



AVEVAWORLD

PARIS



Optimizing Alumina Refinery Operations

through AI/ML-Driven Insights

Agenda

01

Hindalco – What we do and our Purpose

02

Plant of the Future Framework and Journey

03

Industrial Data Management Platform Journey

04

Analytics use case, Impact, and Culture transformation



WE

Hindalco at Glance



Aluminium

One of Asia's largest producers of primary Aluminium and a global leader in aluminum flat rolled products.

UP STREAM

OPERATIONS	PRODUCTS
<ul style="list-style-type: none"> Bauxite Mining Alumina Refining Smelting 	<ul style="list-style-type: none"> Alumina Primary Aluminium in the form of ingots, billets and wire rods

DOWN STREAM

<ul style="list-style-type: none"> Manufacturing of value-added products 	<ul style="list-style-type: none"> Flat rolled products, including foils Extrusions
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PRODUCTION CAPACITY

1.34 million MT

Primary Aluminium

0.43 million MT

Aluminium VAP

4.2 million MT

Aluminium Rolling (Novelis)



Copper

Products known for high purity and quality in domestic as well as global markets.

OPERATIONS

- Custom copper smelters
- Refineries
- Rod plants
- Captive power plant
- Captive oxygen plant
- Precious metal recovery plant
- Captive jetty and other utilities

PRODUCTS

- LME grade copper cathodes
- Continuous cast copper rods
- Precious metals – gold and silver

PRODUCTION CAPACITY

0.42 million MT

Copper Cathode

0.54 million MT

Copper Rods



Specialty Alumina

Recognized as a prominent global player in specialty alumina and hydrates.

OPERATIONS

- Manufacturing of chemicals

PRODUCTS

- Coarse alumina hydrate
- Metallurgical alumina
- Specialty alumina and alumina hydrate

PRODUCTION CAPACITY

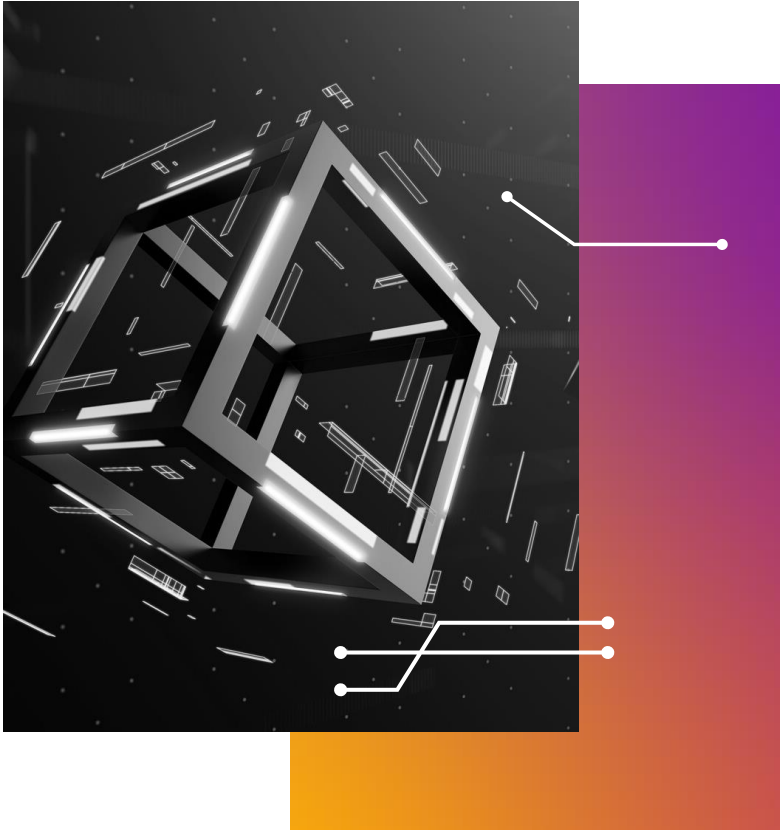
3.74 million MT

Total Alumina

0.46 million MT

Specialty Alumina

Our Digital Ambition



Top 10 digitally transformed manufacturing companies in Asia by 2027.

Plant of the Future - Framework

Value Delivery

KPI Improvement

Deliver value to the business
Safety | Volume | Throughput | Productivity | Cost | Efficiency | Quality | ESG

Smart Office

Seamless working environment
Productive, Paperless office | Employee experience

Gate to Gate Digital

Ease of Doing
Synchronized, error free and efficient processes

Digital Culture

Data based decision making
Data first culture | Data Democratization | Curious , digital Savvy workforce |

Decision Layer

Workflow Automation

Enhanced productivity and transparency
Smart logbooks | Smart workflows | Smart Applications

Visualization and Reports

Decision empowerment with contextual visualization
Operator dashboard | Plant performance dashboard | Digital reports

Analytics - Decision support

Enhance decision quality with advanced Analytics
Predictive | Prescriptive | Optimization | Digital Twins | Simulation | Visual Analytics

Process & Systems Layer

Connected Plant

Connected Assets | People | Processes | Technology
(ERP, IOT, MES, LIMS, EMS, HRMS)

Automation

Task | Work | Process Automation
Automate repetitive work

Asset Management

Asset Availability | Reliability | Cost
Asset Performance

Track & trace

Machines | Materials | Vehicles | Man
(Inbound, Outbound, Intra plant)

Safe & Secure Place

Safety | Induction | Training | Surveillance
(Safety & Security systems)

Sustainable Mfg.

Energy | Water | Waste | Emissions management
(Tracking & minimization)

Technology Stack

IOT

Robotics

AI/ML

Drones

RPA

BLOCKCHAIN

5G

AR/VR

Gen AI

Foundation Layer

IT Management

Connectivity | Speed | Devices | Office Applications | Cybersecurity

Data Management

Sensors | Data Pipelines | Data lake | Analytics tools

Digital Savvy Workforce

Data Citizens | Digital Ambassadors | Data Scientists | Data Engineers

Digital Mindset

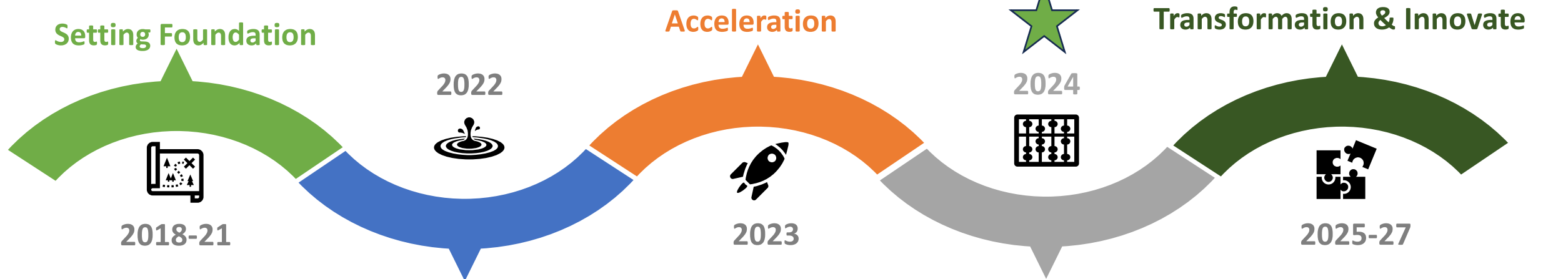
Way of thinking | Data First Mindset

Digital Transformation Journey

- Business imperatives from leadership
- Experimentation + PoC's
- Core team with existing employees
- Data Acquisition
- Building Infrastructure
- Basic Awareness

- Data Visualization
- Digital culture + capability
- OT-IT security layer initiation
- Enterprise Data Lake setup
- 73+ Analytics use cases
- Digital Savvy workforce

- E2E data driven decision across value chain
- Near paper less operations
- Improve 2-3% in EBITDA
- Advance Analytics
- Autonomous Mode with GenAI
- Smart, Safe and Sustainable operation



Setting Foundation

Acceleration

Transformation & Innovate

2018-21

2022

2023

2024

2025-27

Expansion

Democratization

- Tech investment & Data Hub
- 20+ Analytics use cases
- DA Program and Augmented with external hires
- Data Warehouse + Insights
- Mass capability building

- Data Management Platform + Insights
- Democratization of data across value chain
- OT-IT Security layer expansion
- DIY - data visualization + Reports by users
- 250+ Advance Analytics use cases
- Tech Standardization

AVEVA

★ Today we are here

Enterprise Data Maturity

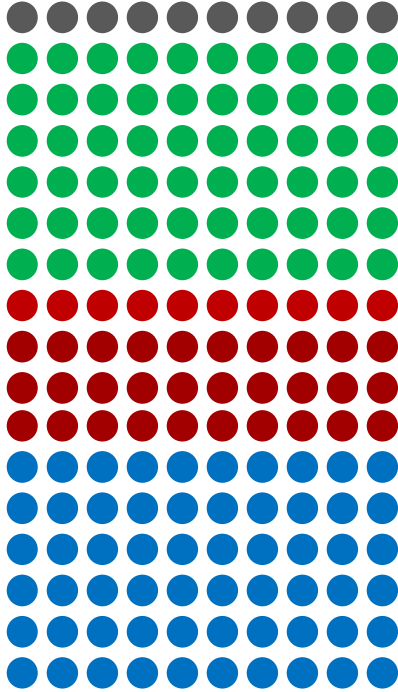
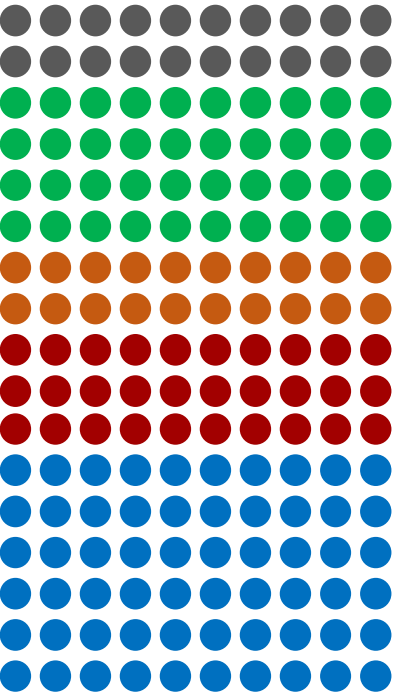
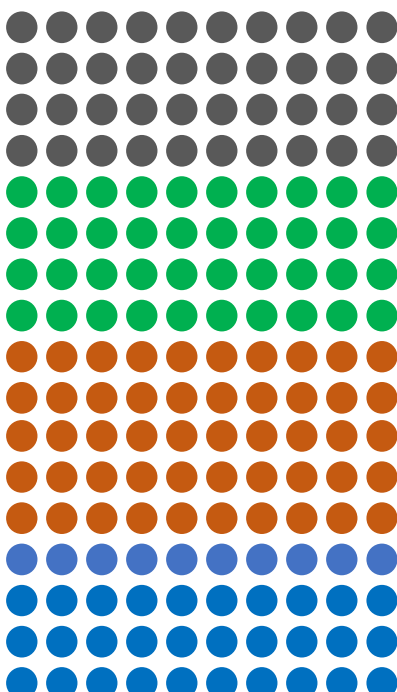
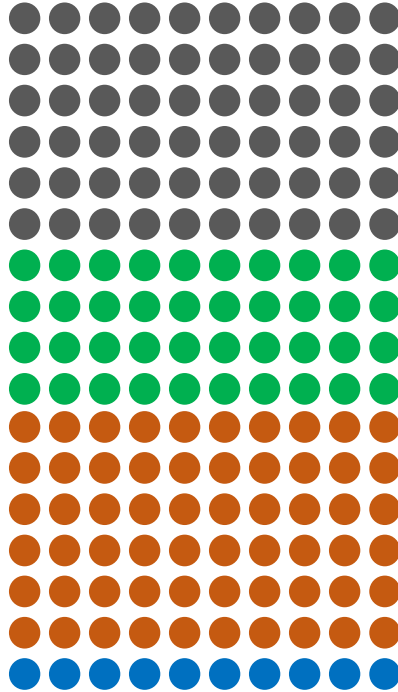
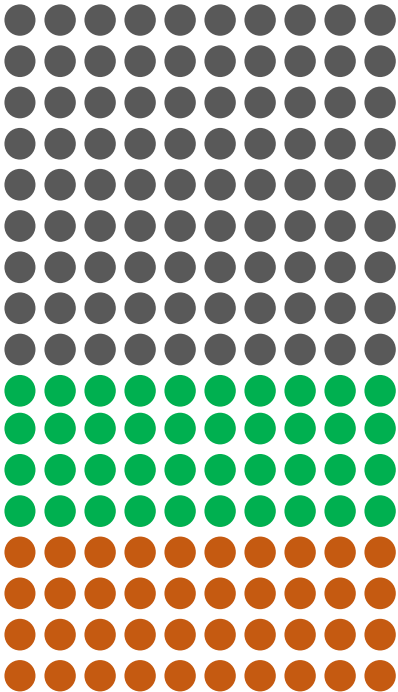
2016-19

2020

2021

2022-23

2024-25



Basic Infra +
Data Acquisition.

Data visualization,
Decision Making,
point solutions

Descriptive Analytics

Predictive + Prescriptive
Analytics

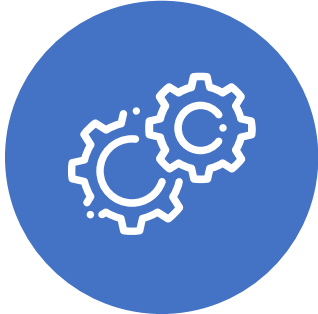
I-Data Management platform Journey

Experimentation

- AVEVA™ PI System™ PoC at 2 plants
- Analytical Insights – 4~5
- Analytics use cases – 2 Nos

1

2020-21



2022-23

2

Initiation Phase: Hirakud – 40K tags Muri – 2k Tags

- Implementation of 42K tags
- Analytics use case – Digital Twin, AI/ML.
- Process/operation improvement

Acceleration All Primary Units ~365K Tags

- Horizontal replication in all upstream units
- Standardized architecture
- 180+ Adv. Analytics use cases
- Development of GenAI

3

2024-25



2025-27

4

Transformation & Innovate Scaleup: ~1.2M Tags

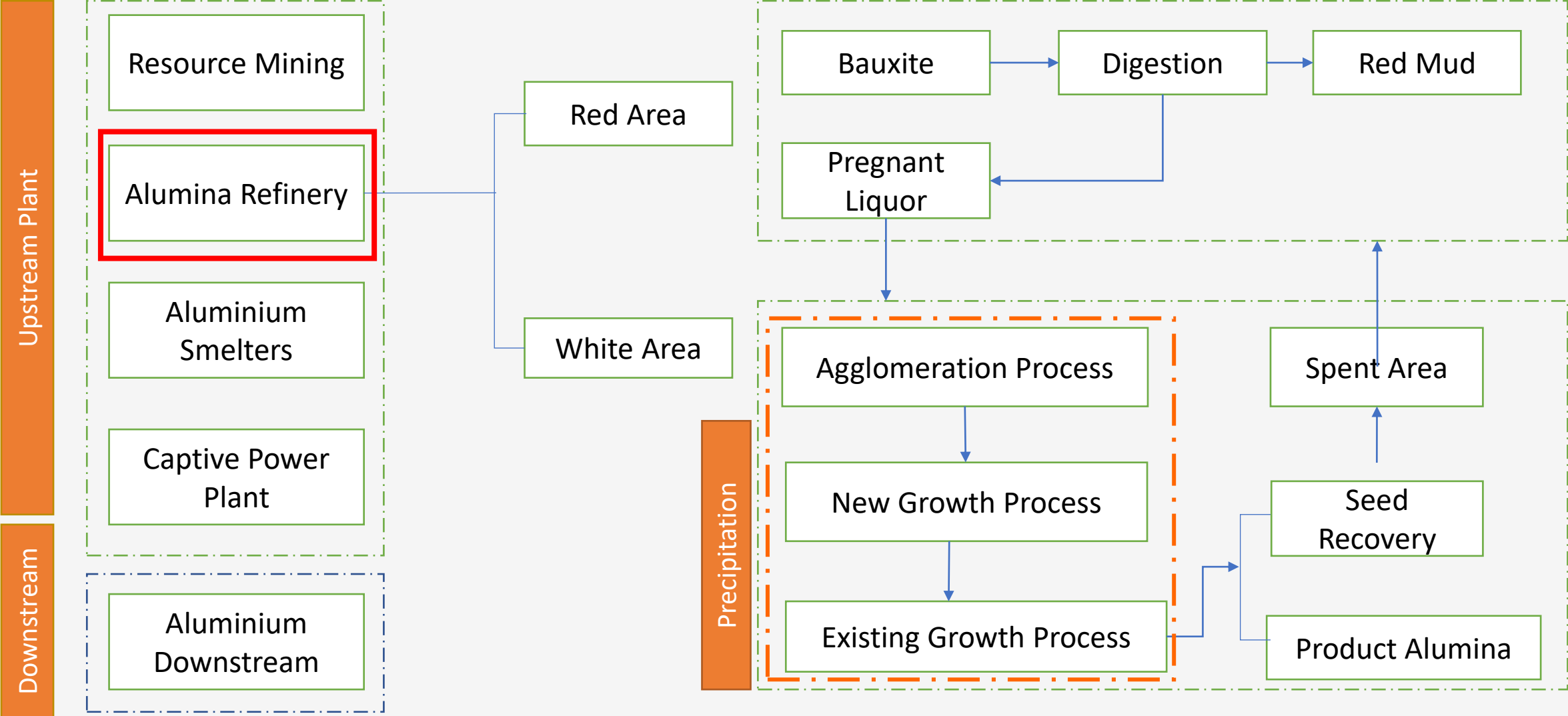
- Mine to Port: Connected Manufacturing & Supply chain
- Autonomous Mode
- Generate Reports using GenAI
- Advance Analytics

Intelligence Operation of Precipitation Control (iOPC) – Yield Improvement

iOPC

Intelligence Operation of Precipitation Control

Glance of Refinery Operation



Business Case & Impact

Business Need

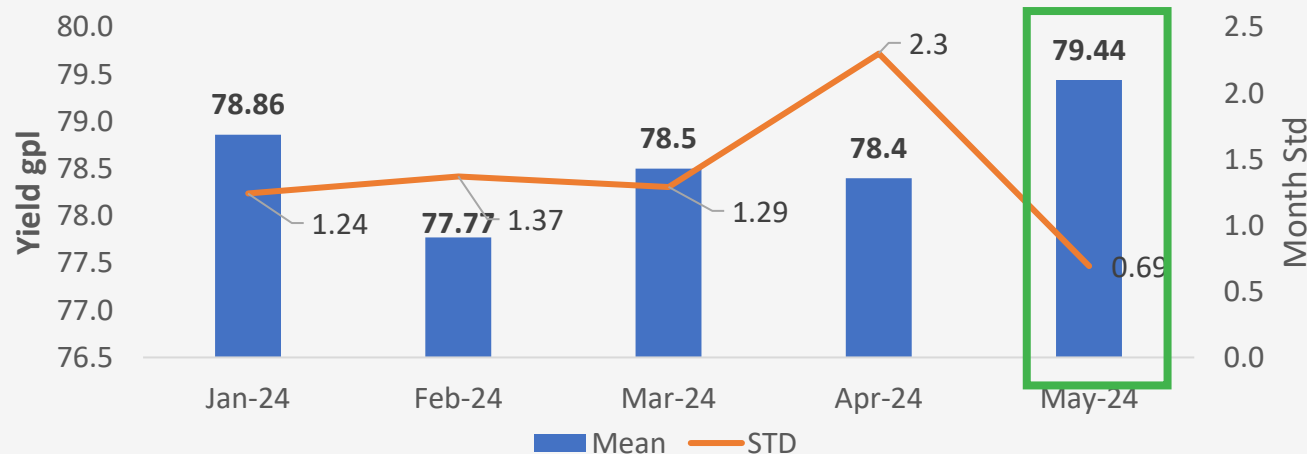
To develop an optimization model "to achieve 80 gpl liquor productivity and maintaining product quality within range".

	Current State	Desired State
Liquor Productivity	78 gpl	≥ 80 gpl

Data & Model

- Complexity** : High
- Data** : Data in AVEVA PI System (DCS, Lab & White Area MIS).
- Solution** : Optimization Model with process & quality parameters.

Project Outcome



Project Success Criteria

Impacting KPI's	UoM	Current	Desired
Yield Optimization	gpl	78.5	80
Na2O in SGA	%	≤ 0.28	≤ 0.28
-325 mesh in SGA	%	8-12	8-12

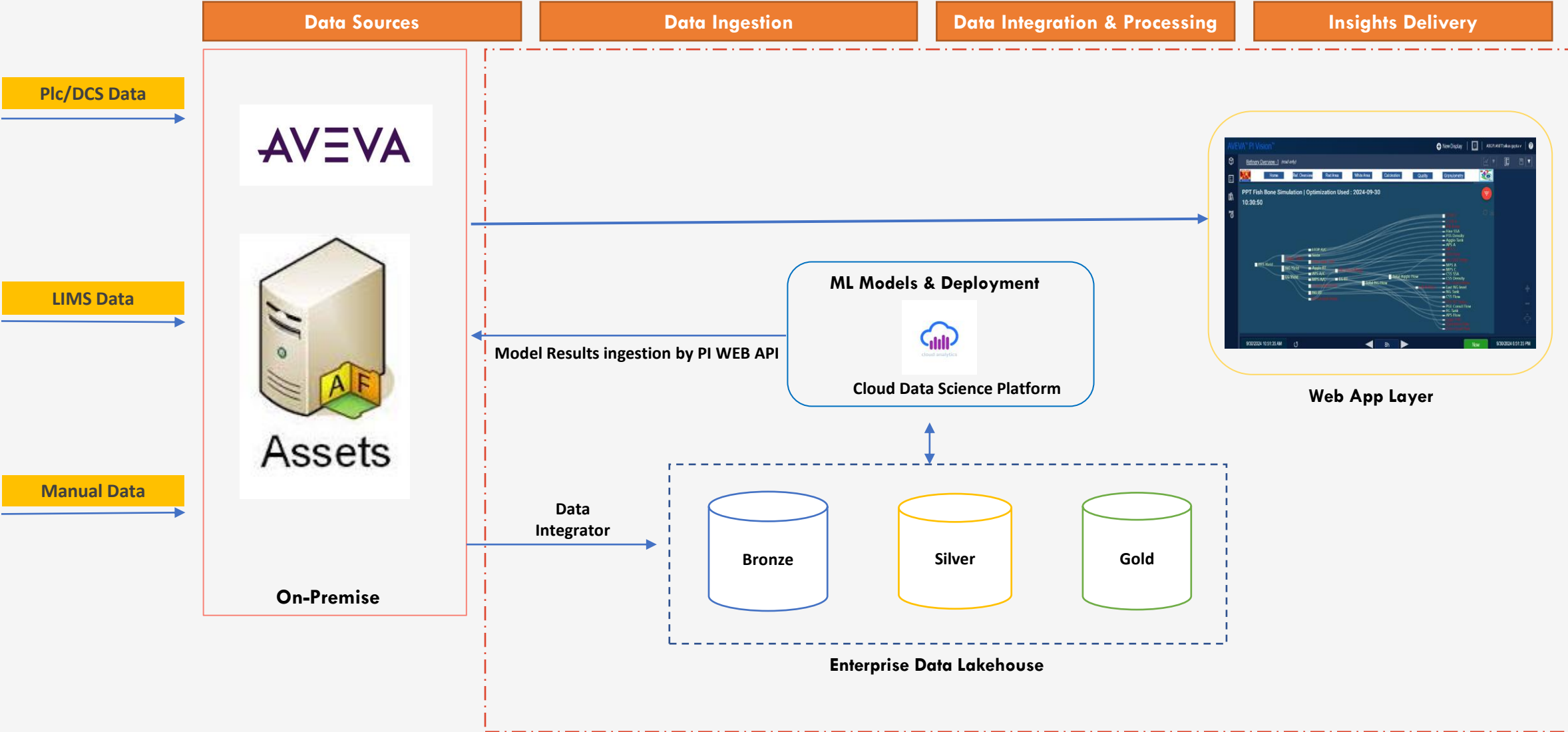
Tangible Impact

- Higher Liquor Productivity (for 1.5 gpl) : \$1.12 Mn/Yr
- Steam Cons. Reduction (26875 MTPA/Yr) : \$0.84 Mn /Yr
- Power Cons. Reduction (2314 MWH/Yr) : \$0.12 Mn/Yr

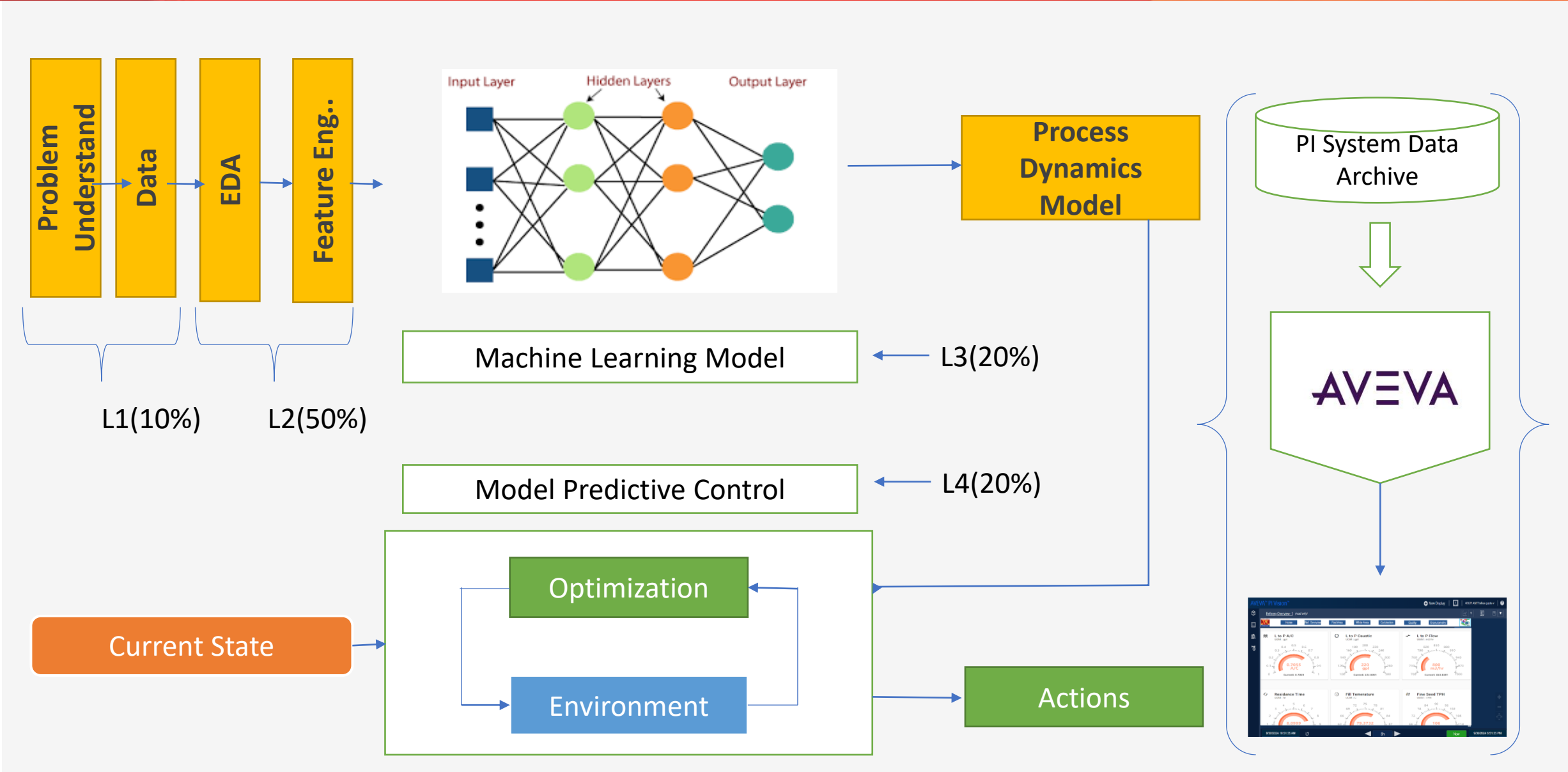
Potential Savings for Next 3 years

\$ 4.8 ~5 Million

System Architecture



Model-building approach



Boiler Tube Leakage- CPP Plant

Business Case & Impact

Business Need

Boiler heat exchange in power plants involves tubes to transfer heat from the fuel to the water. Boiler tube leakage can cause outages and huge power generation loss.

The objective of the project is to ***“Early detect of leaks in boiler tube and hence increase the Boiler Reliability (MTBF)”***

Current State

Desired State

Average Mean time between failures (MTBF) for boiler tube leakage

6 months

9 months

Data & Model

Complexity : High

Data : Data in AVEVA PI System (DCS, Lab & White Area MIS).

Solution : Need solution on Condition base Monitoring, Predictive Maintenance & Prescriptive Analytics with alarms & alert

Project Success Criteria

Impacting KPI's	UoM	Current	Desired
MTBF - EEA	Month	6	9
Maintenance Cost – Rs/annum/boiler	USD.	5000 /incident	Nil
Production Loss, approx. – Hydrate Refinery	USD	20000	Nil

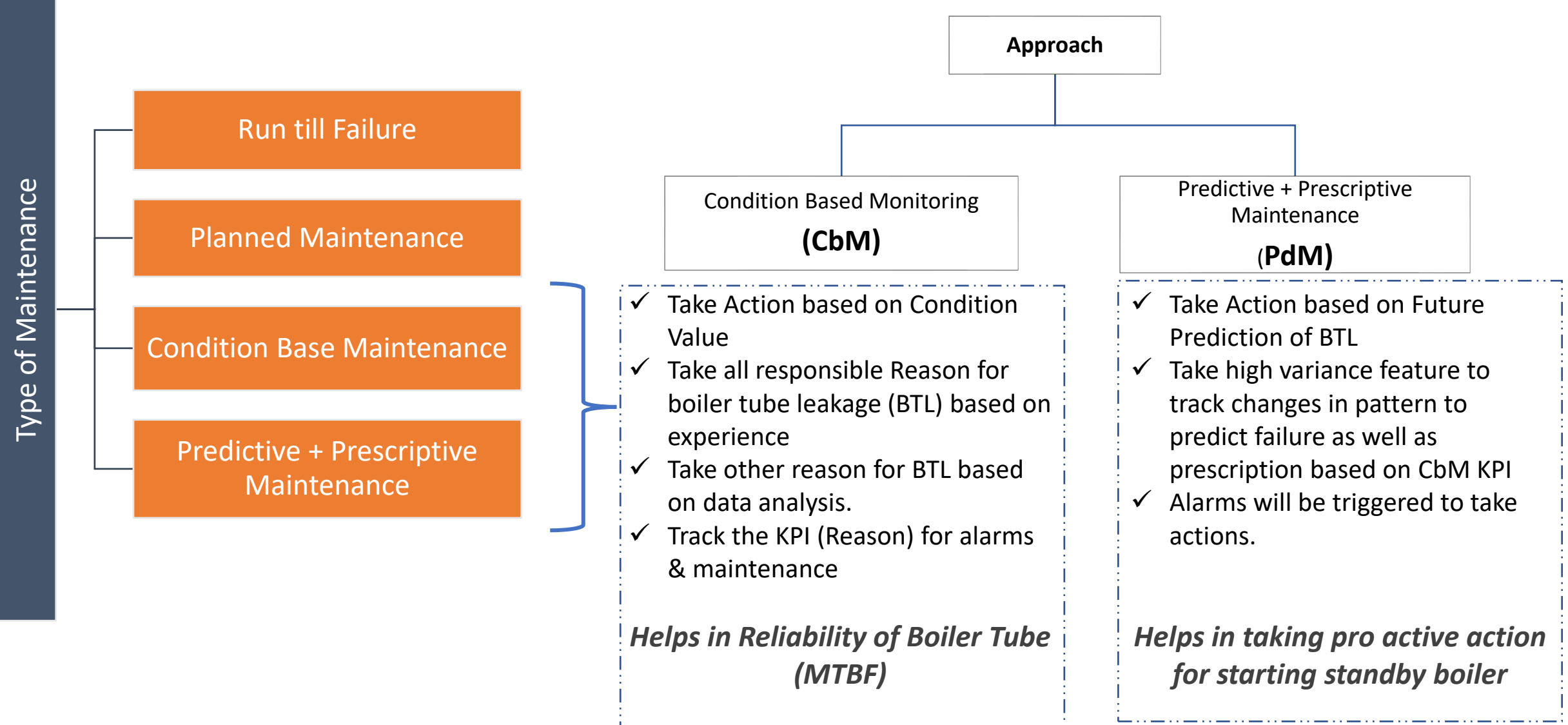
Intangible Impact

Centralised monitoring & control of boiler tubes with alarm alerts.

Ability to produce meaningful reports/history/MIS.

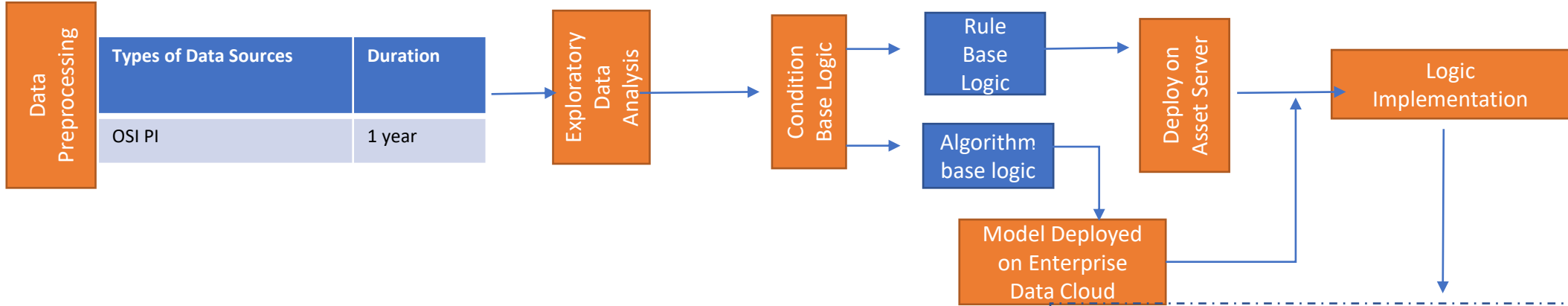
Better analysis

Problem Solving Approach

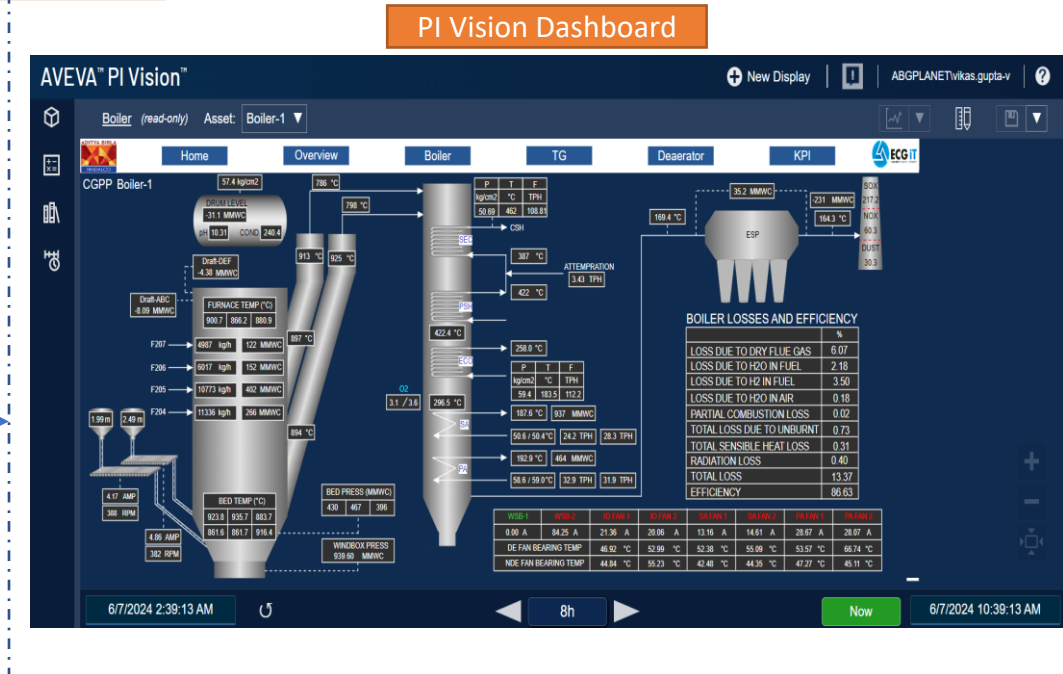
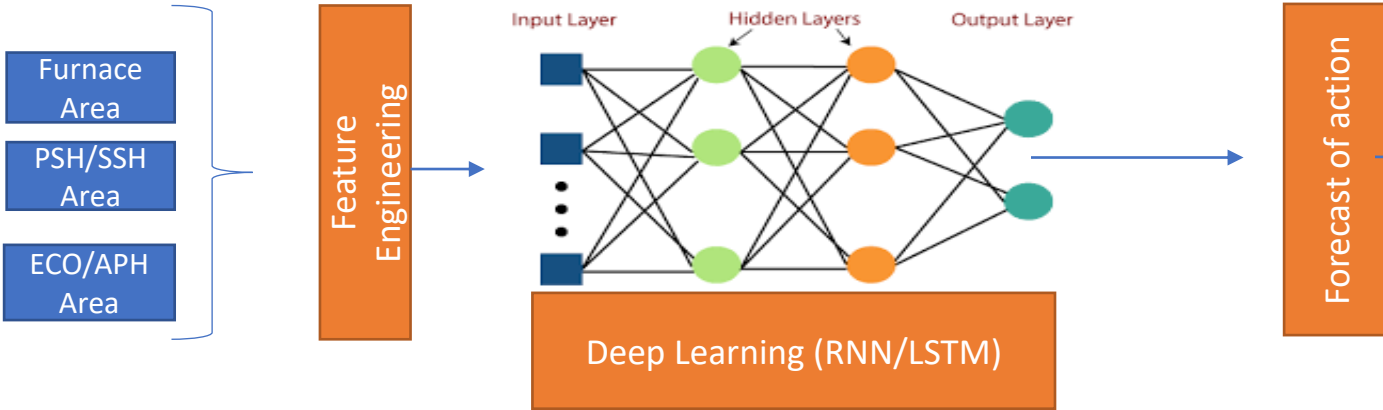


Problem Solving Approach

CbM Tool



PdM Tool



Benefits Achieved



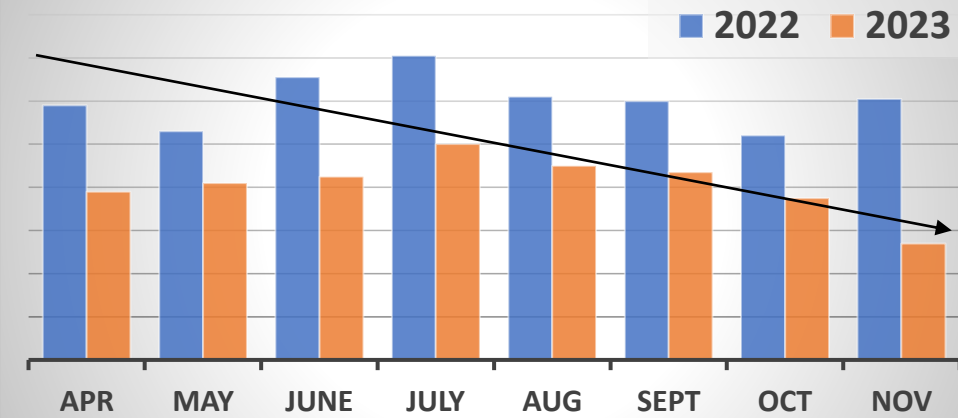
We are able to avoid tube leakage by monitoring the key factors and working on developing a predictive approach to identify potential failures.

2 tube leakages avoided so far
Maintenance duration to 4 hours from 7 hours

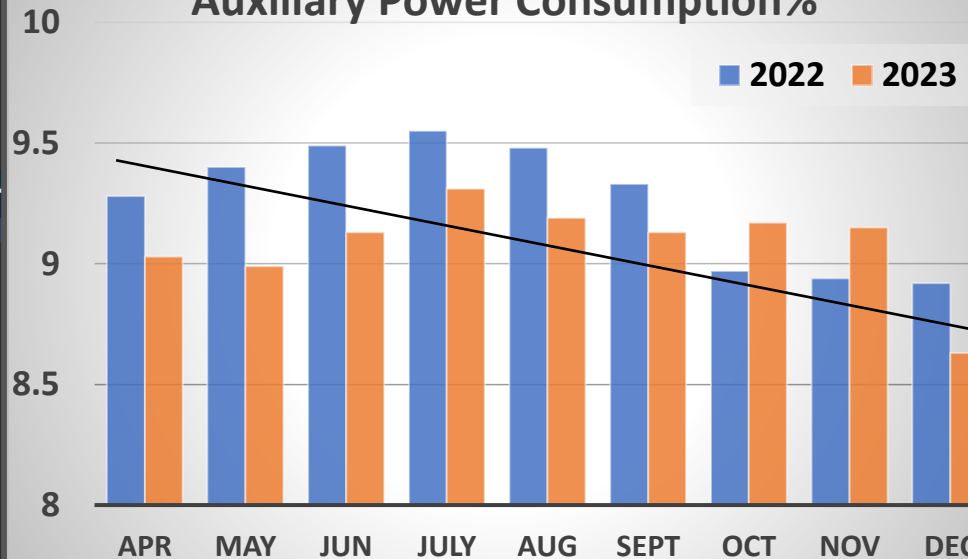
Further, Benefits Achieved

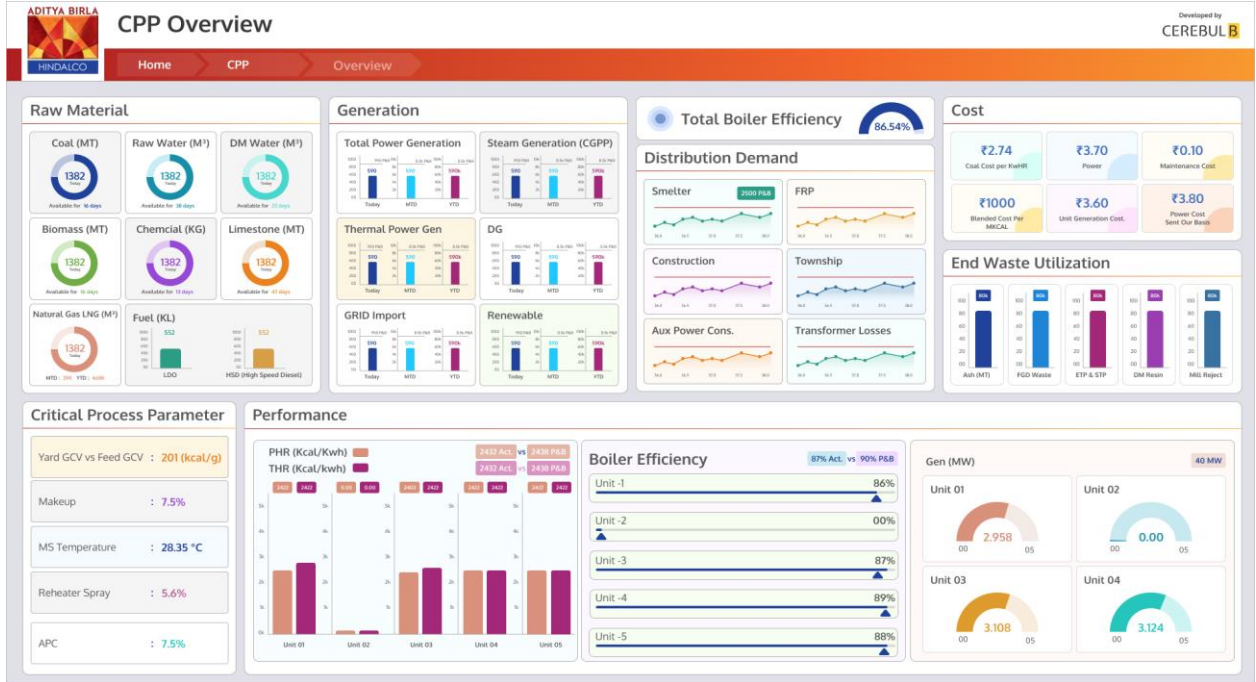
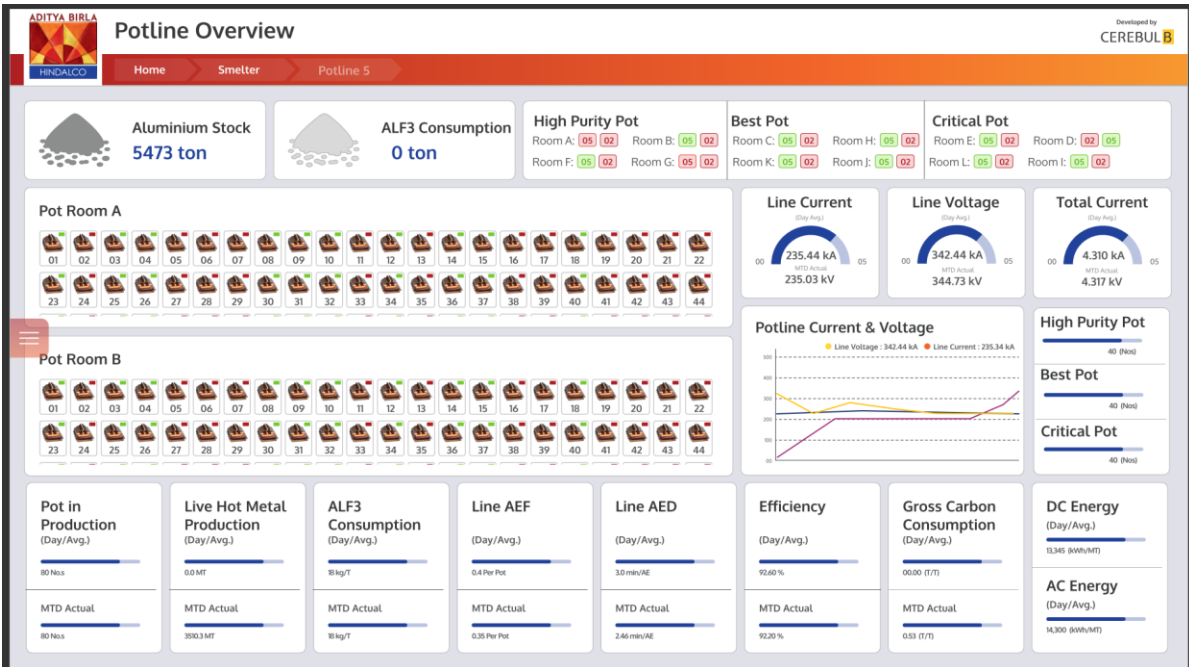


Turbine Heat Rate Kcal/Kwh



Auxiliary Power Consumption%



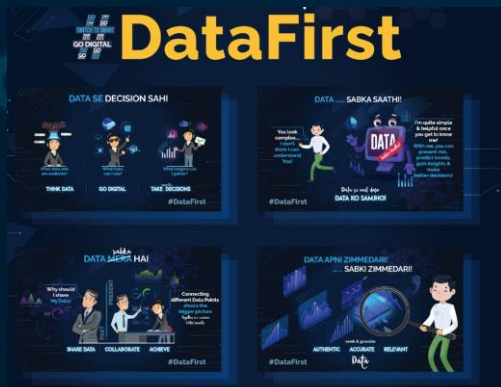


Culture Building



If it is to be, It is up to me

- How do employees “ Talk, Use and Breath Digital (Data) ” ?
- How do practices mature into “Data based decisions” across all levels
- Create “Digital First “mind set .Target all layers



#Whatthetech
#Leadbytes

Torch Bearers

Digital Ambassadors

Digital Evangelist

Initiatives

Data Coach

diGi TALK
SHARE | LEARN | ADOPT

data samay
Time for the weekly huddle!

Digital Maturity Index

DataWeek

Platforms

DIGITAL CONCLAVE' 23
LEAD HINDALCO TO BE GREENER, STRONGER & SMARTER

Smart Factory Workshop



Competitions

DATA-THON

ASSET-O-THON

Recognition



Path forward..

How do we create a sustainable value ?



- Culture Building is the key
- Focus on setting foundation right
- Prioritization & Value delivery, while continuing to experiment for newer technologies
- Anchor plant and then Scale up
- Internal capability building, not externally dependent.
- Co-development of models/initiatives
- Leverage Ecosystem

The journey continues....

Island of Experiments



Centre of Expertise



Federation of Expertise

Great Interaction with you!



Poorav Sheth

*President &
Chief Digital & Information Officer*



Salman Hussain

*General Manager,
Lead Digital Transformation*



Avinash Maity

*Asst. General Manager,
Lead Digital & Automation*



Thank you