



HYDROCARBON PROCESSING*

IRPC

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Driving Value Maximization with Process Digital Twins and Data Analytics



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Vice President





Driving Value Maximisation with Process Digital Twins and Data Analytics



2nd October 2024

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- **A Fortune 500 Company** and **India's Largest and Most Valuable Corporate**
 1. *US\$ 240 Bn+ Market Capitalization*
 2. *US\$ 100 Bn+ Revenue*
 3. *US\$ 20 Bn+ EBITDA*
- **Unprecedented shareholder value creation** – 32%+ annualized return over 45 years
- Constantly leading India's capital creation – **Over US\$ 75 billion capex in last 5 years**
- **Significant transition from B2B to B2C in last 10 years** – established new Market Leading Platforms in Telecom, Retail, Media and Financial Services (now demerged)
- **Rated above India's Sovereign Credit Rating** – Two notches by S&P and one notch by Moody's

We are India's most reputed and trusted Company

Growth Platforms Across Energy, Consumer, Technology Businesses

Digital Services

- **Largest** digital services provider in **India** – **489.7 mn subscribers** in just over 7 years
- Completed **pan-India 5G rollout** – **fastest ever globally, largest operator world-wide** in terms of **data traffic**

Retail

- **India's largest and most profitable retailer** - among the **fastest growing retailers globally**
- **18,918 retail stores, 81.3 mn sq. ft. of retail space**, Leading O2O platform with digital commerce

O2C

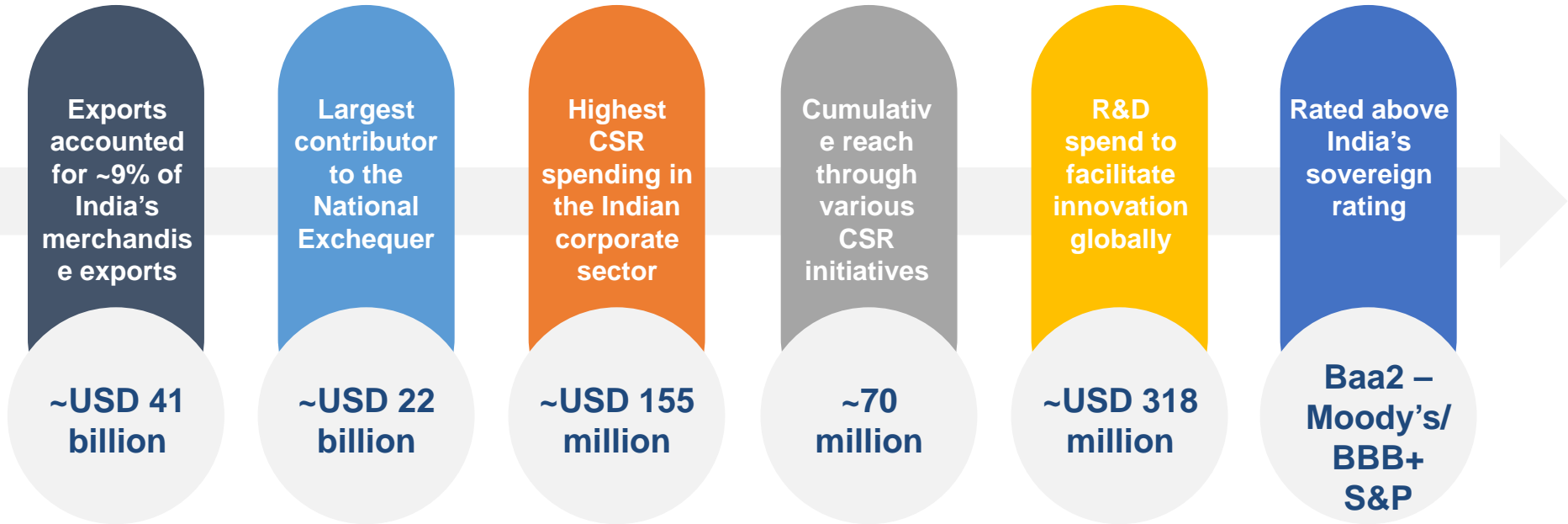
- **Deep integration, competitive cost position, wide product portfolio** reduces earnings volatility
- **Among world's largest O2C player** - operates world's largest single site refinery at Jamnagar

New Energy

- Investment of ~**\$10bn** in new energy business – building world-class **integrated renewable energy ecosystem**
- Developing enabling ecosystem to **rollout 100 GW new solar capacity by 2030**

Reliance is the best proxy for New India's Consumption, Tech-driven Growth Story

Pre-eminent Position in India



Maintained leadership position among Indian corporates for nearly three decades

O2C Business: World Class Assets of Global Scale



1.4MMBPD Crude Refining Capacity
Largest single site refinery complex globally



67.8 MMT of Production meant for Sale
(FY24)



1,730 Fuel Retail Outlets | 4,750+ EV Charging Points
in 51:49 JV with BP



Among Top 5
Largest Producers of PTA & PP Globally



21.1
Complexity Index¹



3rd
Largest Producer of PX Globally



1.5%
of Global Crude produced at Jamnagar Complex



14
Manufacturing facilities in India (11) and Malaysia (3)

Pioneered vertical integration and conceived oil-to-chemicals concept well ahead of industry

• Note: 1 As per KBC study for Jamnagar Supersite Complex

Growth Engines for Sustainable Value Creation



Operational excellence demonstrating robust strategy and execution capabilities



EBITDA nearly doubled over 5-year period; Consumer business EBITDA up ~4x in the same period



Robust balance sheet, prudent capital allocation and risk management framework underpin future growth



Strong commitment to ESG; Target to be net carbon zero by 2035



Energy businesses – enabling a sustainable future through greener fuels and products

- Next phase of O2C growth to be led by India centric capacity expansion, customer centricity and circularity
- Green energy investments and RTC power to deliver lower and predictable energy costs and new revenue streams
- KG D6 to provide valuable transition fuel for the economy



Consumer businesses - unparalleled access to Indian consumers with multiple growth drivers

- Jio – Executing identified strategies for Individuals, Homes, Enterprise and Digital Platforms
- Retail – Expanding omni-channel offerings, strengthening logistics, product development and premiumization

Poised to benefit from structural growth in India industrial and consumption demand

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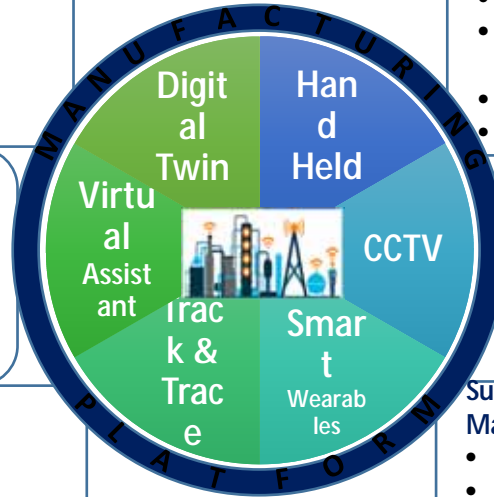


Narender Mitta
Automation

Digital Transformation - Platform for Integrated Operations Management

Digitalization: Quantum Jump in Productivity, Reliability, Safety

Paper based with digital blinds



Complete, accurate, consistent & single data version

- Design Data, Operations, Maintenance
- Predict & Prescribe actions
- Improve Plant reliability & availability

- Close Loop Operation
- Auditable Compliance

Connected Plant

- Task guidance
- Notifications & Actions
- Collaborative team with connected workflows
- Timely response
- Knowledge Access

Collaborate with experts

- Chatbot, Voice chat
- Quick access to Asset Model
- Timely support & Actions
- Supplement competency

Improve Situational awareness through Video Analytics to enhance

- Safety . Health
- Security .
- Productivity
- Productivity

Find when needed

- People, Material, Vehicles
- Geo-Fencing
- Enhance Safety
- Enhance Productivity

- Digital Data
- Speed & Efficiency

Support Operations & Maintenance

- Remote monitoring & support
- Immersive learning
- Guided Instructions
- Knowledge transfer
- Manage Skill gaps

Operations

Technical

Maintenance

Safety

Business

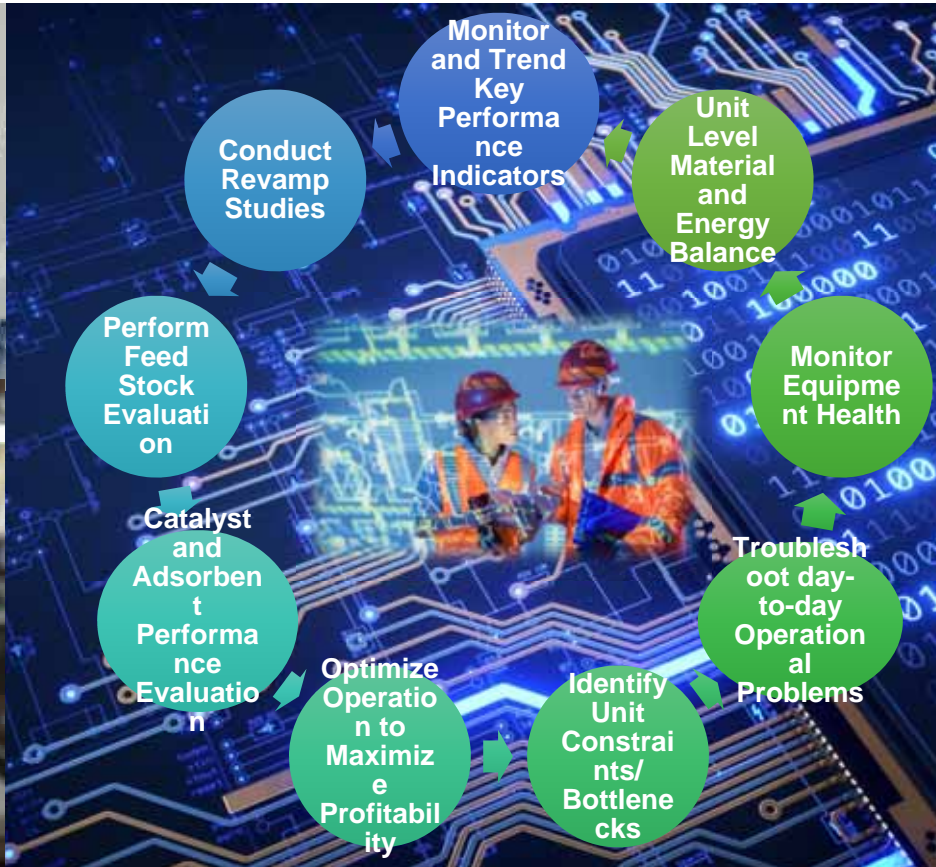
Procurement

Security

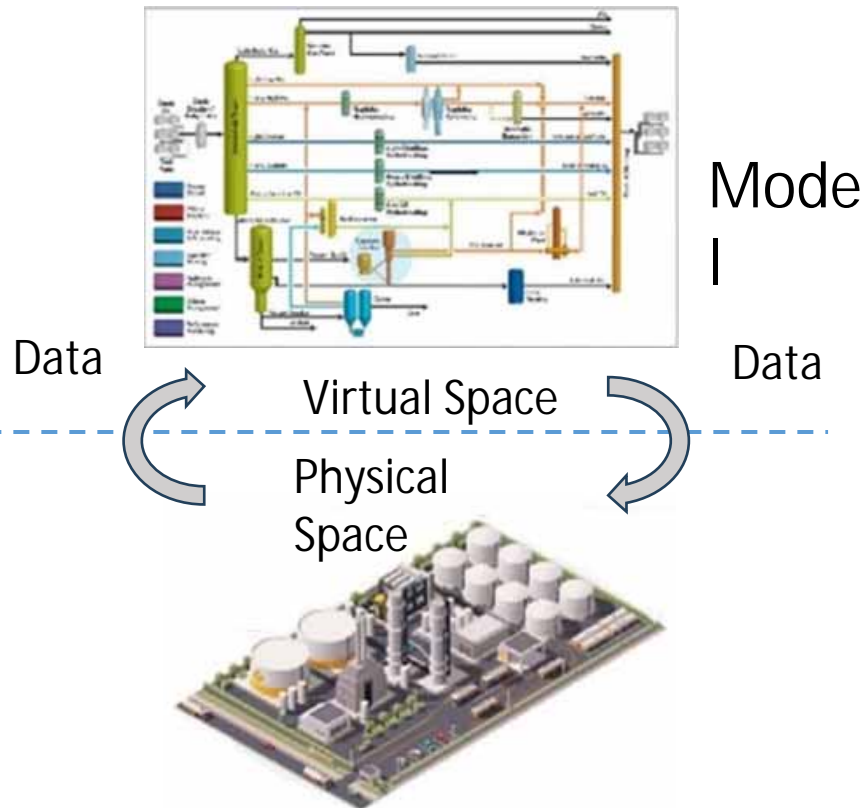
Logistics

Project

Process Digital Twins – Delivering Real Time Operational Excellence



Process Digital Twins – 3 Key Elements



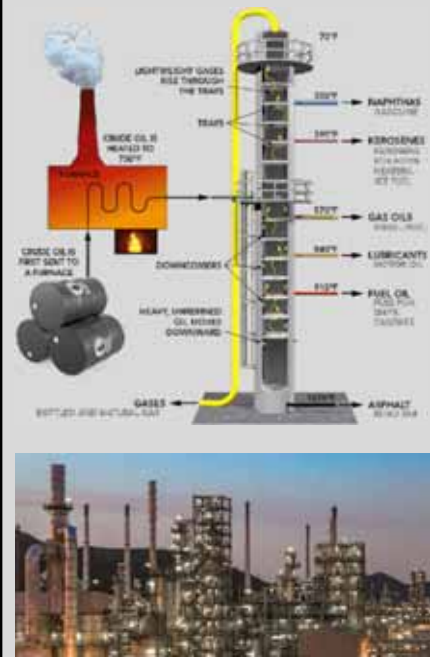
Process Models - First Principle Based / Hybrid
Physics, Chemistry, Engineering Simulation....

Data Analytics Models – Data Driven
Statistical, ML & AI to generate insights

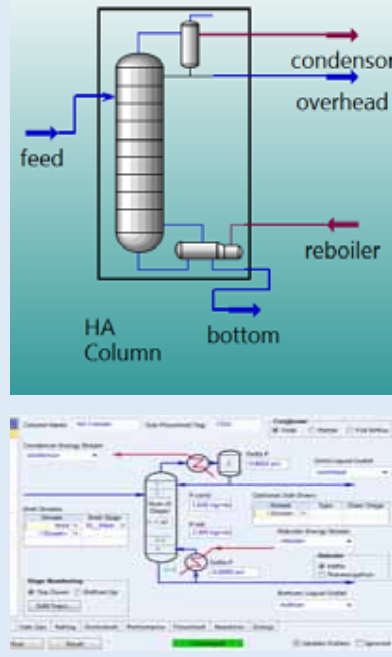
Interactive Dashboard - Visualization
Integrate high-quality data and value-added information for effective and timely Decision.

Distillation Column - Process Model (1st Principle Based)

Actual Operation

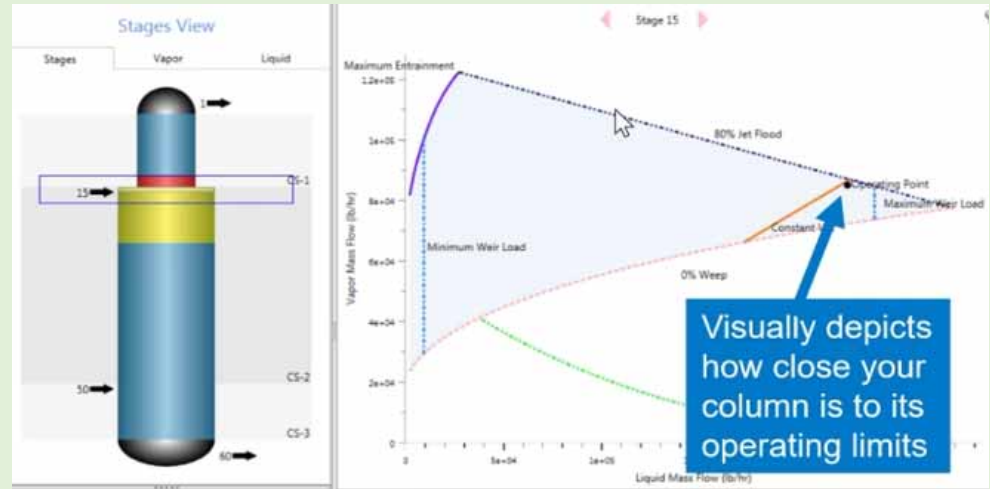


Online Process Model



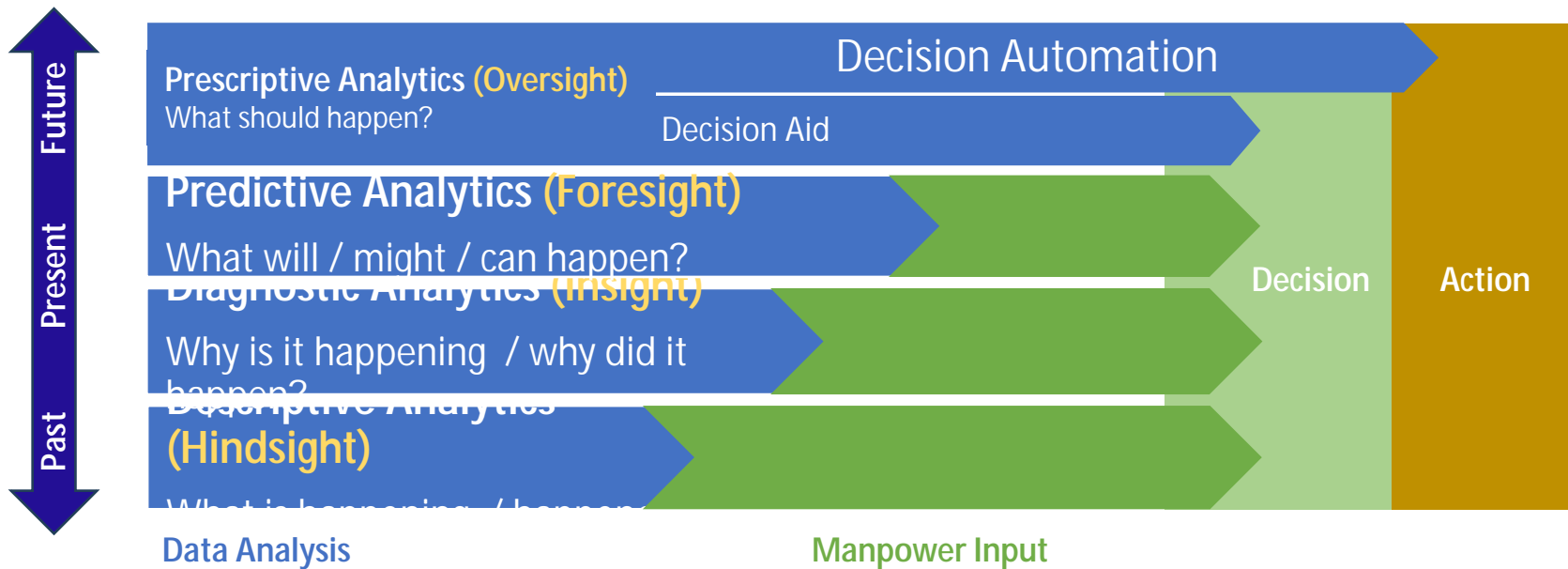
Benefits

- ✓ Obtaining desired Qualities of Products with minimum Energy
- ✓ Maximizing the Capacity
- ✓ Sustaining Optimum Column Performance



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Process Data Analytics Evaluation

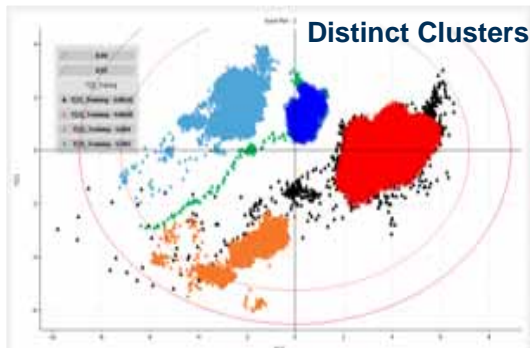


Data Analytics Model – Identifying Good Operating Zone

Business Challenge: Lower Run Length of Process Equipment

Need: Identify Parameters Causing Lower run length, Uncover their Dynamic Behavior and Glean Good Operating Ranges to improve run length.

Result: Identified the factors Influencing run length and their Ranges for Best Runs.



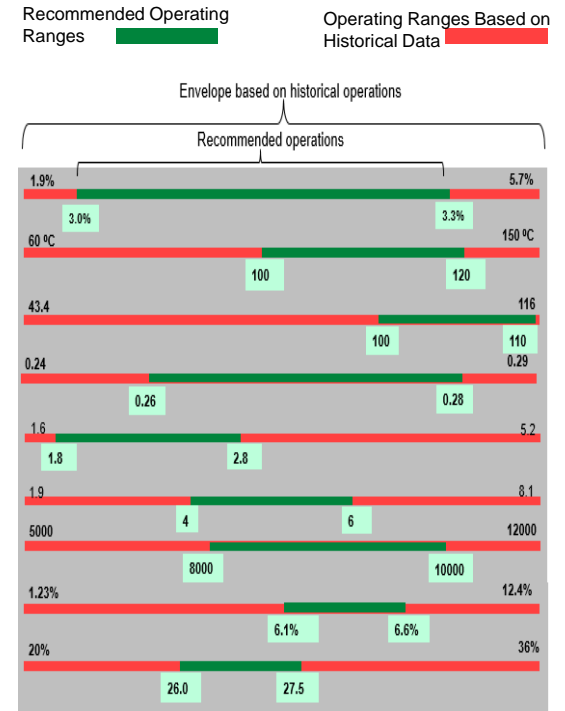
Distinct Operating Zone
Clustering, Classification of Different Operating zones



Identifying the **Contributing Parameters** for Deviations from the best operating Zone



Translation of Data science outcome into Operations Language



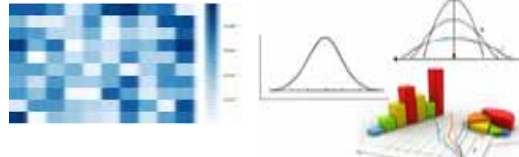
Data Analytics Model Development

Extract, Transform Load (ETL) data.
Analyse the process and identify critical parameters/data set
-SQL, Python, Matplotlib, Seaborn, pair plots etc.,



Exploratory Data Exploration and Feature Selection

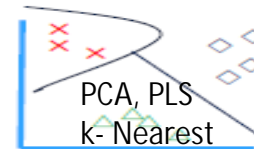
Develop overall trends and correlation – identify features, key tags
- Descriptive analytics, Auto correlation, Heat Maps, Missing data treatment



Data from IP21, LIMS, SAP, Meridium, Excel, email
Inspection images, pdf

Classification: Good vs Poor

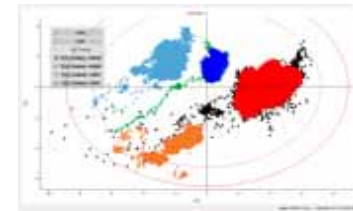
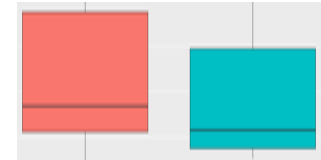
Segregate different operating zone. find groups or sets based upon data at hand. (Unsupervised)
- Dimensionality reduction



PCA, PLS
k- Nearest
Neighbours
Decision Tree

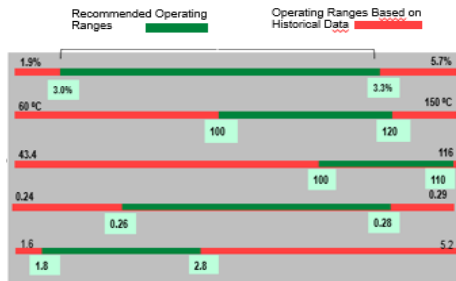
Good Operating Zone

Study the parameters behaviour for good and bad run



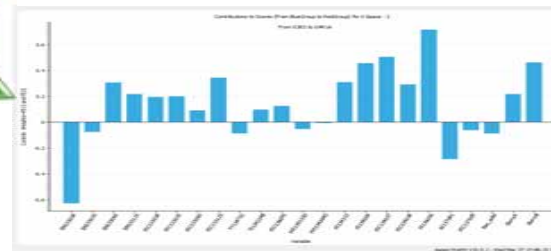
Translate Data Science Outcome into Operation and Technology Language

Recommended Operating Zone



Variable Importance, Optimization

Identifying the **Contributing Parameters** for Deviations from Best



Thanks