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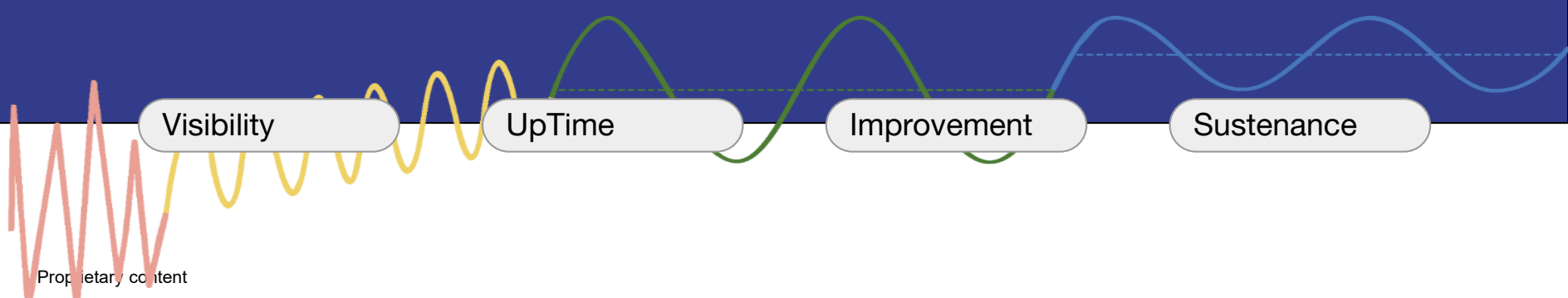
Energising Businesses and Communities Worldwide

Improving and Sustaining KPIs: Leveraging Real time Insights for Optimal Efficiency

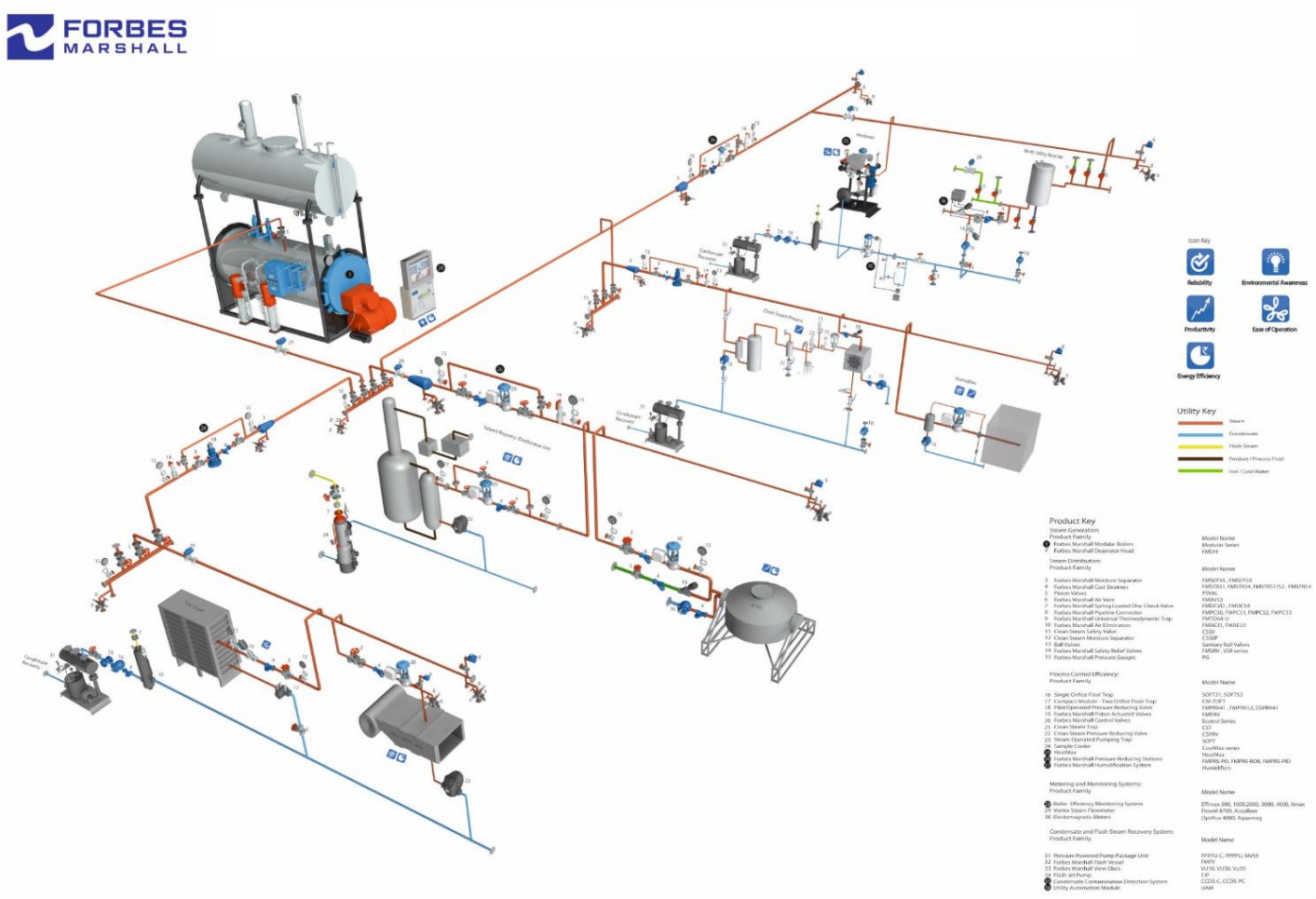


Energy Conservation - Present Plant

Focus and Importance

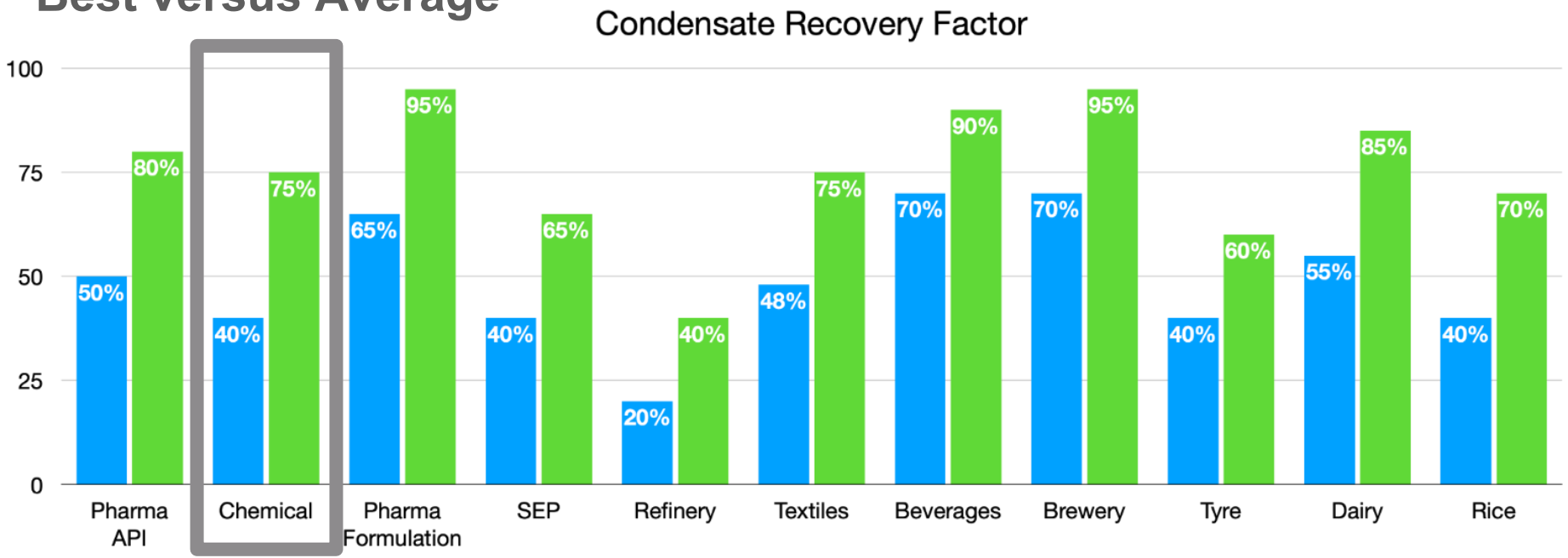
Parameters		Briquette	Rice Husk	Indonesian Coal	NG	Furnace Oil
Boiler Operating Pressure	Bar Abs	9	9	9	9	9
Boiler Efficency	%	65	65	55	85	84
Feed water temperature	°C	75	55	65	70	55
S:F		3-3.5	3-3.5	5-6	13-14	13
Fuel GCV	KCal/Kg	3700	2800	5000	9350	10200
Cost of Fuel Rs/Kg (Previous)	**Rs/unit**	**4.5**	**4**	**6**	**38**	**42**
Cost of Steam-Rs/Kg (Previous)		**1.10**	**1.33**	**1.30**	**2.83**	**2.98**
Cost of Fuel (Current)		**7**	**6**	**13**	**64**	**62**
Cost of Steam-Rs/Kg (Current)		**1.71**	**2.00**	**2.82**	**4.77**	**4.39**
% Increase in cost of steam		**56%**	**50%**	**117%**	**68%**	**48%**

New Generation Solutions



Variations in CRF- A Key KPI

Best versus Average



Reasons for Variations in CRF

- Poor trap uptime
- Condensate evacuation through bypass valves
- Improper steam system design
- Inadequate capacity utiliation
- Inconsistency of throughput and product mix
- Preventive maintenance schedules not followed

Impact of Condensate Recovery

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Water Charges : Any condensate not recovered to boiler feed water tank has to be made up in the form of make-up water, thereby make water cost increases

Reduced Water Treatment Costs : Condensate is an ideal boiler feed water.

Compliance Norms : Draining of hot condensate is increasingly restricted as most plants are expected to meet Zero Liquid Discharge (ZLD) norms.

No boiler derating : Boiler output is maximized

Reduction in Fuel Bill : Condensate is a valuable resource, even relatively small quantity, say from even a single steam trap is economically justifiable

Every 6 Deg C increase in feed water temperature due to recovery of flash steam and condensate recovery reduces the FUEL BILL by 1%

Condensate Recovery Overview

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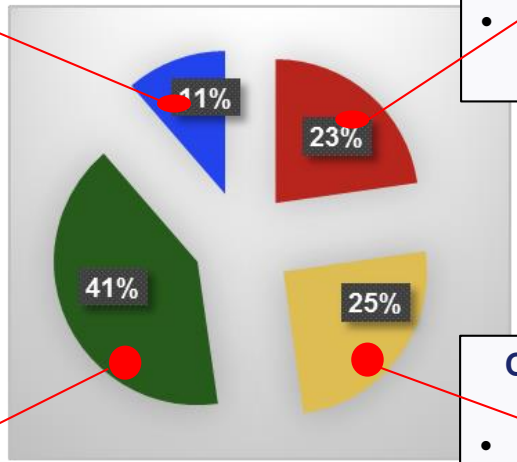
No Condensate Recovery

- Complete loss of flash steam & condensate
- Low feed water temperature
- Make up water required is high

Condensate Recovery by Trap Pressure

- Water logged traps
- Increase in batch time
- Frequent opening of trap bypass valve
- Live steam venting from feed water tank



Condensate Recovery by Flash Vessel & Steam Operated Pump

- Flash steam recovered to low pressure process / boiler feed water tank
- High condensate return temp. (+ 90°C)

Condensate Recovery by Electrical Pump

- Flash steam loss to atmosphere
- Low condensate return temp.(70-75°C)

DIGITAL

#BeyondConnectivity

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Sustenance of KPIs- An Important Facet

Why is digital sustenance of Paramters?

At an Existing Plant

Why is Digital Sustenance Service Needed?

Performance Variance Over Period of Time @ Embio Pharma

Yash, October 2023

Equipment Level KPI

Fludised Bed Dryer

Energy Conservation

Steam Utilization-KPI At Equipment level

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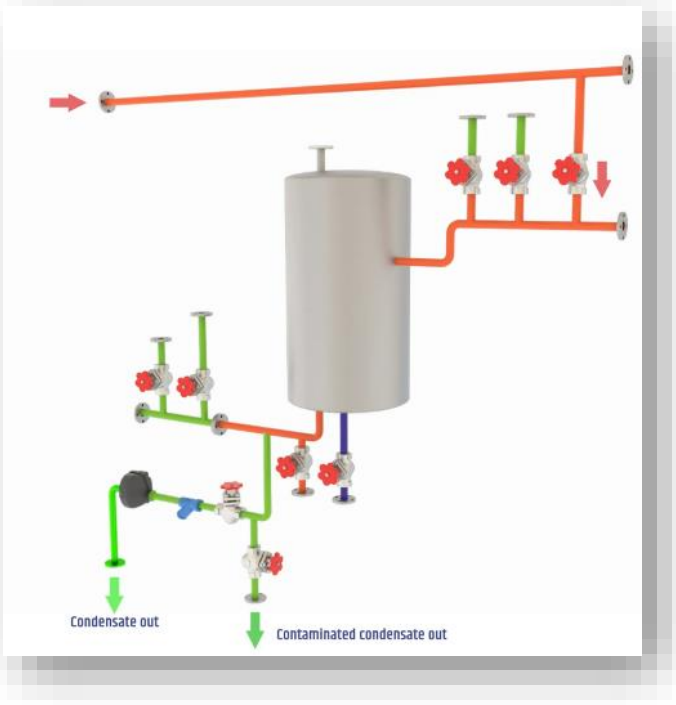
FBD | Auto coater | Wruster | Solvent Recovery Unit | Stripper + ATFD + MEE | Reactors | PSG

Typical Losses

- Production Side
- Equipment Side
- Utility Side
- Environmental Side

Understanding Root Causes → **SOP"S**

Multi Utility Reactor



Production Loss	Higher Batch Time & Startup Time
Equipment Side	Radiation Losses Charging of Reactor despite no batch Scaling Water hammering
Utility Side	Higher Steam Consumption Loss of Steam through Steam Traps Bypass Corroded Condensers Utility Mixing Condensate drain due to fear of contamination
Environmental	ETP/Cooling Tower load increase due to draining of condensate

Cause,Effect & Control

Typical Losses	Root Cause	Available Patented Technology
Higher Batch Time & Startup Time	Incorrect Pressure & Temperature control valve selection	 Steam Measurement with dryness
Radiation Losses Charging of Reactor despite no batch Scaling Water hammering	Incorrect Steam Trap Selection not being able to function under Stall	 Combo-Pressure & Flow monitoring
Higher Steam Consumption Loss of Steam through Steam Traps Bypass Corroded Condensers Utility Mixing Condensate drain due to fear of contamination	Manual Intervention to segregate utilities	 Two Orifice TDS Condensate Separator
	Inability to predict fouling rate	 Closed Loop Condensate Recovery
ETP/Cooling Tower load increase due to draining of condensate	Bypassed equipment	 FoulingPreditco

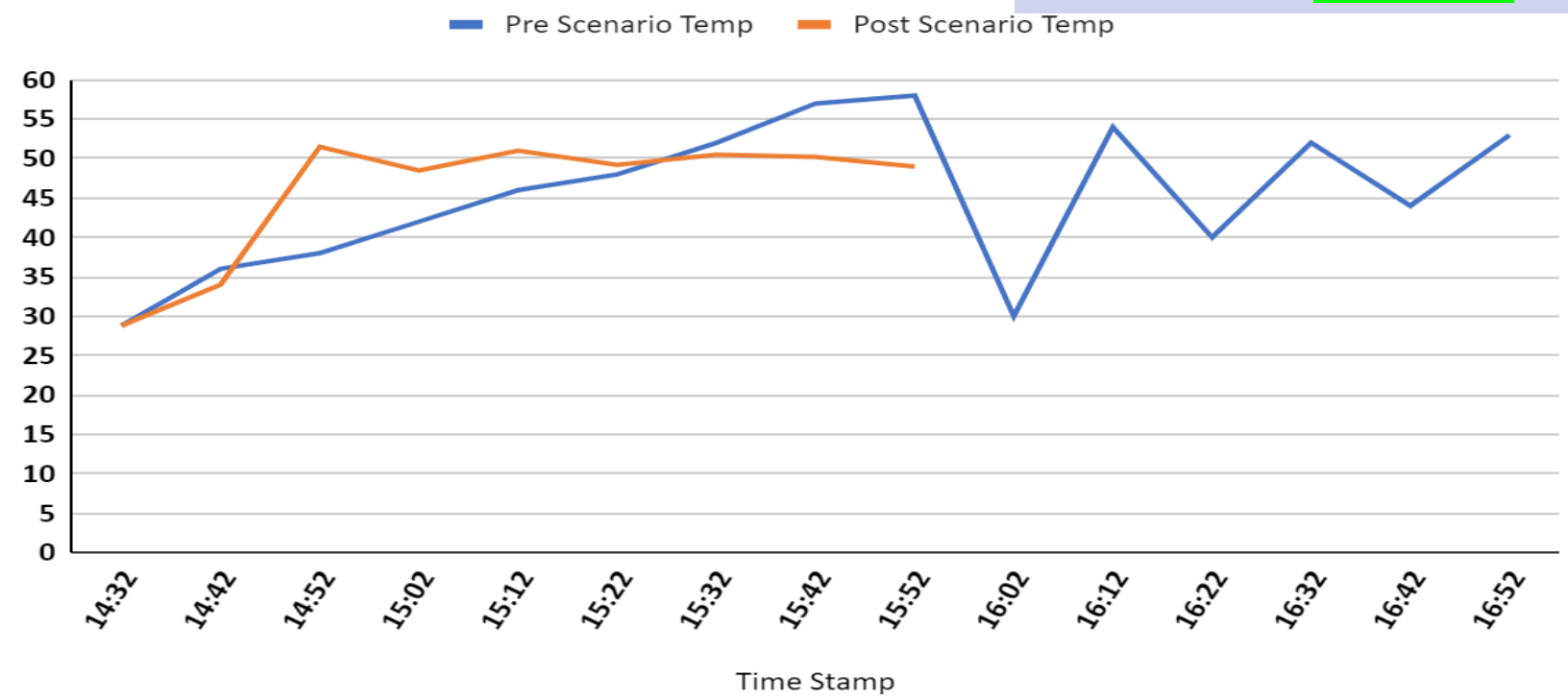
Smart Process Trap- MuPT

Benefits

- **Equipment level** contamination detection and diversion.
- Process equipment failure detection (Heat Exchanger)
- Improved condensate recovery factor
- Utility and condensate **segregation**
- Inbuilt trap monitoring system (detects and indicates system status and failures)
- Compact, Integrated, and online-maintainable design

Equipment Level Success Story
Dryer @ Chemical Plant in Baroda

Pre Solution:2.30 Hours
Post Solution: 1.30 Hours

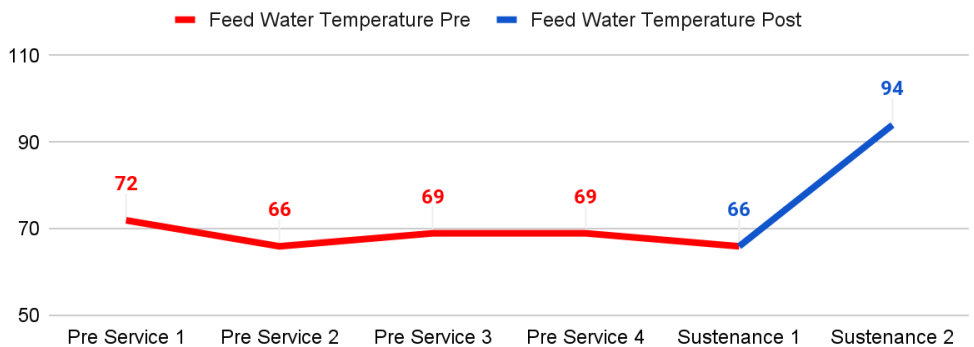


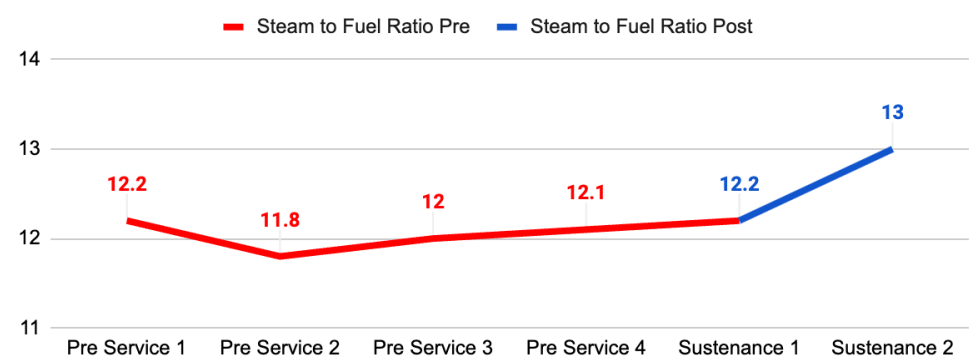
Plant Level Engagement

Condensate Recovery Factor

Water accountability and Management

Plant Level Success Story
Condensate Recovery Factor @ P&C Plant in Baroda





Analysis, Action and Implementation

- Flash steam recovery from Old plant
- Old pump Recovery is not online & not calculated
- MLT header line Condensate is drained
- PSG MP condensate is flashed in open tank, flash vented & only condensate recovered
- Both Flash steam from PSG via flash vessel & from FJP Steam recovery & inter connection
- Maintain level of 2.5-3 KL instead of 5-5.5 kl
- Deaerator Connection interchange for Condensate & flash steam
- Tapping for FWT bottom to deaerator top recirculation line

FM Partner Plants

Industries

Pharma & Chem
Food & Beverage
Textiles
Power Plants
Paper
Water
AAC Blocks
Automobiles
Metal & Mines
Plywood & Laminates

Monitoring every Minute

Plants: **451**
Assets: **893**
Parameters: **6000**
Control Loops: **726**

Drop rate
Connected Sites

≅1%

Service Running

287

Across 240 plants

Customer engagements :
Reports & connects

≅600

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Overview of FM Digital Sustenance Services

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Thank you

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In case of any queries relate to Thermal assessments kindly Contact

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