. It is also apparent at the other end – global public health. Akin to what Indian vaccine companies have achieved on enabling access to routine immunisation for all children in low and middle-income countries (LMIC) with an aggregate capacity of WHO prequalified manufacturing exceeding a billion doses, Indian pharma companies have played a critical role in the global fight against HIV as well as viral hepatitis. While the global supply footprint of antiretroviral drugs for HIV treatment is relatively more discussed and known globally, the impact on novel anti-viral used for the treatment of Hepatitis B and Hepatitis C infections is often under-appreciated. In 2014, Gilead voluntarily licensed



its novel drug for Hepatitis C, Sovaldi, to seven India based generic drug manufacturers (including Indian companies such as Cipla and multinationals such as Mylan with manufacturing operations in India). With access to 91 LMIC countries, this consortium of generic manufacturers has leveraged India's cost competitiveness to enable access to the drug for about 150 million people in the world living with viral hepatitis. Erstwhile price benchmark of US $30,000 for the 28 tablet course now pales before the $300 price benchmark set by Indian manufacturers. While the price rationalisation has been far-reaching in impact, access would have still been a mirage if adoption in public markets would have been elusive. In 2018, we witnessed the celebration-worthy milestone of the Indian government launching the National Viral Hepatitis Control program covering 5 crore people living with chronic Hepatitis B and C in India. Without the preceding possibility of price rationalisation of the novel antiviral drugs, this National Control Program would not have been practically possible. Impact in India is most emphatic as it is on its home turf. The same possibility is now created across 91 LMIC countries.

> "Indian pharma companies enjoying backward integration into API for 70 - 80% of their ANDA portfolio compared to an average of 40% for global counterparts"

Embracing delivery innovation

On the foundation of formulation and chemistry capability, delivery innovation is now the next layer of expertise that is powering the potential of the Indian pharma industry. From a portfolio comprising largely of vanilla generics a decade ago, the industry has now embraced breadth that spans transdermal formulations, depot formulations of peptides and biologicals delivered through self-administration pens, inhalation drugs, ophthalmic implants and vaginal rings. While the strength of delivery innovation has not been a historical focus, it is being rapidly pursued through multiple strategic approaches – acquisition of technologies, in-licensing and strategic partnerships and finally organic development of in-house expertise in offshore teams across the US and Europe. With an evolving ecosystem of device developers now actively pursuing the bastion of Indian pharma companies, several co-developed device innovations are spurring the robust pipeline of drug-device combinations being advanced through the development and approval process. Notable examples include Zydus Cadila leveraging its 2012 acquisition of Hercon Pharmaceuticals to now pursue a globally energized pipeline of transdermal drugs and Glenmark partnering with Texas-based Evestra to develop generic to Nuvaring, Merck's contraceptive drug formulated as an intra-vaginal ring.

Simultaneously with the breadth of delivery expertise, the industry is also embracing the higher risk expanded engagement across the spectrum of peptides, biologicals and vaccines. With more than ten Indian companies having a peptide pipeline, Indian manufacturers are now emerging as a potential global source of next-generation diabetes drugs such GLP-1 agonists produced through chemical synthesis (SPSS) as well as recombinant routes. Again, the lead pipeline candidates across several companies are generic liraglutide, a product that calls for device innovation for realizing commercial value in global markets.

The current threshold of scale closing in the US $40 billion thresholds is built on chemistry synthesis and formulation strength. While this will remain as a core competitiveness driver, current investment in accretive layers of innovation-driven competitiveness shall propel the industry to the next sphere of growth and global influence.

"WE EXPECT TO SEE A CONTINUATION OF THE DIGITAL TREND IN 2021"

Luca Visini, Managing Director, Eli Lilly and Company (India) shares his insights on key market trends, latest initiatives, business outlook, and much more. Excerpts of the interview:

LUCA VISINI
MANAGING DIRECTOR,
ELI LILLY AND COMPANY (INDIA)

Challenges and learning during the COVID-19 pandemic?

COVID-19 has pushed us into becoming more resilient and responsive. Across the pharma industry, we saw how organizations shifted efficiently to work-from-home and digitized setting, ensuring continuity in running regular business programs. For six months, all Eli Lilly employees, including medical representatives, worked from home and that did not stop us from innovating and caring for patients. For instance, in 2020, Eli Lilly launched two new products, one for diabetes and the other for oncology using only digital channels.

Safety was of utmost importance be it the safety of our employees as well as the safety of health care providers. As an organization, in addition to ensuring that we made our employees feel safe in their jobs, we worked on helping them balance their work and personal commitments. We honoured all job offers and focused on employees' physical and psychological well-being in this shift to working from home. Some of our initiatives include salary advances, 'Voluntary Friday' leaves, ergo support and interventions through which employees could seek guidance for their well-being. We also empowered our employees through our 'We are NOT ALONE! (WANA)' campaign to manage both work and personal life expectations.

Finally, as a global healthcare company, we succeeded in maintaining a steady supply of our medicines and also took on the additional responsibility of developing medicines for COVID-19. We continued to work with key stakeholders, the health care providers, to make medicines available for the people who needed them.

280%

"We witnessed a remarkable increase of 280 per cent in the number of digital touch-points as compared to 2019"

Key initiatives undertaken by Eli Lilly in India and globally?

Eli Lilly believes in keeping its commitment to making lives better for people around the world. Eli Lilly has been a leader in diabetes management since 1923 when we introduced the first commercially available insulin. This year, we celebrated the 100th year of insulin discovery. Since then, we have been innovating to find therapies and solutions that address the daily challenges faced by patients living with diabetes.

As a testament to our continued commitment to helping people living with diabetes, Eli Lilly is expanding its partnership with Life for a Child (LFAC) to reach young people in more than 60 countries, including India, Pakistan, Ethiopia, Tanzania and Bolivia. Since 2009, Eli Lilly has donated 2.4 million vials of insulin to LFAC, which provides access to care, education and life-saving medicines and supplies to children and young people with Type 1 diabetes in developing countries.

Over the past few years, we have broadened the accessibility of all our insulins in our endeavour to lessen the burden of diabetes in India. Through our strategic partnerships with Cipla and Lupin for the marketing and distribution of our diabetes medicines, we were able to expand access to healthcare practitioners and patients.

While we are one of the leading companies in the diabetes segment, we have also taken on the challenge of fighting some of the world's most debilitating healthcare conditions by providing best-in-class innovative medicines in therapy areas such as Oncology and Immunology. With these products, we also put in place high-quality patient education and support programs.

The COVID-19 pandemic brought with it serious challenges, but at Lilly we decided to look at them as opportunities to keep growing, learning, and evolving. As we started working from home, we explored numerous digital channels to connect with our customers and continue to deliver on our purpose. We witnessed a remarkable increase of 280 per cent in the number of digital touchpoints as compared to 2019. As we shifted to working in the digital environment, we saw an increase in digital peer-to-peer interactions by 260 per cent. Our customers felt engaged and appreciated Lilly's commitment to helping people living with chronic conditions as well as our strong approach towards safety.

Company's performance financially in the current fiscal year? What are your expectations during FY 2021-22?

High performance with high integrity is our primary belief. Eli Lilly and Company has performed well across the globe during the pandemic and has registered a growth of 10 per cent from the previous financial year. In the coming year, we expect to see continued double-digit growth.

"We invest approximately 25.1per cent of our sales in R&D which is above the industry average and spend US $ 5.6 bn a year on R&D"

Key factors driving the growth of Eli Lilly in the Indian market during the next few years?

Eli Lilly's purpose is to unite caring with discovery to create medicines that make life better for people around the world. In India, our focus is to increase our ability to reach people with unmet needs by sharing scientific data with health care providers on new medicines/indications in therapy areas. This will happen thanks to new launches for medicines/indications in these areas. We will also leverage our growing ability to use all channels available - digital and traditional.

Which key novel molecules are in the pipeline and what are the disease areas that you intend to target?

At Eli Lilly, we value innovation. The medicines we make are innovative and life-changing. We are currently looking at venturing into newer therapy areas with another innovative product that we expect to launch in 2021. In addition to this, we will also continue to get label updates for new indications on our oncology products.

As one of the leading companies in the diabetes space in the Indian market, our focus also remains on bringing innovative products to this segment by 2022-23.

Company's major plans in the coming year, be it technology adoption or digitization?

We have broadened the digital channels we use and have come up with different formats of communication both internally and externally. In 2021, we expect to see a continuation of the digital trend that started in 2020 and for it to become an integral part of healthcare. Face-to-face and digital interactions will co-exist and we will continue to work with a hybrid model, amalgamating digital and face-to-face channels.

Keeping employees' safety in mind, we will also continue to monitor the impact of COVID-19 and accordingly make strategic decisions for employees who visit customers to carry out their work assignments.

Key trends in the diabetes segment? Any innovative solutions that are most awaited in the next few years?

India continues to be a country where the burden of diabetes is increasing rapidly. In India, approximately 77 million people were living with diabetes in 2019. Given the current trends, it is projected that India will have the highest number of patients by 2045. It is also estimated that almost half of these patients could remain undiagnosed. We continue to address this increasing burden through our portfolio of insulins as well as the innovative therapies that we have brought to the market.

To address inequity in access to quality diabetes care for many children and young adults around the world, Eli Lilly and Life for a Child (LFAC) are expanding their long-term partnership and shared mission to provide free immediate care as well as build sustainable diabetes care models for vulnerable populations. Eli Lilly India will play an integral role in bringing this strategic partnership to India. The expansion of the LFAC program is part of Eli Lilly's social impact efforts and supports Eli Lilly's 30x30, the company's goal to improve access to quality health care for 30 million people living in settings with limited resources, each year, by 2030.

Investment towards expansion into new territories?

Eli Lilly continues to ensure it focuses on investing in R&D. We have R&D facilities in 8 countries, and we conduct clinical research in more than 55 countries. We invest approximately 25.1 per cent of our sales in R&D, which is above the industry average. We spend US $ 5.6 billion a year on R&D and have over 7,800 of our global employees – that is about 23 per cent of our workforce – engaged in research.

"MICROPORE IS LOOKING AT INVESTING SIGNIFICANTLY IN INDIA"

Dai Hayward, Chief Executive Officer, Micropore Technologies Ltd. shares his insights on the Indian subsidiary focus, India investment, and new technologies. Excerpts of the interview:

DAI HAYWARD
CHIEF EXECUTIVE OFFICER, MICROPORE TECHNOLOGIES LTD.

Micropore Technologies is in the process of establishing its subsidiary in India. What will be the focus of the Indian subsidiary?

Micropore Technologies is all about precision formulations. We have the technology for doing that which we have already introduced to the Indian market about 4-5 years ago. And with the growth of business in India, we felt it important to establish a subsidiary here. We have registered in Hyderabad and are going through the final formalities of setting it up including obtaining our GST registration. We are very close to doing business directly between the Indian customers and our own company in India.

We plan to make available all our technologies and products including enhanced formulations available to the entire Indian market. The plan will be to roll it out slowly over a while. We already have been doing business with the pharmaceutical and agrochemical sectors.

When in 2021, are you planning to set up this subsidiary and when should it be operational? Any timelines?

As soon as we will finish the registration for GST and similar other processes, everything will be operational and ready to roll.

In 2018, you have done your first sale to a pharmaceutical company in India. How has been your journey to date and how is the Indian company performing?

The sale we made in 2018 was to a pharmaceutical company in Hyderabad. We have deepened our relationship with that company and we have established new relationships with companies in Mumbai, Bengaluru, Hyderabad and Ahmedabad.

"We have deepened our relationship with that company and we have also established new relationships with companies in Mumbai, Bengaluru, Hyderabad, and Ahmedabad"

What is the amount you are planning to invest in India?

We cannot divulge the exact amount but it would be sufficient for the conduct of business properly. We will be investing in laboratories, people who will run them and an additional team for marketing. We have investments in supply chain partners who have been very reliable and we are happy with them.

What will be the key activities of this laboratory?

The laboratory will help the local customers with their formulation challenges. For example, making lipid nanoparticles, liposomes, vaccines and gene therapy treatments. We will demonstrate our technologies and work with the Indian customers in the Indian market in an Indian laboratory. Our homegrown technology solutions are very much fitting with the Make in India call by the Prime Minister of India.

In terms of manpower, how many people are you planning to recruit in your R&D lab?

We will probably recruit three to four experts in the next 12 months and depending on the success, I shall expect it to grow rapidly after that.

Do Micropore Technologies offer a new crystallization process principally targeted at API manufacturers who are working to restore APIs from China? How will this technology help Indian companies?

The technology we have allows one to produce crystals of the right size with minimal downstream processing and no

jack milling. There are two benefits, first is that it is an efficient process and you get the product you want. The second is that because you are not subjecting API to high energy and low jack milling, we can give morphology consistency that API manufacturers won't. It happens to be a continuous process, so it is a very efficient high-volume process.

According to you which product technologies from Micropore would be relevant for the Indian market and why?

We see that there are two areas that I mentioned earlier as well. First is the drug product area where injectable, long-lasting sustained-release drugs are formulated in India. It includes not only micron size materials such as PLGA, biodegradable polymers but also nano-scale materials, liposomes and lipo-nanoparticles. India also has big potential, particularly the last ones. We are looking at collaborating with a couple of companies in India in these areas. Second is the drug substance, and that's the API crystallization story where we can improve and enhance the process including its efficiency and productivity while at the same time improving the final product. Therefore, we can bring significant contributions to India in terms of improvements in R&D.

In 2019, you have closed series A funding with pound 1.5 million? When do you plan to go for the next round and what will be the focus?

We are planning for the next round of funding at the moment. We are looking for 2.5 million pounds and expect to raise this funding during the second half of the year. We already have interest from several investors and obviously, I would be interested in hearing if any Indian company would be doing that as well.

The purpose is to make the product more widely available, provide more support across the globe and to enhance the Indian business as we see a lot of growth potential of our market in India. I have been a regular visitor to India, the first being in 1987. And I have always enjoyed doing business in India. I have great respect for Indian scientists and manufacturers. They are constantly innovating and pushing the boundaries and that fits our philosophy as well. I think that there is a big opportunity for collaboration.

How has your company performed during FY2020?

Despite the pandemic, we grew by 50 per cent and we increased our workforce by nearly 100 per cent. So, it was quite good.

How do you see Micropore's business landscape in FY 2021?

The business has started well and I would expect it to continue that way as we are getting more recognized across the globe and particularly in India where we are establishing an on the ground team. The purpose of the funds is that we can robustly support our growth.

Other than India, which are the other geographies that you are focusing on?

We have an office in the United States since 2009 but it has been always a sales subsidiary rather than a standalone presence. The plan is to have a standalone presence, exactly as in India, to have a full-fledged laboratory and staff to serve the local market locally. We are also expanding into Japan. Our growth in Europe is through the United Kingdom and that's going great.

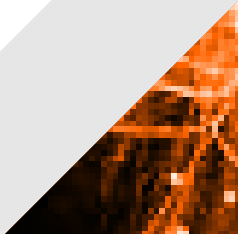
Are you satisfied with the performance in the last 10 years? How do you look at the big picture in the next 10 years?

I am not satisfied with our performance in the last 10 years as we should have planned well. The biggest challenge that needs to be overcome is to turn the old technology into more robust and scalable for use by the manufacturers. Since we began doing that at the beginning of 2018 and we witnessed encouraging growth.

In the context of the Indian market, the main opportunity is the interface with more Indian companies to get us and our technologies understood and collaborate.

Digitalisation

Creating Opportunities For Sustainable Growth

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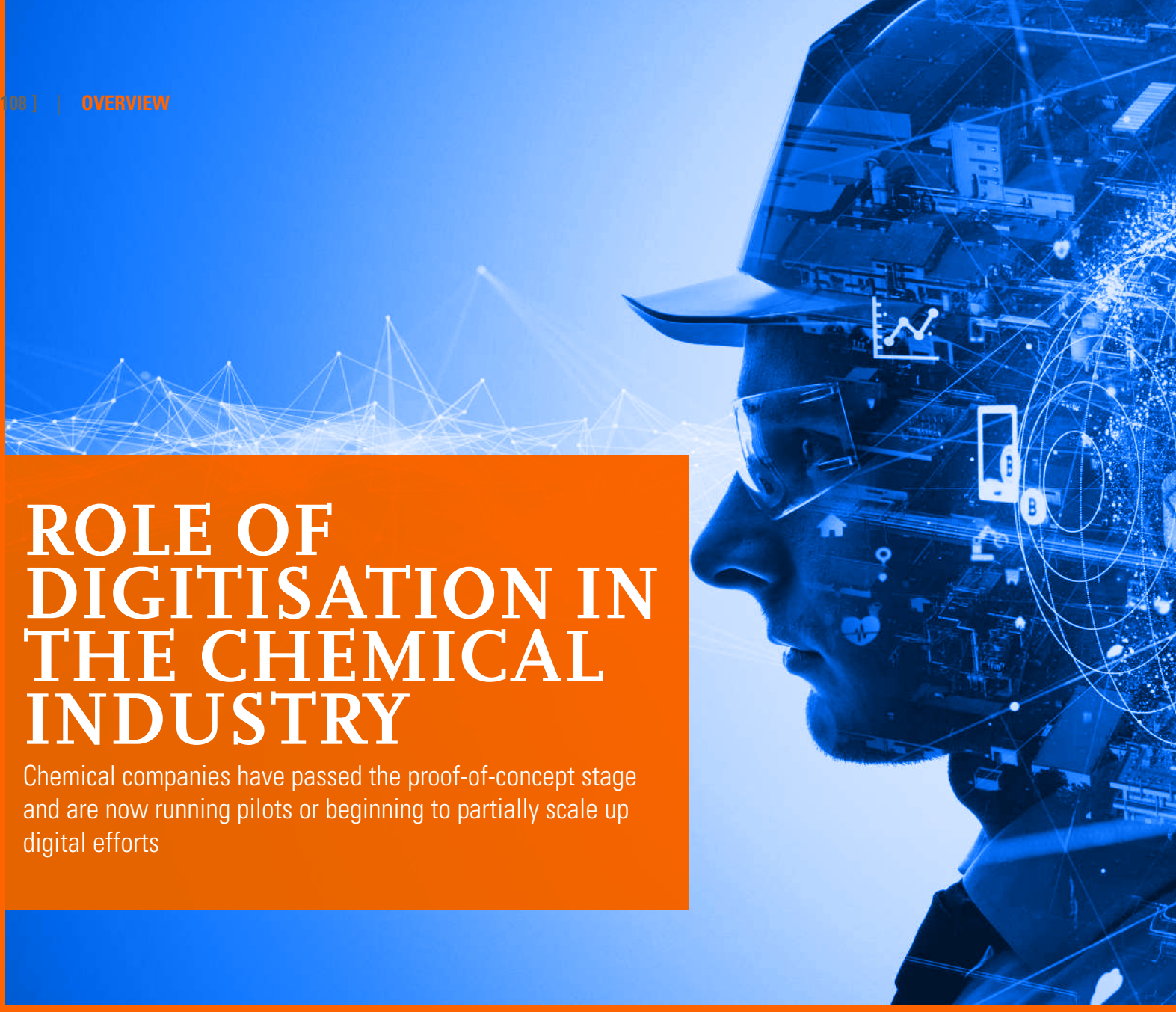


ROLE OF DIGITISATION IN THE CHEMICAL INDUSTRY

Chemical companies have passed the proof-of-concept stage and are now running pilots or beginning to partially scale up digital efforts

BHUDEEP HATHI
MANAGING DIRECTOR - CHEMICALS LEAD, ACCENTURE TECHNOLOGY INDIA

On your marks. Reset. Go! This past year has brought many challenges, but it also marked an opportunity to adjust and rethink fundamentals as we go forward. Indeed, the World Economic Forum has called this era the Great Reset—and it is shedding light on how the chemical industry can use digital technology to move forward.

The pandemic caused many of us to rebalance our daily lives—to shift our focus down Maslow's hierarchy of needs to the basics of food, shelter and health, and find ways to carry on in a dramatically changed environment. The industry demonstrated that plants can operate with fewer shifts and smaller teams—with some plants even achieving record production. Remote Marketing and sales became the norm. Greater cost efficiencies were achieved through reduced employee movements, having fewer contractors on-site, optimised supply chains and the increased use of collaboration tools. These changes were made out of necessity, but they helped define effective new ways of working. No one can imagine going back to the

"Technology-led digitisation in the chemical industry will play a pivotal role in driving the next wave of growth"

way we operated pre-pandemic. We now have new baselines for work practices, costs and efficiency that are being woven into the chemicals industry. These are driven by the technology-enabled abilities and insights that helped chemical companies sustain themselves through the pandemic.

The future of the industry lies in providing sustainable, secure, hyper-personalised interactions and experiences across the chemicals value chain, enabled by technology and the integration of processes, systems and talent. Competitive differentiation is moving beyond the traditional "economies of scale" in terms of IP ownership, horizontal and vertical integration and access to feedstock. Instead, it is now shifting to "economies of value"—that is, having the right ecosystem of partners, being agile, innovative and flexible, and delivering superior customer experiences. As we move towards the eventual post-pandemic recovery of demand, digitisation will play a central and indispensable role in realising these economies of value.

The chemical industry is no stranger to either digitisation or technology-led innovation. Indeed, the adoption of digital technologies in the industry has increased over the last three years. This can be seen in the growing use of robotics, remote operations centres, Industry 4.0/ smart plant twins, autonomous operations in warehouses and logistics, data-driven agribusiness platforms and digital supply chains—to name a few examples. Accenture's research shows that the industry's digital maturity index in 2020 stood at 42.2 per cent, compared to the overall manufacturing industry figure of 39 per cent. (In this index, 100 per cent indicates that all digital capabilities are being deployed and rolled out). This means many chemical companies have passed the proof-of-concept stage and are now running pilots or beginning to partially scale up digital efforts.

To understand the potential of the technology—and where the industry needs to go—it is useful to look at digitisation through four key lenses: customer expectations, new business models, cost efficiencies and business value, and the workforce of the future.

"It is useful to look at digitisation through four key lenses: customer expectations, new business models, cost efficiencies and business value, and the workforce of the future"

Customer expectations

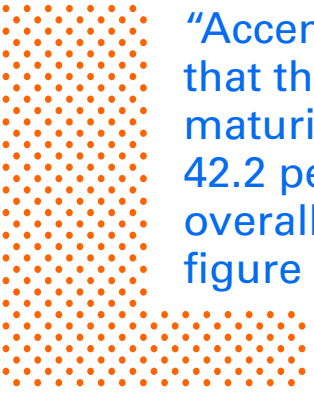
Digital technologies will be at the heart of this experience, as companies leverage the power of technology platforms that are seamlessly integrated with customers' systems and inventory data, and that deliver data-driven insights. The Accenture 2020 Global Buyer Values Study found that chemical industry customers believe that it is important to have digital interfaces and experiences that make interactions easier and more intuitive—and in fact, they are ready to pay more for a differentiated experience. However, the research also found that chemical companies underestimate the importance that customers place on digital interactions. Nevertheless, they do see value in it, and about one-third of the surveyed chemical companies believed that they could increase profits by more than 20 per cent by leveraging new technologies more extensively for customer-centricity.

That belief isn't always translating to action. Early examples of successful digital channels at Dow Corning and Sigma

Aldrich have not been broadly imitated across the industry. Instead, ecosystem companies such as Knowde and MOLBASE, distributors such as Univar and Brenntag, and established e-commerce giants such as Alibaba are setting the new standards for digital interactions. In India, the industry still has a way to go in creating its strategies for using digital technology to win customers, which means that a well-defined digital ecosystem will be essential to providing a superior customer experience.

New business models

For the chemical industry, new business models often focus on circularity, and there is growing interest in circularity—globally and in India. End consumers are demanding sustainability, and chemical companies are seeing a pull from downstream value chains for circular products and processes. This creates opportunity, but it also threatens to disrupt existing value chains and profit pools. Also, investors are increasingly likely to consider not only business performance but also a company's positive impact on society and the environment.



"Accenture's research shows that the industry's digital maturity index in 2020 stood at 42.2 per cent, compared to the overall manufacturing industry figure of 39 per cent"

Digital technology will play a critical role in these new business models. It holds great potential in areas such as carbon emissions capture; improving chemical recycling processes; tracking waste; machine learning (ML) based sorting of recyclables; digital passports for tracking circular products; using data science to increase energy efficiency in plants; monitoring the loss of water and other resources; understanding the impact of emissions on climate; and the tracking of key metrics to help improve overall yield/throughput, safety and sustainability in operations.

Cost efficiencies and business value

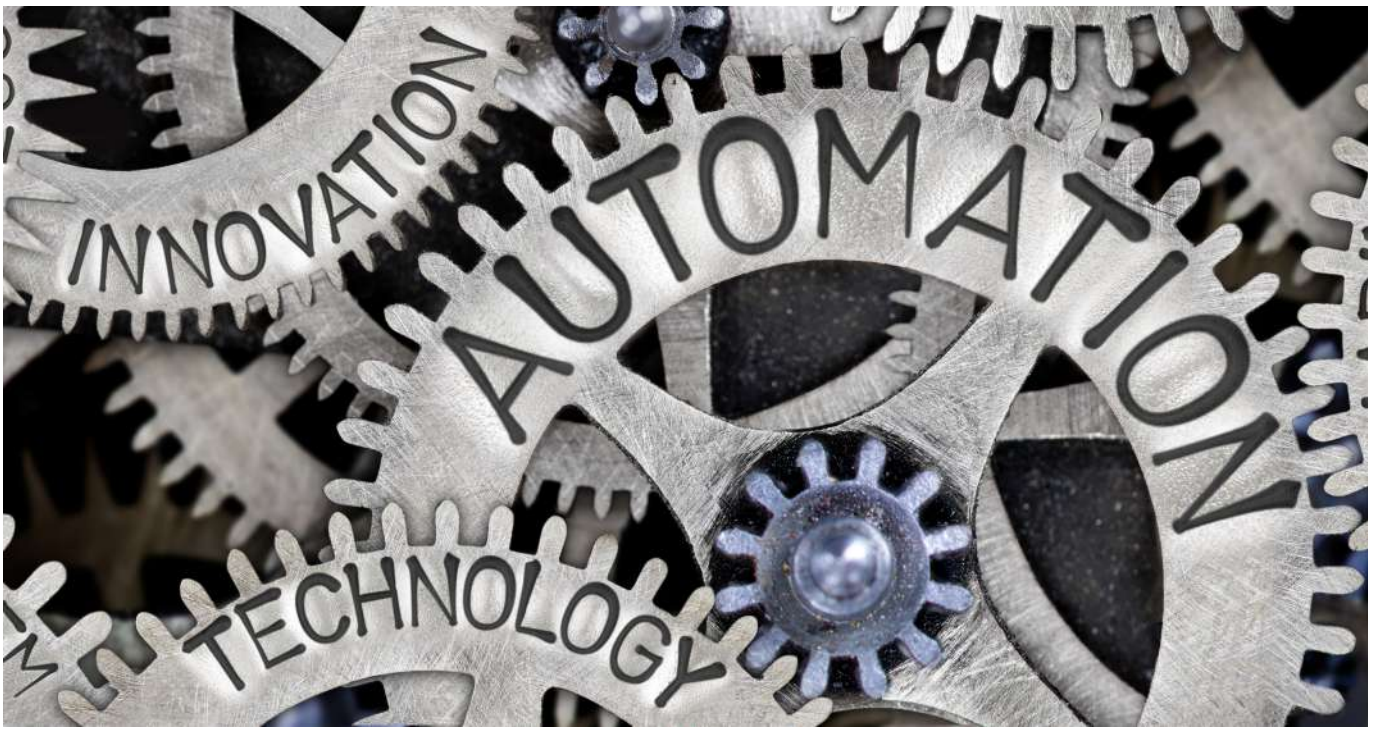
The search for cost efficiencies and increased business value is as old as the chemical industry itself, as companies have looked for ways to thrive in the face of industry cycles and demand-supply shocks in end-user industries. In the coming months and years, cloud, analytics and Artificial Intelligence (AI) technologies will play a key role on this front.

According to Accenture's research, more than 80 per cent of chemical companies have started using cloud, IoT and data analytics technologies in the last three to five years. Almost 70 per cent of chemical industry leaders have invested significantly to build the in-house expertise needed to accelerate cloud Software-as-a-Service adoption in their organizations. Industry leaders such as Dow Chemicals have deployed data-driven cloud platforms to personalize their marketing programs and find innovative ways to collaborate with customers. Speciality chemical businesses such as AkzoNobel are building Microsoft Azure cloud-based IoT platforms to perform analytics in real-time. Service-oriented chemical businesses such as Ecolab are deploying cloud-based predictive analytics services for industrial water management.

Companies are doing more than "lifting and shifting" existing systems to the cloud—they are building new capabilities that let them take full advantage of data to drive business actions. For example, companies can use cloud-based data to speed up new product development and reduce the number of experimental iterations in R&D, or to improve yield optimisation using data lakes to support data-driven operational decision-making. The cloud can simplify M&A, as well, with the use of virtual private networks making it possible to more easily bring different clouds into one common account; or, clouds can be combined using a tiered parent company and child company approach. IoT, AI/ML and blockchain platforms hosted in the cloud can enable real-time updates for end-to-end visibility of shipments to make supply chains more resilient. And as the pandemic has clearly shown, the cloud has a central, vital role to play in remote working and business continuity.

AI has become a hot topic in the industry, and chemical companies recognize the immense business value it could bring in terms of yield improvements, profitability and margin management, cost optimization, and accelerating R&D, among other things. Recently, ADNOC formed a joint venture with the Abu Dhabi AI firm Group 42 to develop and commercialise AI products and applications for the oil and gas industry. In India, some manufacturers are turning to the Industrial Internet of Things (IIoT) and analytics to help drive growth. Case in point: Tata Chemicals, which is looking at modernising its plants with IIoT. The key question is whether the chemical industry is ready to scale up AI in its plants and operations. Beyond the AI tools themselves, effective AI depends on data and process readiness. It requires large blocks of accurate data and integrated processes to ensure that it is solving the right problem holistically, without working in silos. Thus, it is critical to establish the right data governance processes, culture and data strategy as a foundation for AI.

Overall, chemical companies that



fail to make effective use of these technologies to run their enterprise will risk missing out, not only in terms of increased efficiency and business value but also in building the ability to keep their businesses running in the face of future disruptions.

The workforce of the future

Like other sectors, the chemical industry has been debating workforce topics such as the gig economy, digital natives, the need for new skills, and employees' evolving expectations about roles and work. Today, we see chemical companies, including those in India, competing to find data scientists, innovation specialists, robotics engineers, and other technical specialists, which speaks to the need for people who can help implement digital technologies at scale. To encourage future generations to choose chemicals as a profession of choice, chemical companies need to give employees the same quality digital experiences that they have in their daily lives as consumers. That means providing collaboration tools, bring-your-own-device policies for non-hazardous areas in plants, and digital identities that streamline interactions, to name just a few. Digital technology will not only be important to chemical companies' operations—but it will also be key to attracting talented people and empowering them to perform their roles with greater efficiency, velocity and tenacity.

Leading through technology

Many observers have noted that every business is becoming a technology business. The Accenture Technology Vision 2021 takes this a step further, saying that every leading company will be a technology leader, and a company's technology architecture and capabilities will be the true source of competitive differentiation. For example, the use of massive, intelligent digital twins is ushering in new opportunities for chemical leaders to bring data and intelligence together, ask and answer big questions, and reimagine how they operate, collaborate and innovate. At the same time, we are seeing the "democratisation" of technology, as natural language processing, low-code platforms and robotic process automation are adding an embedded grassroots layer that enables and motivates every employee to become an innovator.

Technology-led digitisation in the chemical industry will play a pivotal role in driving the next wave of growth. But moving ahead will require more than asking "which technologies do I want to use?" Instead, companies will need to start by asking "what business problems do we want to address?" Once the business imperatives and underlying process improvement opportunities are defined, the key will lie in "technology unity"—the marriage of these digital technologies to provide a comprehensive approach to solving business problems. It is not cloud alone, AI alone or blockchain alone that will deliver significant business results, but rather a combination of technologies designed to help companies achieve new levels of growth and business value.

The path ahead is going to be complex because effective digitisation involves not just technology implementation, but also business transformation. It will require an overarching digital strategy that addresses culture, business process, technology and talent. It won't always be easy—but for an industry with a long history of solving difficult challenges, it will not be insurmountable.

CRAIG HAYMAN
CHIEF EXECUTIVE OFFICER, AVEVA

THE POWER OF FOUR

Combination of digitization, automation, sustainability, and data will be the key differentiator

Technology has become deeply embedded in almost every facet of life and plays an intrinsic role for many businesses across the globe. Digital transformation is enabling organizations, particularly in the industrial sector, to enhance their capabilities, and increase their returns across their assets and operations. The use of the Industrial Internet of Things (IIoT) through real-time analytics has had a profound impact, by improving response times to potential issues and minimizing possible damage to the environment, which has resulted in the avoidance of costly unscheduled shutdowns, while improving profits.

As we look ahead into 2021, four key technology predictions stand out for the Industrial sector.

First, digitization will continue to spread and mature within organizations – Connected IIoT will go deeper and wider across the core of many businesses.

Second, Artificial Intelligence (AI) and Machine Learning (ML) enabled technologies will continue to automate processes to deliver improved performance and agility.

Third, there will be a greater focus on sustainability businesses looking to become cleaner and more efficient in their use of natural resources.

Fourth and not least, businesses will look to unlock critical insights from data.

"An increased focus on digital transformation and data-driven insights will be a game-changer"

Digitization will deepen and cloud Usage will mature

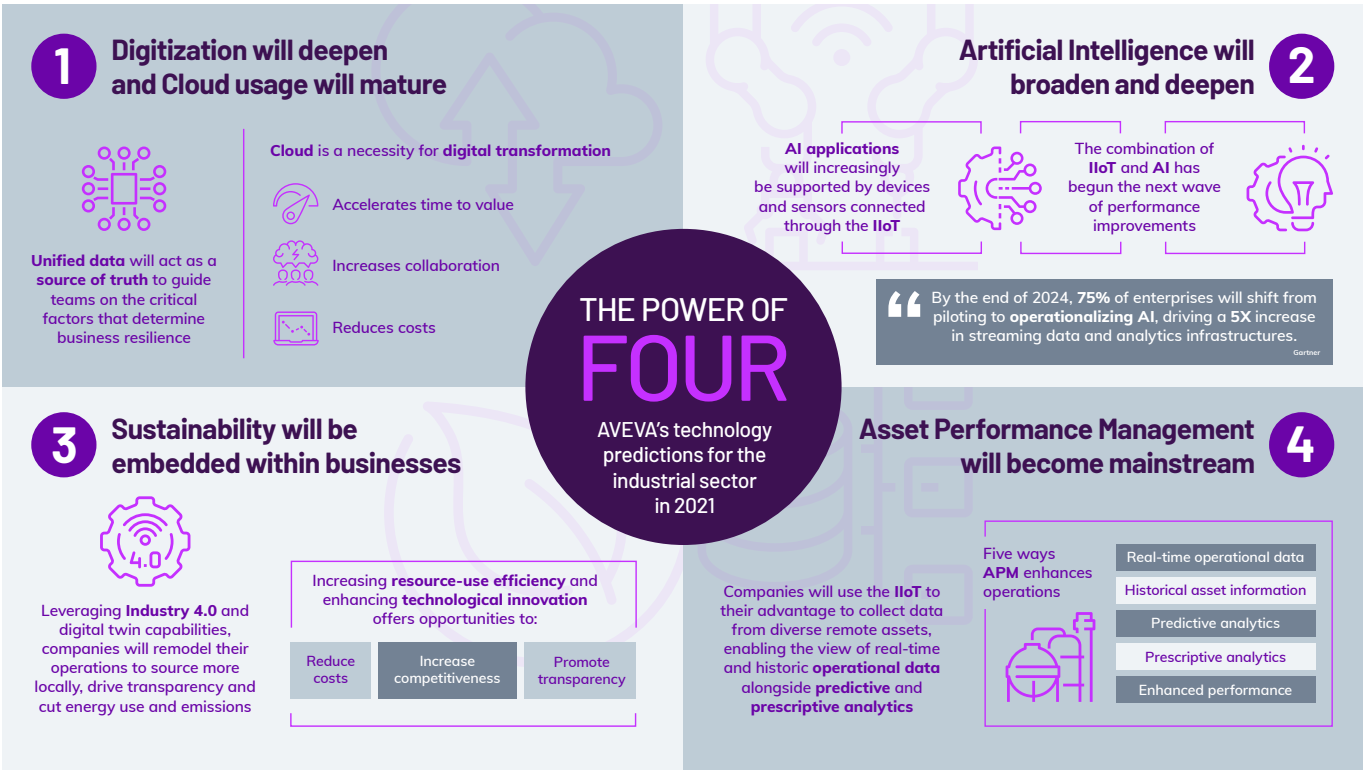
Digital capabilities strengthen resiliency. 2021 will pave the way for further digital transformation within the industrial sector organisations. Across industries, business leaders are also turning to technologies such as AI and 3D modelling to understand their production processes and plans. To adjust to an environment where the supply of raw materials is volatile and demand for end products is focussed on the essentials, businesses must understand their production facilities better than ever before.

Cloud is not necessarily a prerequisite for digital transformation but an enabler. Cloud technology accelerates time to value, increases collaboration and reduces costs. What's been evident in 2020 is that a cloud platform allows organizations to consolidate data from multiple sources into a central location for improved transparency and accessibility – at any time, any place and from any secure device.

The current crisis is accelerating the use of cloud and data in increasingly sophisticated ways to help provide visibility and certainty into operations. The adoption of analytics is said to be one of the greatest drivers of digital transformation, as businesses seek greater data-driven insights. Data acts as a source of truth that aids teams to focus on the critical factors that determine business resilience. There has also been a fundamental shift in mindset: customers now understand where they need to get to and how quickly they need to get there. In an age where time is of the essence, an increased focus on digital transformation and data-driven insights will be a game-changer.

Automation will pick up pace

According to Gartner, "By the end of 2024, 75% of enterprises will shift from piloting to operationalizing AI, driving a 5x increase in streaming data and analyt-



ics infrastructures." Boosting augmented data management systems with AI will also help to optimize and improve operations. Examining large samples of operational and historic data will become the norm.

> "Integrating real-time and historical data enables a team to assess potential outcomes of operational states and behaviours"

We will also see AI applications increasingly being supported by devices and sensors connected through the IIoT. The combination of IIoT and AI has led to the next wave of performance improvements, especially in the industrial sector. Furthering this automation, AI uses the historical IoT data to analyse trends which can help in streamlining and improving the supply chain process through cutting-edge solutions such as AI-driven operations scheduling. This provides recommendations to humans as to the optimal scheduling sequence, substantially reducing error and inefficiencies.

Sustainability to be embedded

Sustainability is a journey beginning by measuring where organizations are. Digitization is the natural first step for a fact-based approach. This data allows complex businesses to develop a meaningful strategy and execute it on the ground.

Industry 4.0 will help to bring information together to build a digital twin that allows organizations to optimize sustainable processes. If we take the energy sector, in the past few months jet fuel consumption dropped dramatically, however, energy consumption overall remained relatively stable and electricity demand grew. Electricity remains the most efficient way to distribute energy around the world.

Industrial development is crucial for economic growth, eradicating poverty and employment creation. However, increasing resource-use efficiency and enhancing technological innovation offers real opportunities to reduce costs, increase competitiveness and employment. The industrial sector, although late to the digital transformation process, has a unique opportunity to lead the way in making a significant impact on the planet.

Data repositories will acquire memory

The adoption of data analytics is said to be one of the greatest drivers of digital transformation, as businesses seek

greater data-driven insights. Data acts as a source of truth that helps teams focus on the critical factors that determine business resilience. Businesses are acutely aware that they must become more resilient by using technology.

Companies are using IIoT to their advantage to securely connect, and collect data from diverse remote assets, channelling information to advanced operational applications, and closing the loop by feeding key business applications.

This has been particularly true for the industrial sector, where data has had a significant impact in five key areas:

- Real-time operational information is increasingly being used to understand what is happening in real-time and enables the condition management of asset and operations lifecycles.
- Historical operational information helps organizations to understand what has happened in the past to create intelligence around the operational behaviour of assets. Through operational trends, the display of KPIs and dashboards, one can create abstracted views of operational states. For example, a graph may be displayed on a dashboard showing the turbine's past vibration frequency during operation. This can be compared to the real-time vibration frequency, creating intelligence on the asset's long-term operational trends.
- Predictive analytics is used for what-if type modelling. Integrating real-time and historical data enables a team to assess potential outcomes of operational states and behaviours, even accounting for tertiary variables. Deterministic or non-deterministic models can then be applied for open-loop simulation and predictive analytics. For example, you can now estimate how long a piece of equipment can run before it requires inspection or is predicted to fail.
- Prescriptive analytics describes what's needed to optimize asset and operations lifecycles. Scenario-based guidance is created and delivered through learning elements and closed-loop algorithms to enable your team to calibrate planning and scheduling across the entire enterprise value chain.
- Enhanced safety is achieved through a combination of connected IoT devices, augmented and virtual reality technology, which provides real-time operating procedures and key messages to operations personnel, reducing human error for performing specific tasks.

Be Bold, Reflect and Evolve

Uncertainty is here to stay, as well as the possibility of a resurgence of Covid-19, the length and depth of the economic downturn, trade wars, oil price fluctuations and so forth, so businesses must take lessons learned from uncertainty and create their new normal.

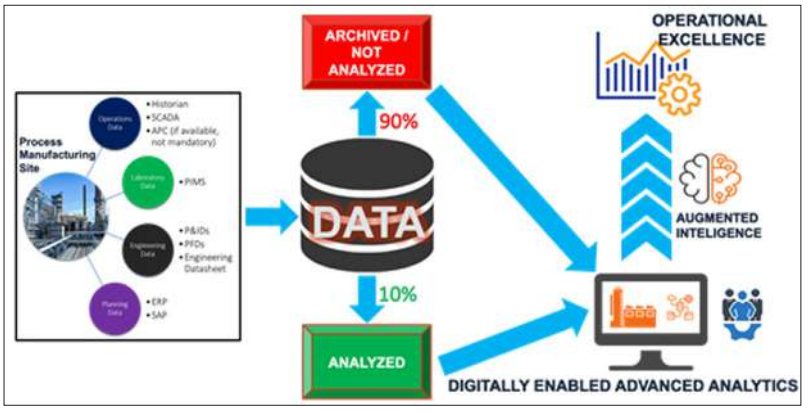
What lessons have we learned from 2020? Businesses require intelligent software to address industrial pain points for value creation, productivity improvement, insight discovery, risk management and cost optimization. With the right technology, businesses can be incredibly agile to manage costs, boost efficiency and avoid costly mistakes. The combination of digitization, automation and data-driven insights, with a focus on sustainable business, can be a key differentiator and a propelling force to help ensure businesses meet their goals of today and tomorrow.

DR. PRATAP NAIR
PRESIDENT & CEO,
INGENERO INC.

DATA ANALYTICS KEY TO TRANSFORMATION

Advanced analytics breaks the paradigm and allows utilization of traditionally archived data to extract insights that are otherwise missed

The chemical industry has digitized its operations over the past three decades. The large volumes of a variety of historical data collected and stored have been growing exponentially with time and every second more data gets added. However, less than 10 per cent of the data is typically utilized and the rest archived. Despite the wealth of information that resides in this archived data, effective utilization and analysis have typically not been happening. Digitally enabled advanced analytics breaks this paradigm and allows utilization of the traditionally archived data to extract insights that are otherwise missed.



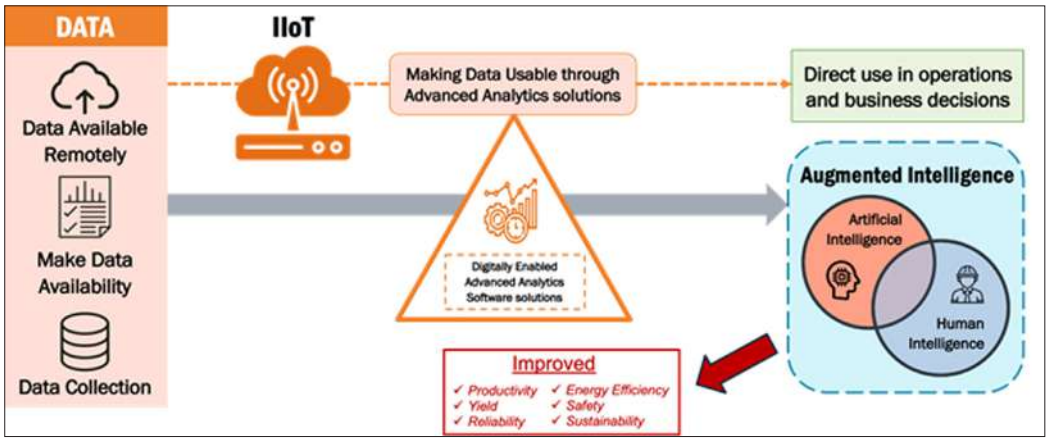
Analytics paradigms in chemical

In the chemical industry's manufacturing step, chemical transformations and separations happen within pipes and vessels and the details of what is happening come from the sensor data. Market dynamics and changes to inputs to the process make manufacturing decisions even more complex. Chemical engineering fundamentals can explain the most complex interactions. For the past three to four decades first principle simulations capture this knowledge and describe expected process and equipment behaviour. However, while these analytics tools based on fundamentals have helped transform the chemical manufacturing plant design process by orders of magnitude over the years, the use of simulation to modify and improve ongoing operations has been limited.

Certainly, attempts have been made to use fundamental-based simulation models by combining them with data collected from the plants to predict the behaviour of the manufacturing process, to better control the process, to optimize operations, and to perform what-ifs to troubleshoot or plan future improvements to operations and design. Combining raw data with these fundamental models has been a challenge due to inherent errors in the data collected, model convergence issues, and limitations in getting timely inputs for decision making. Statistical data-driven models are often used when these issues are present or for processes and unit operations where fundamentals-based predictions are not available. Using limited data sets can make data-driven models tractable to solve. Likewise, simplified linearized models are used for planning purposes depending only on infrequent updates based on actual data. However, the disconnect among the various models from using different databases typically results in gaps between plans, schedules and response to market demands.

Advanced analytics paradigm shift

The dramatic increase in computational power, communication speed and lower



cost of data storage and computations over the past decade have been driving the development of technologies that enable making data available anywhere, increasing computational speed of large volumes of data and better visual presentation of data in real-time. This is transformational. The application of traditional statistical techniques now provide timely results using larger data sets and can include intelligence from fundamental models. This has given rise to the wide use of technologies like Machine Learning (ML), Artificial Intelligence (AI) and hybrid models (combining fundamentals with data models and selectively simplified models). When combined with other Industry 4.0 technologies like IIoT, more comprehensive databases, enhanced visualization tools and advanced data analytics, applications can greatly enhance decision making that formerly required approximations or intuition. Digitally enabled Advanced Data Analytics is a key ingredient to be able to ultimately glean value from any Industry 4.0 implementation and makes the connection between the physical and the digital world to deliver value.

Impact of digitally-enabled advanced analytics

Applications are being made that dramatically improve productivity, reduce the risks on account of safety or environmental impact, improve the reliability of operations, reduce the gap between plans and actual and respond faster to changes in the market or conditions. With digitally-enabled advanced analytics, chemicals companies have far wider and deeper insight than ever before, enabling more informed strategic decisions. Digitally-enabled advanced analytics make sense of the data to drive action on the physical assets and across different stages of the value chain. Data about chemicals processes, asset performance, energy use and supply chain operations are being used to draw meaningful insights that can guide informed decision making.

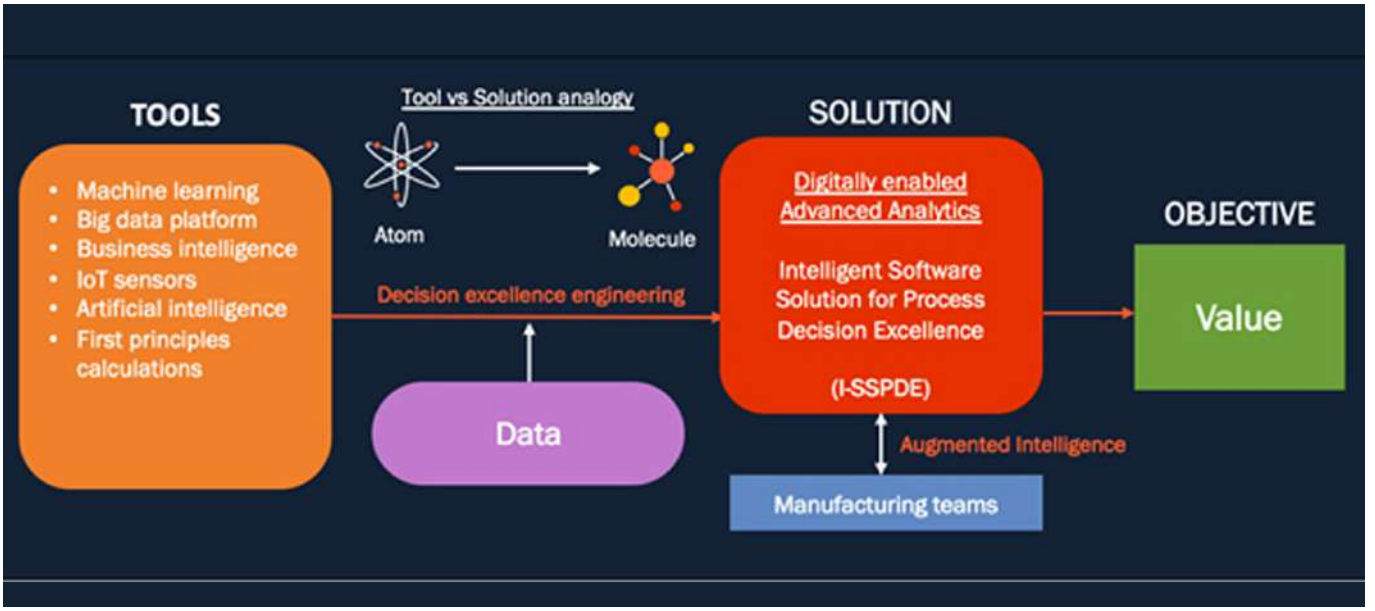
"Disconnect among the various models from using different databases typically results in gaps between plans, schedules and response to market demands"

Specific opportunity areas where the chemical industry is beginning to leverage digitally-enabled advanced analytics include:

- Improving Asset Performance
- Predicting reliability issues long before they occur, giving time to act on it proactively, preventing unanticipated downtime – increases production and asset effectiveness
- Identifying and weeding out errors in data, using a larger data set, data science techniques as well as intelligence from fundamental models – decision quality information for engineers and planners
- Dynamic benchmarking – benchmark with the previous best under similar conditions and how to get there in real-time for both continuous processes as well as batch processes (Identifying and replicating the performance of the "Golden batch").
- Revising and optimizing plans to changes in market conditions, faster
- Integrating models to plan, schedule and operate, based on a consistent and updated data set
- Better handling of instrument drifts and equipment fouling in real-time – minimize quality excursions, lower emissions
- Better manufacturing operations performance – production, yield, availability, costs (energy, specific raw material usage), lower operational risks
- What-ifs at operations, engineering and planning levels, using updated models
- Better emissions, energy and waste management
- Better demand forecasting
- Faster R&D and product development
- Faster concept to execution
- Data analytics to augment buyer-seller arrangements with dynamic value-based pricing
- will likely impact the way chemicals companies operate and grow their businesses, as they shift away from the pay-by-the-ton revenue model to provide value-added products and services to their customers.

Dynamics of advanced analytics implementation

Domain expertise is a critical aspect of setting up digitally-enabled advanced analytics. Software solutions require not just software programmers but also domain experts who can marry chemicals domain knowledge with software capabilities. Converting analytics tools and techniques into a solution that can provide Augmented Intelligence requires a



specialized Decision Engineering Process.

Case examples from chemical industry

Combining engineering design, process engineering, software engineering and data science domain expertise allows powerful solutions to be built. These digitally-enabled advanced analytics applications with the appropriate decision engineering utilized have delivered impressive value:

Increased capacity with better sustainability:

A long Chain Alcohol facility in Louisiana, USA was able to overcome off-spec product challenges and better manage multiple product transition complexity and was able to enhance capacity by 30per cent without CAPEX, improve first-pass quality by 11 per cent and stop external tolling, all of which improved the Carbon footprint, through use of continuous use of advanced analytics on their operations data.

Increased profitability and efficiency:

- Two ethylene facilities in the Middle East of a major US Petrochemical major were able to improve yield, plant availability, throughput and efficiency, saving US$ 250 million over 5 years, while simultaneously improving Sustainability parameters, through the utilization of a Hybrid Digital Twin using fundamental models and Machine Learning, along with remote tracking.

> "Digitally enabled Advanced Data Analytics can ultimately glean value from any Industry 4.0 implementation and makes the connection between physical and digital world to deliver value"

Better visibility and quicker implementation:

- A Midstream company in the USA, operating the largest NGL pipeline network in the USA, was able to increase profitability by 22 per cent, using Ingenero's Digital Twin deployed over 40 facilities, providing centralized asset visibility, allowing a systematized identification and prioritization of process/operations requirements and optimization capabilities.

Reduced product loss:

- Advanced Analytics helped minimise ethylene losses in a process at a Petrochemical facility in India, addressing cyclic ethylene use and batch process challenges that the manufacturer was facing through concept development and follow through cost-effective engineering and implementation, providing an annual savings of US $ 650,000. 1.5 tons per day of ethylene loss was reduced to 100 kgs/day.

Combining simulation with statistical data analytics (Machine Learning), domain expertise with software expertise and real-time data with thoroughly analyzed and modelled data enables powerful solutions for the chemical industry to be built using these tools drives significant improvement in terms of profitability and sustainability.

NANDAN MISHRA
FOUNDER & CEO,
ALGO8 INC.

AI PLAY IN CHEMICALS

AI-powered solutions have unlocked predictive asset maintenance capabilities, process tracking and optimization

The pace at which our industries are getting digitized is ever-increasing; I mean, it's pretty intuitive if you think about it. The more digitization we have, the more digital information we have access to, and that just make making digital business models easier. For the last couple of decades, we have had widespread computer infrastructures installed in large and process-driven industries such as chemicals, manufacturing, oil & gas, etc. And they have been in place, gathering massive volumes of process and industrial data over the years. The problem however remained, that we did not have the means to utilize these data-stores to their full potential.

However, with the advent of advanced Artificial Intelligence (AI) and Machine Learning (ML), we finally can make our computer systems intelligent and do the work for us. Essentially, digitization technologies have reached a stage of sophistication where we can equip industrial setups with 'self-conscious' computer systems; this will be the next iteration of Industry 4.0, where we will see Smart Factory setups become commonplace.

Chemicals play a crucial role in the industry as well as a society since they can be found in a wide variety of everyday products from automobiles and medicines to toys and clothes which means the impact that AI will have on the chemical industry, will greatly impact us all via multiple channels, even if they are indirect.

AI makes computers capable of performing tasks that would traditionally depend on the cognitive abilities of humans, such as observation, learning, decision making and problem-solving. Now imagine that all the computers and control systems involved in a factory process, say a chemical plant producing petrochemicals, are armed with AI capabilities. One wouldn't need a human operator to perform basic process-control operations such as observing and maintaining parameters such as process-pressure, fluid flow rates, temperature and so on. The computer reporting the process parameters like pressure, speed or temperature itself is aware of these values. It is no longer simply measuring and displaying them for the operators. Rather, they have been trained to know which values of process parameters are desirable, which are safe, and which are not. So, effectively the workflow for several process control functions can easily be simplified from Process out of bounds > The control device registers change > Operator registers change > Operator decides the course of action > Operator uses the control panel to fix change > Process rectified. To a much more concise and faster workflow: Process out of bounds > Computer registers change > AI-based corrective measure > Process rectified.

"AI-powered solutions have unlocked predictive asset maintenance capabilities, process tracking and optimization"

So clearly, one of the primary advantages of smart factories will be the fact that several processes will be completely automated. Without the need to depend on personnel to carry out these tasks, computers can achieve far superior results and much snappier response times, since their action is instantaneous. Any scope for inefficiencies in the operations due to oversight or human error gets eliminated, workflows become more streamlined with fewer moving parts, and well, the computer core can simply handle far more information than a human mind is capable

of, so the analytical and reporting capacities see a giant leap.

AI-powered solutions have unlocked predictive asset maintenance capabilities, process tracking and optimization. Traditional methods for maintenance of industrial assets have been reactive; which means that there would have to be a noticeable disturbance to operations or component failure for maintenance activities to take place. The damage gets done and then we fix it.

With cutting-edge industrial Internet of Things (IIoT) networks, AI has the power to keep a much closer eye on the equipment. For instance, cooling towers and condenser units are critical assets in the chemicals sector and they have historic data for them. Now, an AI-model can feed the operational and maintenance data for these assets which have been accumulated and stored in silos, which will study and analyze these historic records. It will identify trends in and changes in operational parameters around a reported breakdown event, and now when deployed the AI would be capable of spotting signs of distress to the equipment with a significant lead time, weeks or even months before any damage is taken or the process is disturbed.

To give an oversimplified example, the pressure in the condenser unit spikes three times before past breakdowns. Under normal circumstances, the three spikes themselves might be within operational parameters, nothing to be alarmed about. But the AI will pick up the pattern, along with various related fluctuations, and alert the personnel that the condenser needs some maintenance right now, or the unit will experience a breakdown in some time.

> "The rising pace of digitization is pushing the frontiers of industrial technologies and AI-solutions"

With these data-driven insights, maintenance crews can keep a hawk-eye on the health and working condition of equipment and transform their practices into proactive maintenance rather than reactive methods. There are highly-sophisticated AI-solutions out there already, and some even provide recommendations for what corrective action should be taken. This way, there is a much greater visibility, the longevity of the equipment increases significantly, supply-chain operations can be better planned with visibility over spares requirements, and most importantly, unplanned downtimes are avoided. They contribute to significant capital and operational losses, which can now be precluded by integrating AI-solutions.

IIoT networks can even provide a level of operational visibility where AI-tools can provide optimization insights and recommendations at a very granular level and identify anomalies in the processes. With large factories and several multiples of assets, it becomes very challenging to coordinate operations across different teams working on a variety of operations. In the chemicals sector, even small anomalies can have a huge effect on the quality of the final product. Early identification and rectification is going to be key for large-scale operations to maximize their production efficiencies and optimize the processes.

The awareness of industrial spaces

can be taken to the next level if the AI is integrated with the CCTV and additional camera networks on board. This unlocks major computer vision capabilities which have multi-faceted applications for businesses.

Deep learning-based AI-models can be implemented to perform advanced facial and object detection tasks which can further be repurposed for a wide variety of use cases. Workspaces will soon be equipped with fully automated and intelligent employee and visitor management systems. A person would simply have to walk into a building of work and a CCTV camera would pick them up.

Subsequently, the AI will run a scan of this person's face and identify if they're an employee or not; if they are, they're attendance will be marked. And if they're not, then they will be tagged as a visitor and their location can be constantly monitored without the need for an operator to sit behind an elaborate console and manually watch this person walk from screen to screen.

Security networks can be tightened and largely automated. With the reach of CCTV webs and the observational and analytical capacity of AI, workspaces across industries can be enabled with features such as crowd management, mask & PPE detection, social distancing violation alerts, fire & smoke detection, vehicle identification and Automated Number Plate Recognition (ANPR).

Another major application that AI-tools serve is that of process optimization which goes hand in hand with maximizing the energy efficiency of industrial operations. With the heightened visibility over operations and assets and employees and everything else, AI can even be smart enough to suggest overall process and design alterations/improvements to maximize resource and energy efficiency, while minimizing waste generated, carbon footprints and overall costs.

For example, Borealis is an Austrian chemical company, the world's eighth-largest producer of Polyethylene and Polypropylene, and they have deployed an AI-tool to develop dynamic target values for the energy consumption of a plant, improving the facility's energy usage and thus cutting emissions and costs.

The rising pace of digitization is pushing the frontiers of industrial technologies and AI-solutions. The potential that AI has to offer is enormous and it will soon become a staple in industries everywhere, offering to maximize managerial and process efficiencies, deflate maintenance and functional costs, avoid unplanned downtimes, and drive operations to achieve business goals and benchmarks. There is a massive number of resources and time being poured into the research and development of intelligent future-first technologies, and their presence and impact will continue to rise.

"WE SEE A LOT OF PROMISING NEW PROJECTS IN REFINERY"

Anil Bhatia, Vice President and Managing Director for Emerson's Automation Solutions business in India, shares his insights on digital trends in India and globally, his company's performance in India, as well as expansion plans, and solution offerings. Excerpts of the interview:

ANIL BHATIA
VICE PRESIDENT AND MANAGING DIRECTOR,EMERSON'S AUTOMATION SOLUTIONS INDIA

What are the global digitisation trends in 2021?

As we bid goodbye to 2020 and welcome 2021, digitisation has led to transformation across industries in the aftermath of the pandemic. A large number of organisations globally have taken significant measures to enhance digitisation in their working methodologies. According to a Gartner report, 89 per cent of hi-tech CIOs expect the increase in the use of digital channels to reach customers. Digital transformation will become essential for economic recovery in 2021. Digital trends like cybersecurity have become the need of the hour; work-from-home, remote and virtual spaces shall remain the new normal; Artificial Intelligence (AI) and Machine Learning (ML) will be the backbone of most digital tools, and the concept of software as a service (SaaS) is gaining momentum. Creating a digitally empowered workforce with actionable insights is the next step to achieving game-changing performances.

"I feel we will lead the pack as we move towards economic recovery during 2021"

What are the digitisation trends that you see in India?

Advanced analytics powered by AI and ML are the critical enablers that will fuel India's digital transformation. We've seen repeatedly how a practical approach – one that generates short-term wins with measurable gains – can be replicated for an enterprise-wide impact., Indian chemical companies are investing in digital technologies such as sensors or connectivity devices, as well as software and applications. This would generate a lot of data, requiring big data solutions.

By using data-driven approaches to our plant operations, which are the most energy-intensive processes, ML and AI-based analytics are the best place to start. A classic example is a heat exchanger which is a high-energy intensive asset in any chemical plant.

Today, data from multiple host systems, both structured and unstructured, is being brought to a data lake wherein it can be analyzed in a secure way to help operators make the right decisions.

The pandemic has certainly brought agility into this process because of the RoI it yields by helping the chemical industry achieve significant cost reductions, enhanced safety and improved reliability.

How would you rate Emerson's performance in 2020 and what is your forecast in 2021?

In 2020 we were doing very well until the pandemic stuck. It affected the industry as a whole, so ripple effects were felt in more ways than one. But we were able to get back on our feet soon, with the momentum picking up by September 2020. I am being cautiously optimistic about decision-making and I hope the markets will recover soon as more and more companies start investing in new projects or upgrades. I feel we will lead the pack as we move forward towards economic recovery during 2021.

Will this cautious optimism be for the entire year or do you see it changing in the second half?

I believe our outlook will improve significantly in the second half of the year. As the COVID-19 situation gets better on the ground, so will the momentum of activities that are already moving in the right direction.

Are you seeing any new projects coming up?

We see a lot of promising new projects in the refinery sector. The market has slowed down but now EPCs are getting awarded and the projects will get executed. Even in the chemical space, we foresee many new projects gearing up for launch. I am very positive about the recovery of the chemical industry and I am sure the geopolitical situation will further support the chemical sector in India.

How is Emerson's automation business geared to take up this challenge in India? What solutions will make it a reality?

Emerson has introduced the Digital Maturity Model Quick Index, which is a tool that lets businesses know where they are in their digital transformation journey in comparison to others in the industry. This is based on decades of Emerson domain expertise as well as the Smart Industry Readiness Index and the Biophorum Digital Maturity Model. We are encouraging the executive leadership of the chemical process industry to adopt this index to understand where their organizations stand in various areas like risk and security, health, safety and environment, people and culture, business insights, and analytics, reliability and maintenance. This will help them identify specific operational improvement areas which will then yield high RoI and improve KPIs regarding their business value propositions.

At Emerson, we take pride in being associated with the chemical sector as a most trusted partner in their journey towards automation and modernisation. With all these sensors in place, Emerson is now ready with its software solutions and IIoT platform to ensure how we make data accessible and then get the right data to the right person, in the right format, at the right time to make a decision. It's about transferring digital data into digital intelligence by using the thousands of touch and sensing points in a chemical plant. With the help of advanced analytics and ML, business leaders can recognize patterns and make decisions based on these patterns instead of individual measurements. As I always say, start small, think big and move fast to start the digital journey. If already initiated, scale it up quickly to remain relevant in this highly competitive business environment.

Recently, Emerson has deployed smart wireless technology. Do you see its deployment in the chemical and petrochemical sector?

The chemical and petrochemical sectors are always early adopters of new technologies. Some of the largest WirelessHART installations in India and globally are in the chemical and petrochemical sectors. This is hardly surprising. The environment in these plants is much more corrosive compared to other industries such as power, food & beverage or metals. So, the failure of instrumentation signals due to the corrosion of wires is one of the perennial problems these industries face. With WirelessHART that problem gets nipped in the bud. Also, employee safety and emissions are two other important metrics monitored by the top management of the plant. WirelessHART has very effective solutions addressing both these areas. Some of the benefits derived from wireless technologies are non-intrusive measurements that do not require mechanical penetrations, elimination of manual operator rounds at hazardous locations in the field, timely and accurate detection of passing valves contributing to emissions and monitoring the health of critical plant assets. With these solutions, plants benefit in terms of increased safety, improved equipment availability and reduced emissions.

> "As I always say, start small, think big and move fast to start the digital journey"

When do you see chemical factories being run remotely in India?

Large petrochemical complexes have been running remotely with nominal personnel intervention. But smaller chemical plants have the potential to run remotely in clusters with the right investments and technical support.

How will an integrated manufacturing campus help chemical and petrochemical companies in the country?

The Emerson Integrated Manufacturing Centre (EIMC), in Talegaon, near Pune, is one of Emerson's biggest capital investments in India to date. It will help consolidate our manufacturing footprint and improve service levels for our customers in India and around the world. Developed with full support from the Maharashtra Industrial Development Corporation (MIDC) and Invest India, the total build-out in phase 1 is over 450,000 square feet of manufacturing and engineering space, with an opportunity for future expansion. We inaugurated this facility virtually on December 16th, 2020, with our isolation valve and actuation businesses moving in first. With the addition of the Pune facility, we will not only strengthen Emerson's Automation Solutions manufacturing capabilities and network across the region but also foster a hi-tech workforce and enable operational excellence that will drive our ongoing commitment to exceptional customer service and sustainable future growth for all process industries across India. In addition to

our KTM Virgo ball valves and Keystone butterfly valves, we will also be manufacturing our prestigious Vanessa triple offset valves at EIMC, while we continue to add new product and engineering capabilities to better service our customers. In addition to valve manufacturing, our capability to automate these valves with actuation technologies brands such as Biffi and Bettis, the chemical industry will greatly benefit from reduced lead times driven by products manufactured in India and strong local aftermarket support.

Is the manufacturing plant at Pune already operational?

Phase 1 has started and we have moved the actuation unit there already. Since we have to get certifications, the valve unit will move there in phases. Then in the next six months, the isolation valves will also move there. In the coming four to five years, we are also planning to expand further and for that, we have acquired land from MIDC. Overall, in the next six months, it will be fully functional.

In phase 2, the plan is to have our measurement systems business relocate to this site and if we acquire other companies, we plan to integrate them into this one location. We have three manufacturing facilities in India and we are now expanding our base.

What solutions do you offer to chemical companies for better energy management?

Extracting value from applied industrial energy requires a holistic approach all along the value chain. Energy is purchased, converted, distributed, consumed, and sometimes exported on every industrial site and the environmental, financial, and productivity impacts are significant and complex. Emerson's industrial energy experts can tame complexity and improve business results. From the captive powerhouse to energy-intensive process units, we have monitoring, control, and predictive solutions to optimize energy performance. Our flexible, integrated and scalable Plantweb digital ecosystem provides secure and robust real-time insight from pervasive sensing technologies. A suite of analytical applications is available to provide embedded domain expertise across the enterprise. Steam trap monitoring for steam blow-through and/or blocked flow to reduce energy wastage, critical asset monitoring of energy-intensive assets like pumps, heat exchanger monitoring that provides a complete report on energy consumption and loss, and real-time predictive energy alerts, have been deployed at multiple chemical and other process industries sites across India.

Do you see India latching onto hydrogen? What is Emerson's role with regards to hydrogen?

There is no doubt that India will have to catch the hydrogen wave to stay competitive. Green hydrogen is evolving quickly on the economic side, so Emerson is fully engaged in the US-India Hydrogen Forum and working with petrochemical companies in this regard. We look forward to positively contributing to this sector.

You mentioned DeepTech technologies such as AI, NLP, blockchain, ML as well as software and cybersecurity as a service. How will these technologies help Emerson to be more sustainable and economical for clients?

Deep tech technologies like AI, ML, data science analytics, and the Industrial Internet of Things are built into our digital transformation software portfolio. Our analytics software, including Plantweb Insight and Plantweb Optics Analytics, use AI, ML, and data science analytics to provide smart persona-based real-time predictions to our customers. Many of the other technologies you mentioned were developed for other industries and applications but will soon find their way into control systems to support what's required and continue to operate as safely, efficiently, reliably and profitably as possible. Some of the features which will deploy these technologies are facial recognition for secure operator login, voice and gesture user interface for simplified operations, drone inspection of problems in the process, augmented reality to overlay diagnostic information with AI, location awareness for safer field operations, and predictive analytics for optimized operations. All these technologies will be beneficial in the long run.

In Focus

Accelerating Future Growth Momentum

GREEN ECONOMY

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PRIORITIZING FOR A HIGHER GOOD

Indian manufacturers have started investing in R&D and implementing green methods to produce non-toxic chemicals

Green chemistry, also known as sustainable chemistry, is an area of chemistry and chemical engineering focused on the design of products and processes that minimize or eliminate the use and generation of hazardous substances. Green chemistry focuses on the environmental impact of chemistry, including reducing the consumption of nonrenewable resources and technological approaches for preventing pollution.

The overarching goals of green chemistry—namely, more resource-efficient and inherently safer design of molecules, materials, products, and processes—can be pursued in a wide range of contexts.

Important examples of green chemistry phasing out the use of chlorofluorocarbons (CFCs) in refrigerants, which have played a role in creating the ozone hole; developing more efficient ways of making pharmaceuticals, including the well-known painkiller ibuprofen and chemotherapy drug Taxol; and developing cheaper, more efficient solar cells.

Industries across several sectors use hazardous chemicals and chemical processes and leave behind pollutants that get discharged in land and water. The chemical reactions during many processes release toxic chemicals, result-

"Green chemistry prioritizes safety, improving energy efficiency and, most importantly, minimizing toxic waste"

ing in smog, ozone depletion, basically the planet at large. Taking cognizance of several issues, many companies have started taking the 'green chemistry' approach.

However, there's a long way to go for government agencies and companies to take green chemistry seriously. To increase the research in this field, we need to publicize the needs, effects, and practice of green chemistry. Currently, green chemistry research in India is confined mainly to areas of greener synthetic strategies, catalyst development, usage of bio-catalysis, usage of non-conventional technologies, and analytical techniques.

Green strategies

Indian scientists are mainly concentrating on avoiding environmentally non-compatible reagents, solid-phase syntheses, modification of synthetic routes to decrease the number of steps and increase overall yield, usage of newer catalysts and simplification of classical procedures of reaction. However, what is required is a combined approach for a greener synthesis.

Reagent chemists in India are working towards the development of more benign and selective reagents that require ambient conditions. The elimination of hazardous solvents is one of the prime concerns among them. Enzymes have emerged as biotechnological tools, which can offer solutions to the major problems of the chemical industry in India. Over the years, chemists in India are engaged in the enhancement of an application base of enzymes to develop new alternative sweeteners such as high fructose corn.

Future outlook

The global green chemicals market is recording high growth in emerging economies such as India, China, Brazil, Russia, and Indonesia. Many manufacturers of green chemicals are shifting their manufacturing operations to these countries due to factors such as availability of land, economical labour, low transportation costs, and favourable regulations promoting the use of green chemicals. These markets are also characterized by increased spending on pharmaceuticals, automobiles, electronics and electricals, and consumer goods. Therefore, the global green chemicals market is expected to grow significantly in emerging economies during the forecast period. A report by Technavio predicts the green chemicals market is expected to grow by US $ 50.38 billion during 2019-2023.

The key segments such as bio alcohols, biopolymers, bio-organic acids, and bio-ketones are expected to register good growth. Indian manufacturers have started investing in R&D and implementing green methods to produce non-toxic chemicals. The textile chemical producers have likewise understood the significance of moving towards biodegradable options and have started to put resources into the advancement of bio-auxiliaries and applications of probiotics to produce alternative biochemicals. It is observed among the industry that the companies that invested in Zero Liquid Discharge before it was made compulsory. These have gained huge returns in terms of quality and cost compared to those that did not act on time.

Rahul Koul

"Driven by India's pitch as an attractive investment destination and the use of chemicals in industrial operations and manufacturing, the demand of the chemical industry is expected to drive further"

FOR FUTURE GROWTH

As the chemical industry evolves into the world's solution providers for modern global challenges, its obligation to adhere to sustainable principles and practices becomes even more important

The chemical sector is a partner, innovation enabler and solutions provider to essentially all sectors of the economy. The scale and diversity of the industry provide it with widespread opportunities to contribute to the realization of the Sustainable Development Goals (SDGs) by 2030.

The chemical sector creates an immense variety of products that interact with virtually every aspect of our lives. While many products from the industry, such as detergents, soaps and perfumes, are purchased directly by the consumer, others are used as intermediates to support the development of other products such as food, plastics, and pharmaceuticals. The complexities of the industry are broadly highlighted in the figure below. The industry uses a wide range of raw materials, from air and plants to minerals and oil. With increasing competition worldwide, innovation remains crucial to finding new ways for the industry to satisfy its increasingly sophisticated, demanding and environmentally-conscious market.

The chemical sector can contribute to achieving the 17 SDGs adopted by all United Nations Member States in 2015 as a universal call to action to end poverty, protect the planet and ensure that all people enjoy peace and prosperity by 2030. These goals are in-

"Achieving the SDGs requires the partnership of governments, the private sector, civil society and citizens alike to make sure we leave a better planet for future generations"

tegrated and recognize that action in one area will affect outcomes in others, and that development must balance social, economic and environmental sustainability.

Understanding the chemical sector and how it relates to the SDGs

The chemical sector is a US $ 4 trillion global business, employing more than 20 million people directly and indirectly. Today's world – from the food we consume, the way we travel, the clothes we wear, and the technology we harness – depends on the products of the chemical industry. Through the responsible production, use, and management of chemicals, the chemical sector can support the SDGs through innovative products and practices that minimize negative impacts, protect the environment, promote social progress, and support economic growth.

The roadmap sets out to explore how the chemical sector can contribute to achieving the SDGs through more effectively managing its operational footprint, working with others to enhance capacities along the value chain, and leveraging its expertise and innovation to unlock new business opportunities that are aligned with the SDGs. This will require action to minimize any adverse aspects while maximizing positive impact. The chemical sector at large is a supplier of products and services to every other industry. Due to this, the roadmap is not an exhaustive overview, but instead describes areas where the chemical sector is uniquely suited to make a considerable and lasting impact.

Future Outlook

India being a diverse manufacturing base for the chemical industry, has immense potential to become a global supplier. Therefore, a sustainable supply chain for the sector has become vital. With initiatives like "Make in India", reforming labour laws, easing the land acquisition rules and GST, India is on the brink of becoming a manufacturing hub for the world. Globalization has made supply chains more complex. Therefore, the joint initiative of 'Together for Sustainability by global chemical companies has been introduced to encourage Indian chemical manufacturers and suppliers to implement sustainability practices in their management and manufacturing systems. This initiative aims to establish benchmarks that will create a sustainable supply chain. The member companies of this initiative, have assigned their resources to build up a worldwide program to audit and evaluate suppliers under pre-defined criteria regarding management, environment, health and safety, labour and human rights, and governance issues.

Rahul Koul

"The chemistry enterprise has a broad reach into technology, the economy, and human health, and there are already many ways chemists are working to support Sustainability Development Goals"

SUSTAINABILITY: A RECKONING FORCE

A 360-degree view that considers all stakeholders' needs and blends both financial and non-financial goals into key business strategies

SHOHAB RAIS
CHIEF OPERATING OFFICER - INDIAN CHEMICAL BUSINESS, TATA CHEMICALS LIMITED

Globally, the chemical sector is a key engine for an economy's growth and forms the bedrock for all major industries. The US $165 billion Indian chemical industry needs to adopt a two-pronged approach to reach the ambitious target of US $ 300 billion by 2025, as set by the government – by grabbing the opportunity to expand to a global scale and by recognising and embracing sustainability as a strategic business blueprint.

Sustainability, however, cannot be viewed from a limited lens. It is a crucial subject and its principles include business continuity and social impact in addition to the environmental aspects of the entire value chain. It is not just about effluent and discharge but encompasses energy & water efficiency, adoption of principles of a circular economy, climate change mitigation and biodiversity impacts of business; it is also about seeing the complete picture, a 360-degree view that considers all stakeholders' needs and blends both financial and non-financial goals into key business strategies.

Globally, the chemical and petrochemical industry contributes to

"Sustainability currently is at the periphery of education and needs to become a part of the core"

one-eighth of the industrial carbon emissions. Given this, it becomes imperative for chemical manufacturers to contribute to limiting global warming to 1.5°C. Accelerating sustainability and decarbonisation are clear priorities now. Robust sustainability strategies and policies could help drive encouraging changes across the business. Furthermore, when it comes to sustainability, the industry must set business agendas that are aligned with the environment and local communities and are beyond compliance requirements.

The actions that can contribute to the chemical sector becoming sustainable are:

- Use of renewable energy
- Use of alternate fuels including waste and biomass
- Recycling products for raw materials
- Developing bio-based and green products
- Addressing health and safety risks to employees and in communities of operation
- Creating awareness and imparting skills to the workforce to imbibe sustainable practices

These can make a significant impact on building a sustainable tomorrow. However, critical in the journey towards industry leadership, global significance and sustainability is innovation.

Innovating for sustainability

Innovation aimed at sustainability within the chemical sector has far-reaching effects. As a business strategy, chemical companies must focus to innovate and create products that begin their lifecycle through sustainable inputs and processes and also are innovative in their application to integrate the needs of the economy, society and the environment.

Innovation to achieve sustainability will be a defining factor for the chemical industry, especially the speciality chemicals segment. As per a recent report by McKinsey & Company, the speciality chemicals market in India is expected to grow from US $ 28 billion in 2018 to US $ 40 billion by 2025. This exponential growth potential provides the opportunity to the speciality chemicals sector to adopt innovative approaches to capitalize on the new market for cleaner and greener products and practices.

This market has taken a step in that direction, which brings into focus the concept of a circular model. As companies today strive to build a truly circular economy, what we need to recognise is that it is driven by innovation. Following a circular model – reusing and recycling, instead of disposing of, is a product of innovation and R&D. Recycling spent lithium-ion batteries from discarded laptops, mobile phones and even electric vehicles, to extract raw materials is one such example. This innovation does not only reserve valuable resources and minerals but is used in the manufacturing of a product that runs cleaner vehicles.

The sustainability road map of several industries such as agriculture, auto and nutrition includes revamping efforts and strategies for inclusive growth.

Let's first look at the agriculture sector. We are witnessing an uptake for sustainable solutions. A whole range of bio-pesticides, bio-fertilisers are being developed in the agriculture sector which aims to give efficiency at par with its traditional chemical counterparts.

"Following a circular model – reusing and recycling, instead of disposing of, is a product of innovation and R&D"

Today, many global and local chemical companies are investing in R&D and innovation for this sustainable change and bio-substitutes can be a major facilitator.

Innovation is also taking centre stage in the auto industry, including in a product like tires. A key component used in tires – rubber is being replaced by Highly Dispersible Silica or HDS, making way for green tires that improve fuel efficiency and reduce the rolling resistance, improved wet grip for safer tires and improved abrasion resistance that improves durability. Green tires are the new-generation tires that reduce CO_2 emissions as well as fuel consumption, thereby controlling pollution.

Hence, what the chemical companies are doing in the R&D labs could have benefits that can only be limited by our imagination.

Educating for sustainability

While imbibing sustainable practices across functions of a chemical company is imperative, this vision must be inculcated in its people, the workforce and the extended team across the supply chain. Individuals involved in the process of delivering sustainability need to have the right capabilities and proficiencies to understand and implement these practices, while also encouraging sustainable development.

Sustainability currently is at the periphery of education and needs to become a part of the core. As an industry, we need to partner with institutions to play a role in bridging the gap, in terms of emphasizing the need for sustainability and innovation as the current students could be our future leaders.

Today, preferences are changing and customer organisations are seeking greater participation and commitment towards these areas. Hence, to improve business and market share, we must strive to build what the market needs which is a sustainable business in the future – respecting the environment, planet, and people, and building an ecosystem around it.

Investing for sustainability

Lower carbon footprint along with building a manufacturing eco-system that is committed towards the cause of preserving and protecting the climate and environment begins with an investment in a sustainable enterprise strategy that is focused on green technologies and clean development mechanisms.

A global group of 23 chemical companies has committed to setting Science-Based Targets (SBTs). This is a major step to commit towards Science-Based Targets to reduce carbon emission in absolute terms. These companies cover sectors such as transportation, utilities, consumer products, textiles, banks, information technology, hospitals, mining, food & beverages, chemicals, construction materials, pharmaceuticals, telecommunications, education etc.

Government intervention

By signing the Paris Agreement, the Prime Minister has already given a clear signal about the future direction in this journey. Additionally, giving an impetus to industries to march ahead on the road to sustainability are government initiatives. During the Union Budget 2021, the Finance Minister also highlighted the need for strengthening the environmental, social, and governance (ESG) parameters for corporate India. This is in addition to various schemes that are already in place about solar and wind energy.

Conclusion

In the current context, as we all work towards overcoming the challenges of the COVID-19 pandemic, the importance of a strategic focus on sustainable practices and environment-friendly products and services has come to the forefront. The increasing use of plastics during the pandemic has further accelerated the need for sustainability efforts. The chemical sector should view this as an opportunity to align its practices and operations to the UN goals of sustainable development. Concepts such as ESG are being increasingly talked about, hence for chemical companies, it is even more essential to position themselves as responsible manufacturers by shedding light on the prominence of a circular economy, carbon neutrality and introduction of green products.

The whole gamut of sustainability can be tapped by the chemical industry by leveraging its forte in technological advancements, R&D and innovation to become responsible manufacturers, who contribute to safe and affordable food, give clean water access to communities and foster a green tomorrow with carbon-free energy and transportation.

SHANKER KUPPUSWAMY
CEO, NICER GLOBE

DEVELOPING RESPONSIBLE STAKEHOLDERS

The World Bank report estimates the crash costs at Rs. 5.96 lakh crore or 3.14 per cent of gross domestic product

Safety, security and sustainability are always mentioned in any discussion on the chemical industry. In official meetings/gatherings/seminars these are buzz words. As much as it is expressed with intent & commitment, it also underlines the message of concern. This concern is not unfounded considering the nature of the product, its exposure and its vulnerabilities.

The Indian chemicals industry stood at US $178 billion in 2019 and is expected to reach US $304 billion by 2025 registering a CAGR of 9.3 per cent. The demand for chemicals is expected to expand by 9 per cent per annum by 2025. The speciality chemicals constitute 22 per cent of the total chemicals and petrochemicals market in India. The opportunities for the industry are huge and certainly, there is a need to ensure that operations on the ground match the intent. So, the intent often stated by the business leaders and the regulators shall have to be effectively demonstrated at the ground level as well.

Talking about safety and security, where do our responsibilities end? Certainly not at the gate of our premises but till the product reaches its destination. Sure, we have insured our transportation, which may redeem the monetary losses, sure we have a contract with the transporter to take utmost care and caution, but is the transporter adequately equipped or trained to handle the product safely and securely? More often than not, we would not be able to respond to this question affirmatively as we may not know the actual driver or number of trips that he has done to the principal, as this is not effectively monitored or reviewed.

When an incident occurs and if the driver or transporter failed to act responsibly, it shall be an act of omission of the principal. It will lead to a bad reputation and in today's world, this will be amplified across the world in no time.

India tops the world in road crash deaths and injuries. It has 1 per cent of the world's vehicles but accounts for 11 per cent of all road crash deaths, witnessing 53 road crashes every hour; killing 1 person every 4 minutes. In the last de-

Road accidents, Number of persons killed and injured in the last five years 2015- 2019

	Total Number of Road Accidents (in numbers)	% change	Total Number of Road Accidents (in numbers)	% change	Total Number of Road Accidents (in numbers)	% change
2015	5,01,423		1,46,133		5,00,279	
2016	4,80,652	-4.14	1,50,785	3.18	4,94,624	-1.13
2017	4,64,910	-3.28	1,47,913	-1.90	4,70,975	-4.78
2018	4,67,044	0.46	1,51,417	2.37	4,69,418	-0.33
2019	4,49,002	-3.86	1,51,113	-0.20	4,51,361	-3.85

Source: https://morth.nic.in/road-accident-in-india

Number of accidents, Number of persons killed and those injured by the category of Roads in 2019

Category of Roads	Length as on 31.3.18 (P) Accidents		Persons killed Category of Roads		Category of Roads Category of Roads		Category of Roads Persons injured	
	Kms	% age share in total	Number	% age share in total	Number	% age share in total	Number	% age share in total
National Highways	1,26,350	2.03	1,37,191	30.55	53,872	35.65	1,37,549	30.47
State Highways	1,86,908	3.01	1,08,976	24.27	38,472	25.46	1,11,831	24.78
Other roads	59,00,858	94.96	2,02,835	45.17	58,769	38.89	2,01,981	44.75
Total	62,15,797	100	4,49,002	100	1,51,113	100	4,51,361	100

cade, 13 lakh people died and another 50 lakh got injured on Indian roads. The World Bank report estimates the crash costs at Rs. 5.96 lakh crore or 3.14 per cent of gross domestic product (GDP).

The National Highways which comprise 2.03 per cent of total road network, continued to account for a disproportionate share of 35.7 per cent of deaths in 2019. The State Highways account for 3.01 per cent of the road length accounted for 24.8 per cent of deaths. Other roads which constitute about 95 per cent of the total roads were responsible for the balance 39 per cent of deaths respectively. The heavy vehicles contribute about 10 per cent of the total incidents. Around 55 per cent of the crash fatal incidents are involved in the states where chemical sector essentially operates.

Road Accidents and Road Accident related deaths on different categories of NH during 2019

Categories of NH	Total Accidents	Road accident Fatalities
Road Accidents and Road Accident related deaths on different categories of NH during 2019		
National highway under NHAI	87,966	35,605
Share in Total	64.12	66.09
National highway Under State PWD	38,352	13,495
Share in Total	27.96	25.05
National highway under Other Departments	10,873	4,772
Share in Total	7.93	8.86
TOTAL	1,37,191	53,872

Road accidents are multi-causal and are the result of an interplay of various factors.

These factors act interactively to cause road accidents. Any strategy for designing the countermeasures for accidents should therefore be based on a safe system approach which simultaneously recognizes the importance of traffic legislation for promoting safe road user behaviour, safe road designs (lane width, shoulder presence, number of lanes, median, vehicle design, etc.) and safe vehicle design.

The key factors identified in road accidents are:

Human errors: Lack of focus, fatigue, driving under influence of alcohol, not following traffic rules may all contribute to human errors

"Road accidents can broadly be categorized into three - Human errors; Road environment; Weather conditions; Over aged vehicles; and Overloaded vehicles"

Road environment: Residential areas, commercial areas, road design shall be the key factors

Weather conditions: Extreme weathers leads to poor visibility

Overaged vehicles: Vehicles that are 10 years old or more contribute nearly 42 per cent of the accidents

Overloaded vehicles: This contributes to about 8 per cent of the incidents.

What the data and the findings reveal that transporting on Indian roads is a high risk in nature and if we fail to address it, it shall certainly jeopardize our operations.

How do we address it?

From the findings of the incident details, the focus area should be the driver; journey; product knowledge; vehicle; process; and infrastructure

Driver: It begins from driver induction, orientation, training, monitoring, review, recognizes and reward exceptional performances

Journey: Risk assessment, resting locations assessment, road audits need to be carried out and ensure that the driver is aware of on every trip. Road traffic is

State wise number of accidents and ranking in total accidents during 2015-2019

S. No.	States/UTs	Total Number of Road Accidents occurred in States/UTs					Change in 19 over 18	% change in 19 over 18	Rank of States/UTs in Total Number of Road Accidents				
		2015	2016	2017	2018	2019			2015	2016	2017	2018	2019
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Andhra Pradesh	24,258	24,888	25,727	24,475	21,992	-2,483	-10.1	7	7	7	7	8
2	Arunachal Pradesh	284	249	241	277	237	-40	-14.4	29	29	30	30	30
3	Assam	6,959	7,435	7,170	8,248	8,350	102	1.2	17	16	16	16	16
4	Bihar	9,555	8,222	8,855	9,600	10,007	407	4.2	15	15	15	15	15
5	Chhattisgarh	14,446	13,580	13,563	13,864	13,899	35	0.3	11	11	11	11	11
6	Goa	4,338	4,304	3,917	3,709	3,440	-269	-7.3	21	21	18	21	21
7	Gujarat	23,183	21,859	19,081	18,769	17,046	-1,723	-9.2	9	10	10	10	10
8	Haryana	11,174	11,234	11,258	11,238	10,944	-294	-2.6	13	13	11	14	13
9	Himachal Pradesh	3,010	3,168	3,114	3,110	2,873	-237	-7.6	22	22	16	22	22
10	Jammu & Kashmir	5,836	5,501	5,624	5,978	5,796	-182	-3.0	19	19	14	19	18
11	Jharkhand	5,162	4,932	5,198	5,394	5,217	-177	-3.3	20	20	14	20	20
12	Karnataka	44,011	44,403	42,542	41,707	40,658	-1,049	-2.5	4	3	4	4	5
13	Kerala	39,014	39,420	38,470	40,181	41,111	930	2.3	5	5	5	5	4
14	Madhya Pradesh	54,947	53,972	53,399	51,397	50,669	-728	-1.4	3	2	3	2	2
15	Maharashtra	63,805	39,878	35,853	35,717	32,925	-2,792	-7.8	2	4	4	6	6

Source: https://morth.nic.in/road-accident-in-india

dynamic, in today's time, technology in place to capture and allow us to pass the information which shall be useful during the journey

Product knowledge: Product knowledge/awareness is essential for the driver/transporter. This helps in his understanding and also build ownership.

Vehicle: The standard of the vehicle and its product compatibility is critical

Process: If we had defined standards for the above, it has to implemented through the standard operating procedure and continuously reviewed

Infrastructure: Resting locations has to be identified from a safety and security perspective. From a chemical transportation perspective, quick response squads and emergency call centre are the need of the hour to handle on-road emergencies to attain an acceptable standard on the above, it shall be a journey. A community forum like Nicer globe, promoted by ICC shall play the role of guardian for the industry at large and bring in the efficiencies on the operations. This is critical, considering the logistics cost in India is hovering around 13-14 per cent, which is the highest in the world.

> "Around 55 per cent of the crash fatalities are involved in the states where the chemical sector essentially operates"

Through the active participation of all the stakeholders, we develop responsible stakeholders and drive ownership. An ecosystem to comply with our requirements.

The process has begun through our forum; we should be part of the change to bring the change....

Let's make our place better!

SRINIVASAN RAMABHADRAN
MANAGING DIRECTOR - ASIA PACIFIC, DUPONT SUSTAINABLE SOLUTIONS

ARE WE LEARNING FROM INDUSTRIAL ACCIDENTS?

Common theme arising from the incident investigation reports is that required internal safety procedures were not adhered to

Within the first three weeks of January 2021, there were three major incidents in India alone a toxic gas leak that resulted in at least four fatalities in the Rourkela Steel plant, a fire that took the lives of 10 babies in a hospital in Bhandara and another fire that resulted in the loss of at least five lives in Serum Institute, Pune. This is on the back of a few major incidents in 2020 that include gas leaks in Baghjan Oil India Ltd. and Vizag LG Polymers and explosions in Yashahvi Rasaya, Dahej and Neyveli Lignite. Why is there a sudden increase in the number of incidents?

Risk Accelerators

The emergence of the COVID-19 pandemic has prompted most, if not all, companies to refocus their priorities to ensure that workplace infection is prevented. The decisions made in response to COVID-19 and the attention demanded by the pandemic have resulted in neglect and acceleration of other risks that have always been present, particularly safety risks. These risk accelerators have had serious consequences to the companies' bottom line, and the safety of employees and surrounding communities. A common theme arising from the incident investigation reports is that required internal safety procedures were not adhered to. It is not just about workers following the procedures alone. It has to do with decisions made across the entire supply chain. (Figure 1).

Learning from past incidents

The spate of industrial incidents has called for a serious introspection regarding the consciousness around industrial safety in India.

Interestingly, it was reported that in the Baghjan and Vizag gas leaks, required environmental clearances had not been obtained. While enforcement efforts are more often reactive and fragmented, the responsibility for compliance lies with the companies and not just the regulatory agency. The primary purpose of these clearances is to ensure that all possible risks are identified and controls put in place to mitigate the risk.

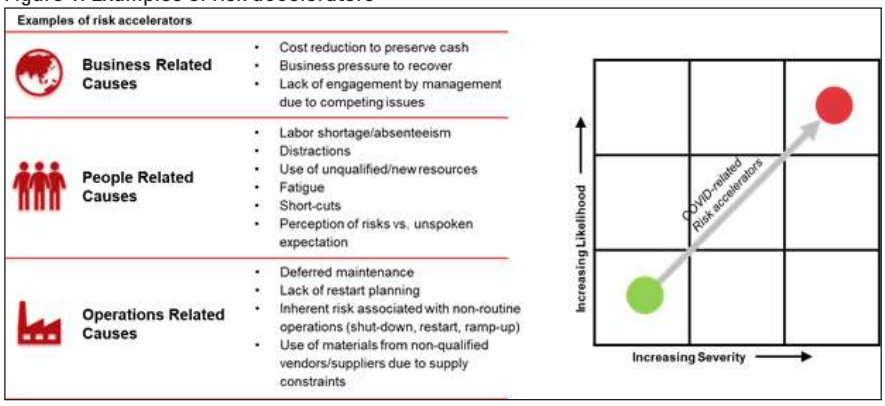
Neglecting this important step means risks are neither anticipated nor are controls put in place. Simply identifying major non-compliances after the occurrence of an incident serves no meaningful purpose.

A common theme arising from the incident investigation reports is that required internal safety procedures were not adhered to. It is not just about workers following the procedures alone. It has to do with decisions made across the entire supply chain. For example, the use of an improper gasket procured from the local market has been identified as a probable cause of the leak which led to the massive fire at ONGC's Hazira gas plant in the early hours of September 24, 2020. This finding is based on a report by an enquiry committee set up by the Petroleum and Natural Gas Regulatory Board (PNGRB) to investigate the incident.

"A common theme arising from the incident investigation reports is that required internal safety procedures were not adhered to"

Some of the underlying conditions that inhibit safety improvement include an abundance of cheap labour, paltry spending on Occupational Safety &

Figure 1: Examples of risk accelerators



Health (OSH), stakeholder resignation to unsafe OSH conditions, inadequate implementation of existing legislation, lack of reliable OSH data and measurement and a shortage of OSH expertise and professional institutions.

Applying lessons learnt

Make in India and Aatmanirbhar Bharat will undoubtedly be major drivers for change with both positive and negative impacts on levels of compliance and good practice at the workplace. There is a huge opportunity to capture lessons learnt from other countries and prevent the recurrence of such incidents in India. There is a great opportunity in adopting international best practices that not only improves safety but also improves productivity.

> There is a great opportunity in adopting international best practices that not only improves safety but also improves productivity"

A huge amount of data and insights are available in the public domain about incidents in the gas pipeline. One such source is shown in figure 2 that is based on incidents over 10 years compiled by EGIG (European Gas pipeline Incident data). The Hazardous Material Safety Administration under the Department of Transportation has almost 50 years of data on pipeline incidents. As companies are embarking on ambitious plans in terms of laying pipelines and expanding gas distribution networks, it is imperative that companies proactively incorporate lessons from the abundant information and insights available in the public domain and prevent catastrophic incidents.

Industrial safety evolution in India

The Bhopal gas tragedy was possibly the single largest trigger for increased regulations worldwide, including India. However, there is a level of cohesion necessary between regulatory agencies, industry associations, companies and the public to achieve a progressive reduction of work-related fatalities, accidents, and diseases.

The new legislation Occupational Safety, Health and Working Conditions Code, 2020 has consolidated 13 Acts that regulate health, safety and working conditions and is a step in the right direction. This could lead to a centralized collection and collation of data that can be analyzed for concrete actions across industries as well as for a specific industry to prevent incidents.

Over the last 20 years, several leading companies, such as Tatas, Birlas, Reliance, Jindals and Hindustan Zinc to name a few, have adopted international best practices. The starting point for all of these companies was a realisation at the leadership level of the need to have a structured and robust approach to increase awareness and create a culture of safety. Many industry associations such as the Confederation of Indian Industry (CII), Federation of Indian Chambers of Commerce (FICCI) and the Indian Chemical Council (ICC) have all embarked on increasing the level of safety consciousness among their members. DuPont Sustainable Solutions (DSS) has been working with companies across the spectrum to increase safety awareness and prevent injuries. While awareness has increased, the journey has just begun.

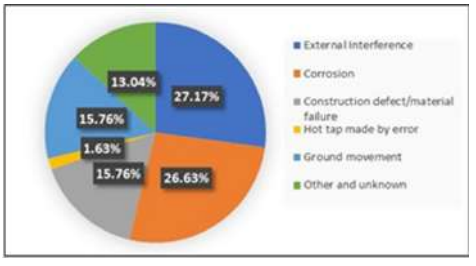
Unfortunately, there is no single source of truth in terms of industrial fa-

tality and injury data.

Whatever data is available in the public domain seems to be outdated. A major challenge in measuring and improving India's workforce Occupational Safety & Health is that data is available for only 10 per cent of the workforce employed in the organized formal sector, mainly in industry, mining and some services.

Call for action

The first and foremost action of critical importance in improving safety performance is a change in mindset. Each time a person takes an action to deviate from an established norm or rule and gets away with it behavioural reinforcement takes place. As an example, if I jump a red traffic light and get away with it, then I get emboldened to do this again. And every time I do it and get away, then such deviations become a way of life, a habit. This normalisation of deviations is one of the critical factors that contribute to incidents and accidents in industrial sites.



An industrial case as an example is a fire involving a pharmaceutical company that not only destroyed the entire factory but also impacted the entire supply chain. The mindset is "I have done it this way for the past 20 years and nothing wrong has happened". Just because nothing happened in the last 20 years, does not mean it will never happen and when it does happen, it can be catastrophic. The required consciousness is that risks are always present and there is a need to understand and manage risks proactively every single time.

A critical component that can significantly enhance the safety consciousness is the span of influence of people in power. It does start with leadership. Tata Steel introduced measures to protect employees long before legislation to the effect was introduced. The focus on safety was always there. Tata Steel chose to adopt international best practices in safety to enhance the level of safety consciousness. Leaders like Mr Muthuraman, Mr Nerurkar and Mr Narendran have all personally committed to achieving excellence in safety. They built upon efforts made by their predecessors and hence, safety is now respected as a core value in Tata Steel.

The use of technology can significantly enhance the consciousness of the frontline workforce.

Digital apps, including e-learning content, are available at affordable rates and with the click of a button using mobile. This should particularly be a boon for small and medium enterprises to raise levels of awareness for the employees at an affordable cost and time.

Safety consciousness is akin to breathing. We can never claim that we have arrived. Every day is a new day and the focus on safety has to be continuous and non-stop. The primary purpose is to do everything to prevent avoidable incidents, fatalities and injuries. There is also a business angle to the need for safety. The productivity of any facility is Zero when it gets burnt down or is shutdown due to non-compliance. Aren't these reasons enough to act?

NARAYANAN SURESH
COO, ABLE
(SRINIVAS RAO CHANDAN, CONSULTING EDITOR, ABLE)

START-UPS CONTINUE TO MUSHROOM

Number of biotech establishments being formed in India continues to grow every year. Nearly 840 new biotech companies were established in 2020

The Indian biotech ecosystem crossed an important milestone at the end of 2016 when the total biotech start-up base reached 1,022 by December end. In the year 2012-13, the biotech industry, policymakers, and the other stakeholders in the country, had identified that "start-ups" will be one of the key drivers for the growth of the biotech sector in future.

At one of the deliberations between industry and the Department of Biotechnology (DBT), the participants did a quick calculation and suggested a target of creating 2,000 biotech start-ups by 2020. This was to promote innovation and R&D. This was accepted as a guidance number. ABLE has been tracking the status of start-ups for the last few years.

According to the latest findings in the IBER 2020 Report of the Association of Biotechnology Led Enterprises (ABLE) and Biotechnology Industry Research Assistance Council (BIRAC), as of December 31, 2020, India has a cumulative biotech start-up base of 4,237. This is nearly double the initial target of having 2020 start-ups by the year 2020.

5.8lk

"4,000+ startups; 150 marketed products; in 5.8 lakh square feet of incubation space"

Biotech startup trends

The entrepreneurship trends in the biotech industry can be classified into three major time frames. One is an era before 2000, the second period is between 2000-2012, and the third phase from 2013 onwards. The period before the year 2000 had a handful of biotech companies in the country. Some of the key enterprises of that era were Biocon, Biological E, Bharat Biotech, Shantha Biotechniques, Concord Biotech, Panacea Biotec, and Serum Institute of India.

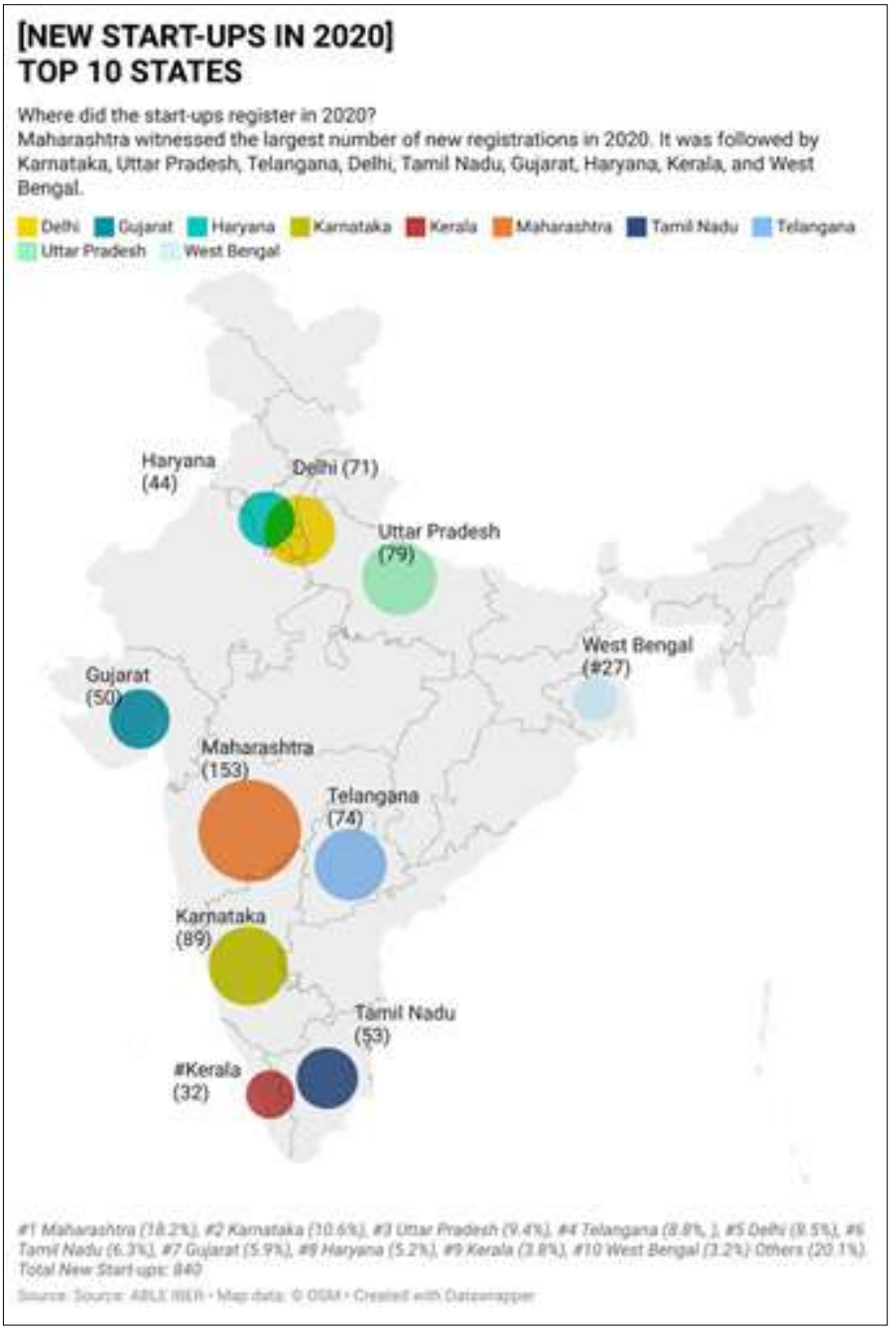
The period between 2000-2010 saw the emergence of new start-ups like Advanced Enzymes, MetaHelix Life Sciences, Strand Life Sciences, Shantha Biotech, xCyton Diagnostics, Sea6Energy and so on ... These were companies started by people who had been in the industry and founded companies to address a different set of market needs and regulatory conditions. The period since 2013 has been witnessing a new trend. We see a remarkable number of companies starting from the classrooms or premium schools and labs as well.

The anchors in the era before the year 2000 were passionate people who defied the gravity of the situation then. These were entrepreneurs like Dr. Kiran Mazumdar-Shaw, Dr. Cyrus Poonawalla, and Dr. Hamied Yusuf. They wanted to create a niche, they wanted to solve the concerns of affordability, sustainability, and quality. The focus for them was "Made-in-India", much before the emphasis of Made-in-India gained attention in the last few years.

The DBT was the anchor in creating skills in the pre-2000 era. DBT was still the anchor during 2000-2010. This was the period when the entrepreneurs like Dr. K. K. Narayanan, Dr. Krishna Ella, Dr. Ravikumar, Dr. Varaprasad Reddy, Dr. Vijay Chandru, and Dr. Rashmi Barbhaiya, waded through the barrage of hurdles on the regulatory front. This was the time

when DBT leadership decided to remove the funding and regulatory hurdles engulfing the entrepreneurs and build an ecosystem that would foster more entrepreneurs, who could work and create IP and venture into newer areas.

DBT's BIRAC was established to empower the emerging biotech enterprise to undertake strategic research and innovation, addressing nationally relevant product development needs. BIRAC become the anchor for the generation of companies after 2013. The environment outside the sector too helped the entrepreneurs like the emergence of new governments, newer industries, newer focus areas, and changing economic situations. Under these conditions, the biotech industry has many positives. Companies like Anthem Biosciences, Bugworks Research, String Bio, all emerged during this period.



Growth and health of biotech startups

The ABLE study, based on the data filed by enterprises with the Registrars of Companies (ROC) appointed under Section 609 of the Companies Act covering the various states and union territories, shows that the biotechnology sector had witnessed 4,237 companies registering with RoC during the last 10 years.

Following were some of the key trends in company formation as of 2020.

- 840 companies are less than a year in age (20 per cent of the total base)
- 1,665 companies are between 1-2 years of age (39 per cent)
- 1,000 companies are between 3-5 years of age (24 per cent)
- 732 companies are over 5 years of age (17per cent)

Only a sixth (17per cent) of the total start-ups base today were set up between 2010-2015. The rest were formed in the last 5 years. Nearly 20 per cent of the companies were formed in the last 12 months. Almost 39 per cent of the companies are less than three-year-old.

Look at the start-ups' set-up during the last three years

One interesting model that most of the companies registered in India adopt is a combination of services and products offering. The start-ups have been focusing on a wide spectrum of areas. These companies are there in medical devices, appliances, and diagnostic services; They have expertise in genomics, proteomics, and other IT healthcare areas. Some of them are into agronomics, CRAMS, energy, and devices sector too. Some of the products and services that start-ups are offering include anti-fungal products, antidiabetics, antidiarrheals, antipsoriatic, antivirals, anti-cancer drugs and detection kits, biosimilars, genome data analysis, personal genomics, IOT products among several other areas.

Based on the data of the companies provided to ROC, the activity of the companies can be considered under the following categories.

- Research and experimental development (R&D)

- Medical health devices, diagnostics, and appliances (Medical devices & Diagnostics)
- Manufacture of basic chemicals for medical purposes (Basic biochemical manufacturers)
- Manufacture of other biologic based products (Other green chemicals)
- Clinical Research/Data analytics (Human Health)
- Other companies that are registered as fibre manufacturers, IT services companies, etc (Others).

While bulk of the start-ups have been working with basic biochemical processes, nearly (60 per cent), the R&D kind of start-ups are on the rise too. Nearly 16 per cent of the start-ups have shown their activity as research and experimental development. This a good sign that innovation culture is now getting set into the DNA of start-ups. It also testifies the fact that BIRAC and industry are now working closely and there is some support to start-ups for research.

Status of capital and grants

The biotechnology sector hasn't been a favourite of investors. Capital availability has been slightly better than in previous decades. Further, the current set of start-ups have a strong and well-structured ecosystem. The start-ups today have access to a network of mentors, accelerators, and incubators. The story of Biotechnology Ignition Grant (BIG) projects reflects the trend.

BIG promoted start-ups have been the catalyst in triggering entrepreneurial energies. BIRAC has provided funding support of nearly Rs. 2,063 crore, supported 1,500 plus start-ups and nourished over 50 Bioincubators.

This sector has employed nearly a lakh people and nearly two out of every board of five members are women. The overall industry today is backed by a good ecosystem and the industry is on its path to reaching the 10,000 biotech start-ups target by 2025.

Biotech start-ups & COVID-19 fight

Biotech start-ups have played a significant role in the COVID-19 pandemic fight. The solutions have been across the various segments of the industry. Over 100 types of products were introduced towards the fight.

Some of the examples include Catheter Reprocessing System, Point of Care Hand Held Multi-Analyte Diagnostic Device, Step-down ICU like continuous health monitor in less than 2 minutes of set-up, Hand Cranked Defibrillator for Sudden Cardiac Arrest, Applied AI on Radiology Imaging for Monitoring Severity of COVID-19 Patients, Mobile Labs, Automated screening of population to look for likely COVID19 infection by checking for fever plus associated respiratory diseases, Real-time Qualitative PCR kit, Suraksha Full Body Coverage Kits, Oxygen generators, CRISPR based diagnosis of COVID-19 using paper microfluidics, Development of necessary reagents and test-devices, etc. The list of interventions is exhaustive.

The critical part is about scale. Take for example Huwel Lifesciences. It was incorporated in 2015 and based in Hyderabad. It is involved in the manufacture of medical appliances and instruments. HuWel developed the Quantiplus COVID-19 detection kit with RT-PCR capabilities and has CDSCO and ICMR clearance for manufacturing and commercialization. It scaled up to provide Rs. 1 crore tests during COVID-19. The biggest challenge India faced was problems of shortage of plastics, columns, etc. or Mylab Discovery Solutions in Pune that produced the first home-made RT-PCR test kits for COVID-19.

The Indian biotech ecosystem played a significant role in testing, sanitisation, and healthcare management.

> "Total biotech start-ups base was at 4,237 as per the ABLE-BIRAC Indian BioEconomy Report 2020 (IBER 2020) released on March 2, 2021"

DR. RAFI SHAIK
FOUNDER & CHIEF SCIENTIFIC OFFICER, CARBANIO.COM

START-UPS TO MAKE INDUSTRY AATMANIRBHAR

Success of 'Aatmanirbhar Bharat' can be achieved only when start-ups are given equal opportunities to grow and evolve

Aatmanirbhar Bharat, launched in the mid of 2020 is Indian Prime Minister Narendra Modi's vision to make India self-reliant. Self-reliance of any country is important to strengthen its economic development, thereby, reducing its dependency on other nations. The contrary is exactly what led to the slump in the Indian economy during the complete lockdown in China due to the rapidly spreading COVID-19 pandemic. The most hit sector due to China's lockdown was the Indian chemical industry which incurred a huge loss. Furthermore, the Indian chemical industry being so huge and supporting various other sectors lead to a surge of the nation's economy as a whole.

To recover the Indian economy from already suffered losses and further strengthen it to face even the worst scenario, it is important to make India self-reliant. It is possible only when individual, small and start-up businesses regain and endure a high growth momentum. The success of 'Aatmanirbhar Bharat,' can be achieved only when start-ups in the chemical industry are given equal opportunities to grow and evolve.

"The growth ofstart-ups is not just for the economic benefit but also innovations and futuristic visions"

Redefining the roles of chemical start-ups

Making India 'self-reliant' is a step towards making our country independent of other nations while growing at both social and economic levels. Considering all the sectors of India, it is an undeniable fact that the Indian chemical industry is the largest and referred to as the backbone of the Indian economy. The chemical industry is huge and diverse and consists of companies of various sizes ranging from start-ups, small-sized, mid-sized, large and multinational companies. The journey towards making India self-reliant is possible only when there is an equal growth opportunity for all the companies.

On a broader scale, the key to self-reliance is not just confined to improving the resilience of social and economic sectors, but there is a need for innovation that will help us emerge as an Aatmanirbhar country and a superpower among the world nations. Only start-ups can bring in a fresh, innovative idea that can change the course of many sectors. Hence, the growth of start-ups is not just for the economic benefit but also innovations and futuristic visions.

One such example of a start-up that filled the operational gaps and streamlined the chemical procurement process across the nation is a company called Carbanio.com. This start-up tried to update the obsolete methodologies and technologies used in the chemical industry with a new, innovative idea of digitization that organized the entire chemical procurement process and offered a seamless experience for both the chemical buyers and sellers.

Like Carbanio, which is recognized by the government of India and recently making national and international headlines, if other start-ups gain such support and growth momentum it would strengthen the chemical sector which will eventually strengthen the entire economy of the country.

In light of the growing emphasis on making India Aatmanirbhar; it can be achieved only if start-ups are self-sufficient with the ability to grow and

flourish. Every step we take towards strengthening our start-ups is a journey we are covering to make India stand at par with other top nations. This is surely time-consuming but not impossible.

Undoubtedly, the Indian chemical industry is huge, standing 3rd in the Asia-Pacific region and 7th worldwide. Considering our area's spread, the number of chemical companies, huge population, and younger demography, we should have made it to the top three on the global level. The reason we still haven't made it to the top of the list is due to a lack of innovation in the sector. This can be achieved only by focusing on start-ups and encouraging the new, transformative ideas they bring along.

Contribution of start-ups

The country's economy has been hit hard due to the rapidly spreading COVID-19, the biggest pandemic the world has witnessed in over a century. This has led to low manufacturing products, job cuts and a slump in the overall economy. To recover the economy and elevate it to greater levels is not possible by industry giants but only by next-generation entrepreneurs who can create new jobs, introduce innovation, increase production and keep the economic cycle up and running.

The 'Aatmanirbhar' initiative can be well-utilized to ramp up the chemical industry. The innovation brought in by the start-ups will eliminate the dependency on huge, well-established brands. This has also helped the common man buy necessary chemicals at a decent price range, create confidence among other smaller entrepreneurs, generate local employment and overall increase the level of prosperity in the society.

The success of 'Self-Reliant' India can be celebrated the day when there exist an equilibrium and supportive ecosystem between the start-ups, smaller, and larger organizations. This is the roadmap for building a self-sufficient chemical sector, which will eventually contribute to the nation's economy.

> "Success of 'Self-Reliant' India can be celebrated the day when there exist an equilibrium and supportive ecosystem between the start-ups, smaller and larger organizations"

How post-COVID era will open up new opportunities?

The post-COVID era for the Indian chemical industry looks quite promising. Having undergone a severe hit in the chemical and pharmaceutical sector due to China's import restrictions during COVID-19, India is slowly recovering from the damage. This led to major movements in India namely "Aatmanirbhar Bharat" and "Make in India," both of which focus on reducing the dependency on other countries and making our nation self-reliant.

The post-COVID era in the Indian chemical industry is considered to be a transformative period where young entrepreneurs with their innovative start-up ideas will rule the industry. Furthermore, they will move up the value chain, increase the supply and demand, utilize the abundance of hidden talent, thereby contributing to the GDP of the country and also helping in the research and developmental activities.

Start-ups have been playing a major role in the growth of the chemical industry in the past few years. Even during the COVID-19 lockdown imposition, start-ups had made sure to supply the sanitisers, grocery, medicine and other essential commodities. Having supported the nation during the adversities, the start-ups have the spirit and capabilities to bring in a transformative change that the Indian chemical industry has possibly seen.

AMRIT SINGH DEO
SENIOR MANAGING DIRECTOR, FTI CONSULTING

CO-CREATE H2 FUND

India should co-create an H2 Fund with Global Multilateral Agencies and European Sovereigns

India has been supporting R&D efforts on hydrogen (H2) consistently for the last two decades, with a national network of experts, institutions and the H2 Centre of Excellence at IIT-Kharagpur, with public funding for pilot-stage projects. The last H2 and Fuel Cell Roadmap was an aspirational document that was backed by H2-Internal Combustion Engine (ICE) transport applications, with proof-of-concept H2 vehicles by Auto Original Equipment Manufacturers (OEMs). Some applications for H2 power (off-grid power for telecom towers) relied on natural gas as input and were rendered economically unviable as gas prices fluctuated. The result was that despite consistent efforts, we have numerous small R&D pilots some of which incorporate indigenously developed technology but untested at scale.

In the interim, H2 technology developed has advanced rapidly – with large scale demonstration projects in different use cases (transport and industrial uses), supported by national-level policies and public funding in the developed markets. While the cost of H2 is still prohibitive and economically unviable for deployment, this has not stopped private capital flows to early-stage H2 companies (some of which are publicly traded companies with enviable valuations) and projects, enabled by matching public climate change funding in developed economies. Access to funding has meant growth in H2 infra and large-demonstration stage projects in developed markets and has led to most H2 technological know-how and Intellectual Property (IP) residing in EU and US jurisdictions. Most electrolyser manufacturing technology and IP in both these jurisdictions, including at least two high-profile listed H2 companies founded by Indian-origin persons.

Asian attempts to catch-up to the H2 developments in Western Europe and the US provide some interesting perspectives. Japan and South Korea have embraced all-in strategies for developing the national H2 infra. Both countries are betting on building a global supply chain capability on transport use cases and relying on sea-borne H2 from Australia and other parts of Asia, given their weak renewable energy generation position. Interestingly, both countries have prioritized the building of expensive national H2 infrastructure as a prerequisite for their H2 transport focus in the following decade i.e. 2030-40. This is counter to what the EU and US have done – the public effort has moved towards H2 industrial clusters rather than building out infrastructure over a large geography. In other parts of Asia, China has focused on Alkaline Electrolyser manufacturing to drive low-cost commercialization of H2 systems and government mandates that may be difficult to replicate outside China.

> "Creation of an H2-dedicated Energy Transition Fund could address the resource allocation question as well as make a meaningful and targeted policy intervention to build large-stage national H2 demonstration stage projects..."

India's choices in this context are framed by internal and external considerations. Internally, India needs to articulate the appropriate H2 commercialisation strategy that it wants to adopt. This could take the shape of three questions that need to be answered.

1. Should India embark on a national (as Japan and South Korea are doing, with a strong emphasis on transport use-case) or a cluster/regional approach (as is the case in the US and EU) towards H2 commercialisation?

2. Should India be technology agnostic or should we focus on specializing in specific H2 technologies e.g. Polymer Electrolyte Membrane (PEM) or Solid-Oxide (SO) electrolysers for H2 production (or Alkaline Electrolysers as China has done), and accordingly take a lead on building a specific set of standards and certifications for commercialization of that particular technology or systems?

3. Given interlinkages between Renewable Energy (RE), Battery Technologies and Electric Vehicles (EV) and Hydrogen (H2); and India's energy diplomacy imperatives, should India wait for another decade for H2 commercialization to achieve maturity, or should it play an active role in building local capability and supply chains, with an eye on the following decade. This has economic and geopolitical implications and could mean few concentrated (and collaborative) efforts rather than multiple small single-entity experiments.

> "As the global green hydrogen ecosystem matures, the cost of hydrogen production is expected to come down and become comparable with fossil-fuels"

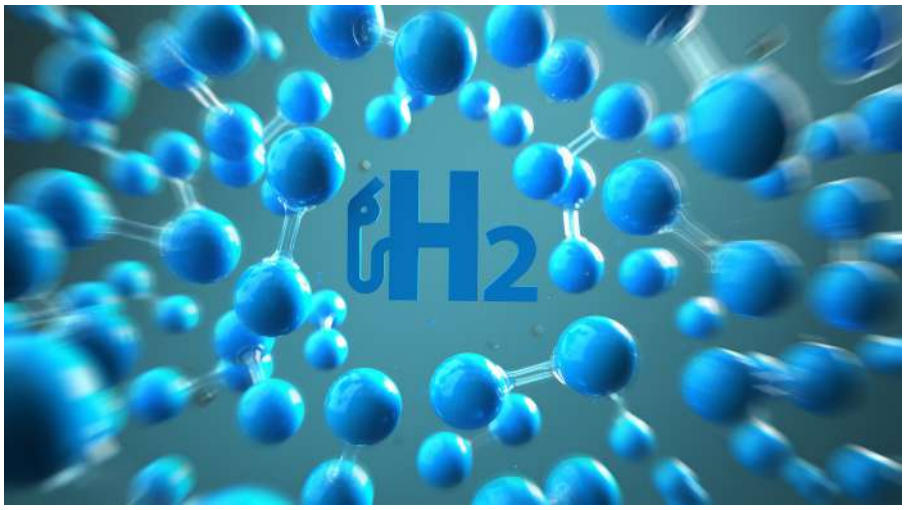
Externally, India should assess the competitive advantage that it offers global H2 players and investors that would encourage them to bring technology and investments to India. This is an opportunity that should be viewed with the following perspectives:

a) Can India provide scale deployment opportunities that help bring down H2 production and usage costs faster than they would in developed markets – telecom markets are a worthy example where India has demonstrated the economies of scale admirably.

b) Can India provide a blank slate to create a collaborative public-private H2 blueprint and economy – with an enthusiastic government, poor air quality urban as a key public concern and climate impact pressures on infra/sectoral investors bringing investments to modernize India's industrial systems.

Negotiating a higher share of global clean energy funding

The year 2021 appears to be the perfect moment for India to make the case for a stronger flow of climate change funding to large emerging markets and climate champions such as India, to fuel a green economic recovery and negotiate multilateral and G2G funding mechanism that allow the creation of H2-dedicated Energy Transition Funds, beyond the current Adaptation and Mitigation funds that flow to India. This is a climate funding diplomacy opportunity for India to leverage. The creation of an H2-dedi-



cated Energy Transition Fund could address the resource allocation question as well as make a meaningful and targeted policy intervention to build large-stage national H2 demonstration stage projects that help develop a local H2 supply chain in India. Just as the National Infrastructure and Investment Fund (NIIF) has created dedicated infrastructure investment funds (with sovereign participation) for logistics and supply chain, India should co-create an H2 Fund with Global Multilateral Agencies and European Sovereigns.

The creation of collaborative consortiums that bring together multiple players, to pool resources and expertise to participate in the large national demonstration-stage projects is another enabling requirement. This is the practice in Japan, South Korea and the EU – and it should provide the template for India as well. Rather than building five separate H2 FCEV platforms, India's truck manufacturers should be collaborating to create an H2 Bharat Trucking Consortium that pools resources and shares risk to build a single, scalable H2 Bharat Trucking System and Standard. This may sound unique but is par for the course in other sectors and other parts of the world. There could be multiple such collaborations in end-use sectors such as steel, fertilizer or cement – all of which are actively considering H2 to decarbonize quickly.

For early technology adoption and building the H2 eco-system, companies need to come together to build such coalitions and consortiums. This is happening faster than one imagines – with the first such coalition that brings global and Indian players together expected to be announced in the next 30 days. These are the sort of developments that will attract more private investments into building the H2 infrastructure, systems and the economy – with attendant impact on the creation of new jobs, cleaner and decarbonized industrial systems, higher air quality and local H2 supply chain development.

On the policy side, India should prioritise enabling policy environment by establishing a public-private taskforce (together with the coalitions or consortiums coming together), co-develop a policy roadmap together with industry, scope large demonstration-stage project that will bring private and multilateral investments that are necessary for build H2 systems at scale and those that deploy at least US $ 100 million over the next five years, scaled to US $ 500 million in next 5-10 years, to build H2 systems and projects. This is the sort of ambition that is required for the proposed Green Hydrogen Mission that will help build a meaningful domestic H2 economy at scale.

Green-DMIC - India's national RE-EV-GH2 demonstration projects cluster

The India Green Hydrogen Policy Roadmap paper launched last December by FTI Consulting, after consultation with industry, identified DMIC as a potential industrial cluster with multiple H2 use cases along a RE-rich industrial corridor that is a focus of Indian as well as global investors. The paper identified four types of aspirational national large-scale H2 demonstration projects, along the DMIC. These are Long-haul, heavy-duty H2Bharat Trucking project - 10,000 H2 truck fleet and infrastructure on DMIC; Four H2Bharat Port and Logistics clusters, linked to IndiaH2 Trucking project; Four H2India Industrial projects, in high-priority sectors (steel, fertilisers and cement); and Municipal level H2Maharashtra/H2Gujarat Urban Bio-Gas projects – with urban (solid waste), dairy cluster linkages.

The advantage of a cluster and defined-geography approach, rather than taking a national approach, would enable the costs of H2 infrastructure to be shared by multiple use-cases and make the most expensive part of the H2 supply chain (other than production cost which is liked to RE input costs) affordable. This mirrors the EU approach of coupling green hydrogen demonstration use cases with renewable energy corridors; acknowledging the high cost of hydrogen infrastructure and transport networks and draws synergies with national decarbonizing initiatives.

As the global green hydrogen ecosystem matures, the cost of hydrogen production is expected to come down and become comparable with fossil-fuels. By the end of this decade, green hydrogen winners and losers will emerge, placing hydrogen importing economies next to low-cost ones (those who leverage national renewable energy and local manufacturing to make green hydrogen affordable). Building an H2 economy is a logical next step for India and complementary with its climate change and decarbonization objectives.

This is the hydrogen-focused energy transition pivot necessary for India's COP 26 position in Glasgow later this year and in the run-up to India's Presidency of the G20 Summit in 2023.

NATURAL GAS EXPECTED TO TOUCH 474 MMSCMD

The demand-supply gap is expected to be about 272 MMSCMD by 2029-30 as supply will fall short of demand

India is the world's third-largest energy consumer globally and natural gas is one of the key components in this mix. Gas consumption has grown quite remarkably in India's residential and transport sectors but has fallen in power generation, as cheap renewables and coal have squeezed out imported natural gas due to cost factors.

The government is committed to further liberalising the country's natural gas market to promote the use of clean fuel. Strengthening regulatory supervision of upstream, midstream and downstream activities should be part of the market reforms, as it is likely to bring greater efficiency and drive up demand for gas and investment in gas transport infrastructure. A liquid and well-functioning domestic gas market would be a strong pillar for India's security of gas supply.

The consumption of natural gas is estimated to increase three-fold in the next 10 years. According to Petroleum & Natural Gas Regulatory Board (PNGRB) report, the natural gas demand is all set to grow significantly at a CAGR of 6.8 per cent from 242.6 MMSCMD in 2012-13 to 746 MMSCMD in 2029-30. This demand represents the Realistic Demand for natural gas in India. Gas-based power generation is expected to contribute the highest, in the range of 36 per cent to 47 per cent, to this demand in the projected period (2012-13 to 2029-30).

"India is set to expand India's natural gas grid to 34,500 km by adding another 17,000 km gas pipeline"

However, the availability of natural gas in India fell short of the total natural gas demand by around 97 MMSCMD in 2012-13. The demand-supply gap is expected to be about 272 MMSCMD by 2029-30 as supply will fall short of demand.

Hence, the Govt. of India aims to increase the share of natural gas in the country's energy mix from 6.2 per cent to 15 per cent by 2030. To achieve this, the Centre has undertaken steps such as building gas import facilities, the setting up of gas trading exchanges and the most crucial among all is the marketing and pricing freedom to producers who develop technically challenging fields.

According to Petroleum & Natural Gas Regulatory Board (PNGRB) report, the demand for natural gas in India has increased significantly due to its higher availability, development of transmission and distribution infrastructure, the savings from the usage of natural gas in place of alternate fuels, the environment-friendly characteristics of natural gas as a fuel and the overall favourable economics of supplying gas at reasonable prices to end consumers in recent years.

The power and fertilizer sector remain the two biggest consumers of natural gas in India and account for more than 55 per cent of gas consumption. The share of fertilizer sector in the overall gas consumption in the country is expected to come down from 25 per cent in FY 2013 to 15 per cent in FY 2030 owing to higher growth in other sectors. The contribution of the City Gas Distribution (CGD), sector is set to increase from 6 per cent to 11 per cent during the projected period. The coverage of CGD projects has been expanded to include 232 new geographical areas spread over 400 districts with the potential to cover 53 per cent of the country's geographic and 70 per cent of the population.

Supply

The supply of natural gas is likely to increase with an increase in domestic gas production and imported LNG. However, the expected increase in domestic production at present is significantly lower than earlier projections due to a steady reduction in gas output from the KG D6 field.

The capacity of RLNG terminals in India is expected to increase from 17.3 MMTPA in 2012-13 to 83 MMTPA in 2029-30 assuming all the existing and planned terminals in India would materialize. Natural gas availability through non-conventional sources like Shale Gas and Gas Hydrates has not been considered in gas supply projections in the absence of clarity on key variables like data as most of India remains unexplored/ underexplored, regulatory policy and lack of domestic infrastructure. The total supply of natural gas is expected to grow at a CAGR of 7.2 per cent from 2012 to 2030 reaching 400 MMSCMD by 2021-22 and 474 MMSCMD by 2029-30.

Table: Consolidated source wise supply of natural gas from 2012-13 to 2029-30

MMSCMD	2012-13	2016-17	2021-22	2026-27	2029-30
Domestic Sources	101.1	156.7	182	211	230
LNG Imports	44.6	143.0	188	214	214
Gas Imports (Cross border Pipelines)	0.0	0.0	30.0*	30.0	30.0*
Total	145.7	299.7	400	454	474

Pipeline Network

India will soon double its existing pipeline network. The first inter-state natural gas pipeline of the country was commissioned in 1987, and by 2014, India had 15,000 kilometres of natural gas pipeline. Last year, the Govt. announced the target of 'One nation, One Gas Grid'. India is set to expand India's natural gas grid to 34,500 km by adding another 17,000 km gas pipeline. Today, there are over 16,000 kilometres of new gas pipelines being worked upon with a total design capacity of around 721 MMSCMD in the next 5-6 years, putting in place most of the National Gas Grid that would connect all major demand and supply centre in India. This would ensure wider availability across all regions and also potentially help to achieve uniform economic and social progress. The regasification capacity of the existing 42 million metric tonnes per annum will be expanded to 61 million metric tonnes per year by the year 2022.

The design capacity of the pipeline network in India is expected to reach 815 MMSCMD in 2029-30.

However, considering the addition of capacity directly linked to the existing/ planned sources of natural gas in the country, the gas grid capacity in India (pipeline emanating from source) is expected to reach

582 MMSCMD in 2029-30 from the present 274 MMSCMD.

This capacity is expected to take care of the natural gas supply scenario in the projected period. In addition to the trunk lines regional gas pipelines, similar to the intra-state network of Gujarat, are recommended for highly industrialized states. It is expected that going forward the Southern and Northern part of India would catch-up with the Western part in terms of pipeline infrastructure while the Eastern and North-Eastern part of the country would lag and would require a policy boost for industrial development to attract more investments.

In the Union Budget 2021-22, the Govt. of India said that it will set up a transport system operator to auction gas pipeline capacity in India, as the country seeks to deepen its gas markets and reduce its carbon footprint. India plans to spend US $ 60 billion in creating gas infrastructure by 2024, including pipelines, liquefied natural gas (LNG) terminals and CGD networks.

> "It is important to introduce structural changes at the beginning of the reform to set the stage for developing markets and competition"

Focus Areas for India

Developing competitive natural gas markets and attracting investment in the development of infrastructure may require frequent regulatory changes and interventions, as it happened in both the USA and UK. However, increased regulatory risk and other factors discourage investment in the natural gas sector. Therefore, it is important to introduce structural changes at the beginning of the reform to set the stage for developing markets and competition. Thereafter, continuous improvement in the regulatory framework must always support market development. The market forces have also proved to be vital and effective in the natural gas industry, once an appropriate structural and regulatory framework is put in place.

Pravin Prashant

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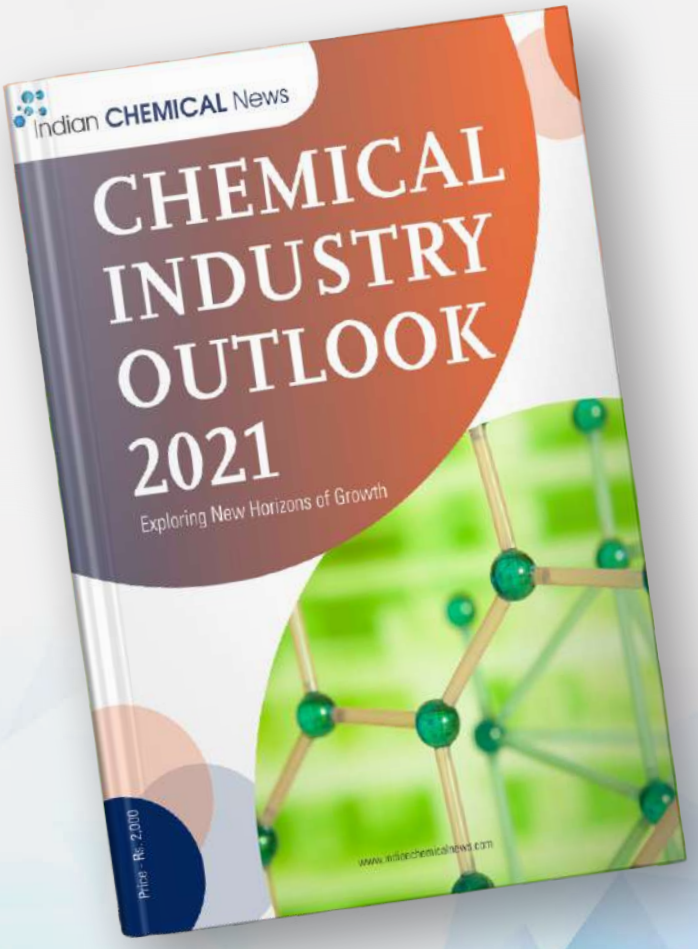

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