

Aditya Aluminium



Energy Analytic Platform using Power BI with AI and energy saving using Copper Insert

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- Our Machines & Processes

Hall – Heroult Process
 $\text{Al}_2\text{O}_3 + 3 \text{C} = 4 \text{Al} + 3 \text{CO}_2$

360 KTPA Aluminium

CPP 900 MW
(150 MW X 6)



Challenges



Difficulties in managing and processing bulk energy data

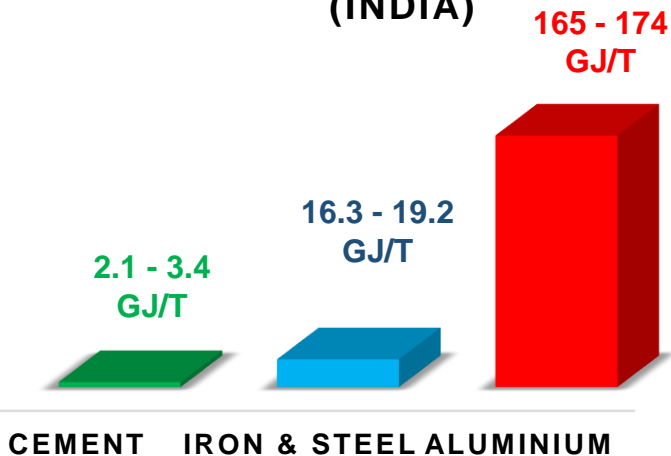
Inefficiencies due to lack of proper decision making

Lack of awareness led to energy wastage

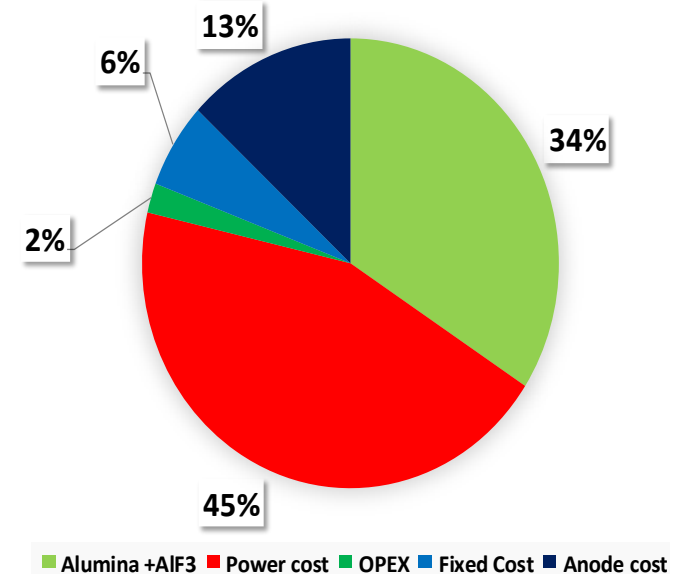
Higher Energy impacting the overall cost of Metal

Future readiness for capacity enhancement for increasing productivity (Current Ramp up)

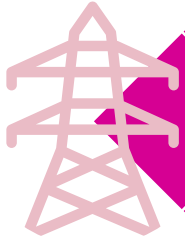
ENERGY INTENSIVE PROCESSES (INDIA)



Cost Components: Per MT of METAL



Approach



To leverage industry 4.0 using any analytics platform.



To monitor the energy consumption by facilitating intelligent actions and insights from the energy data.



To collaborate and create awareness among different users and enabling them in faster decision-making to save energy

WHY Microsoft Power BI?



Cost Effective Business Tool

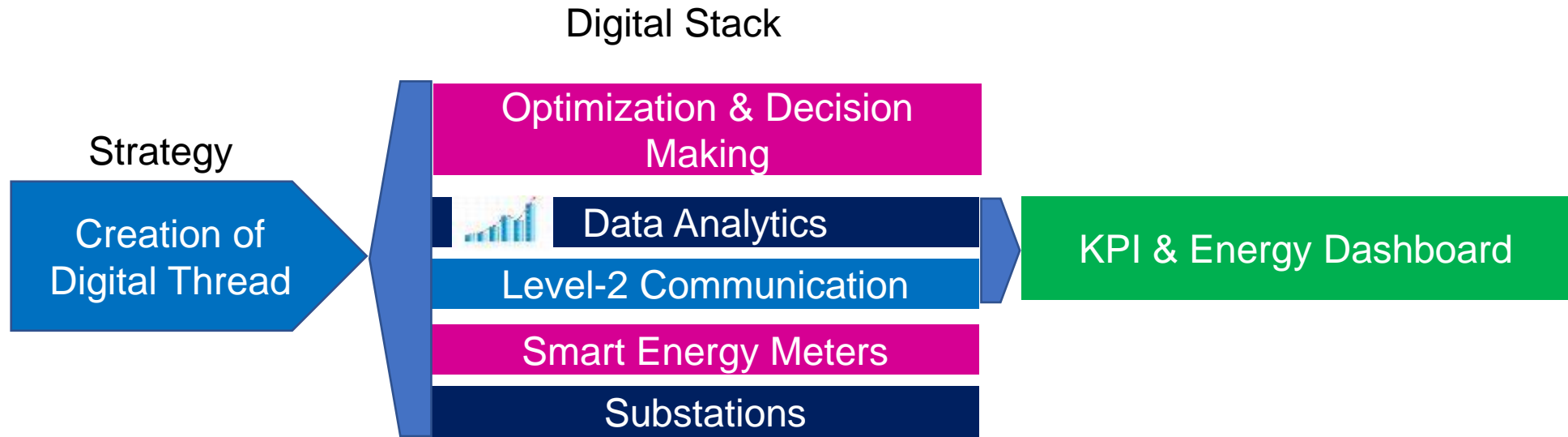
Integration with any kind of data source

Mobility features / On spot accessibility

Data security (ABG IT policy approved)

Solution - Energy Analytics Platform

Enhancing Smelter Energy Management - The Digital Way



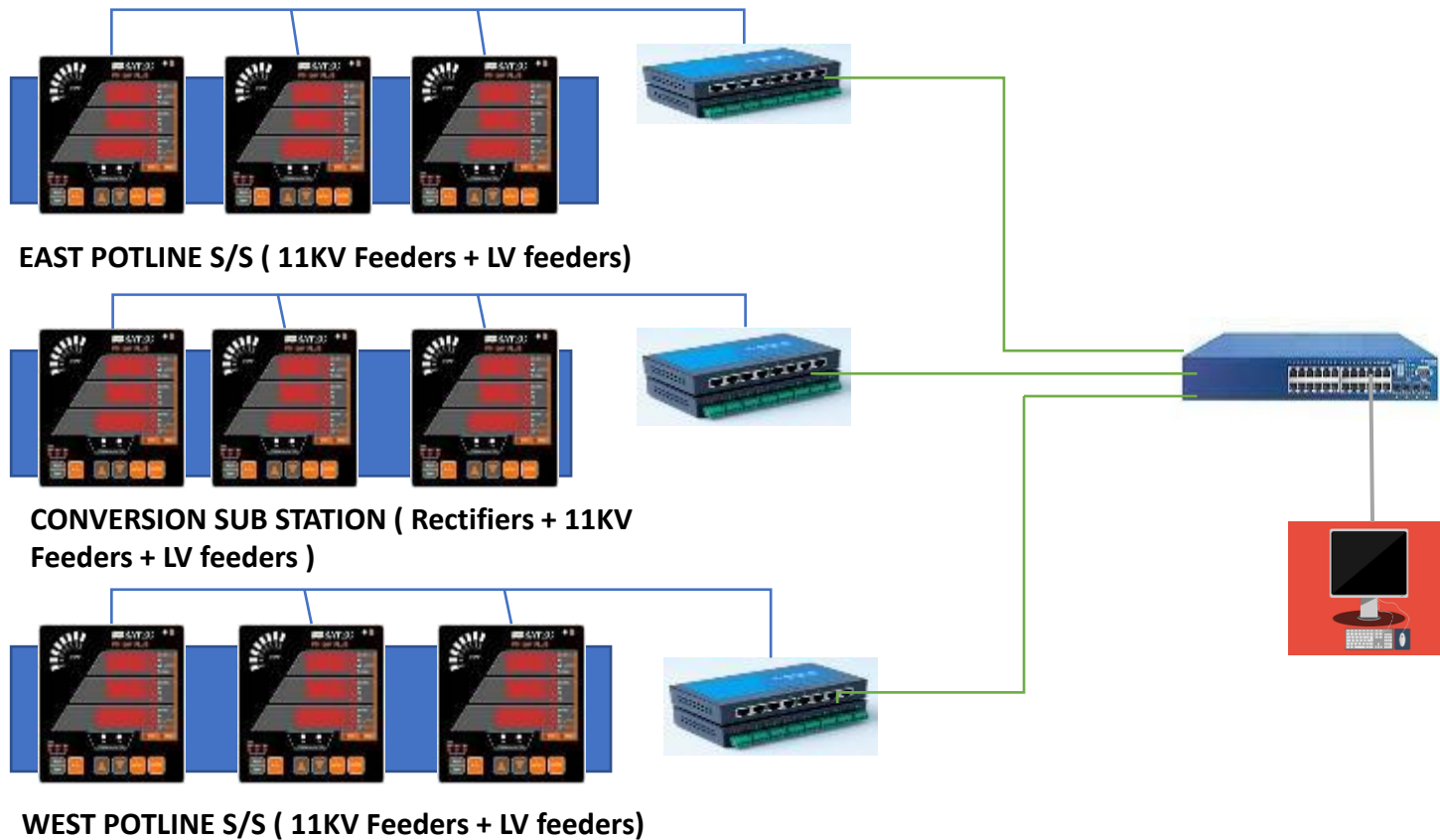
ENERGY DATA
ACQUISITION

DATA
MODELLING

DAX AND
VISUALIZATION

REAL TIME DATA ANALYSIS,
OPTIMIZATION & DECISION
MAKING

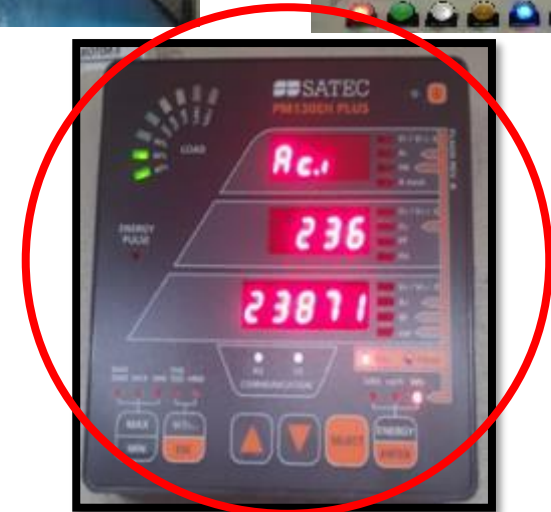
Data Acquisition



Conventional Energy Reading

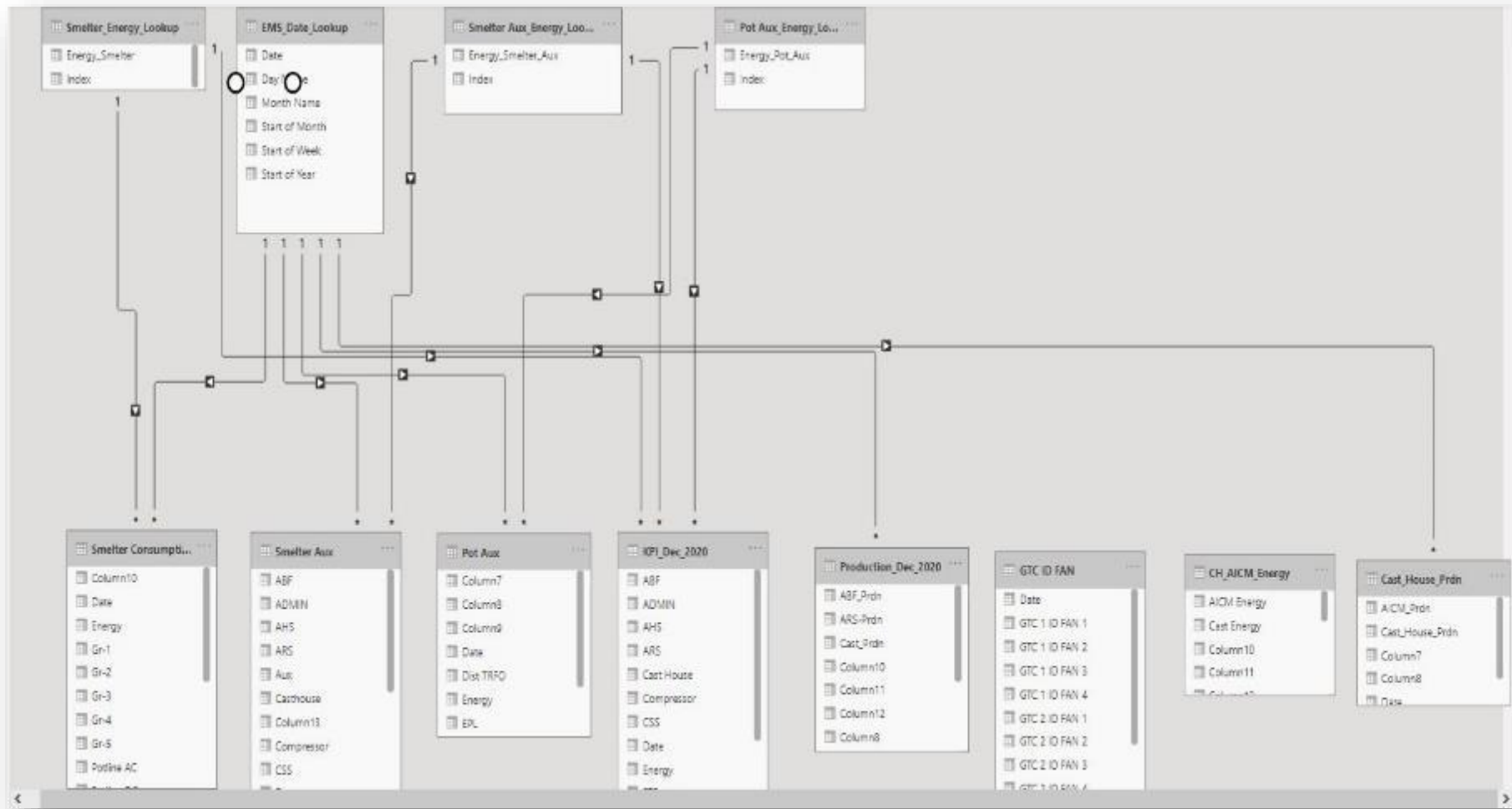


Smart Energy Meters



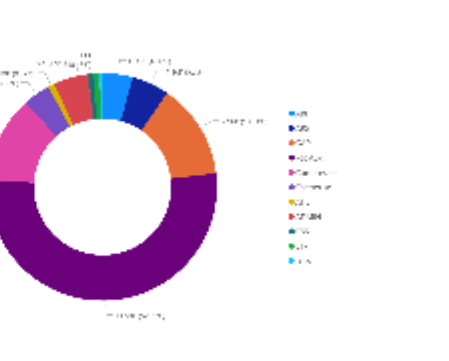
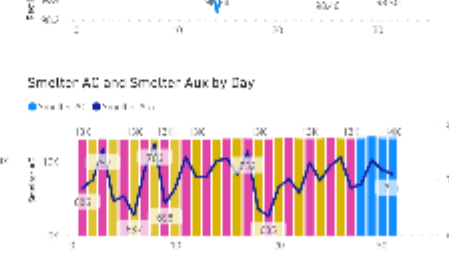
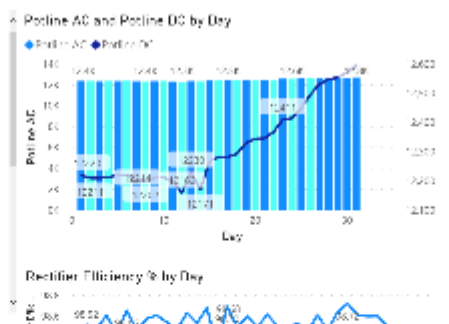
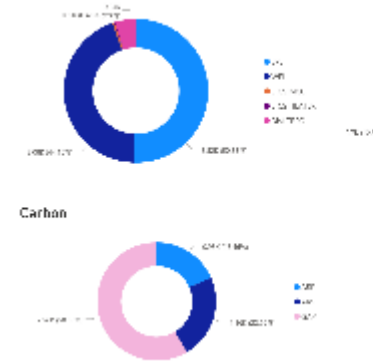
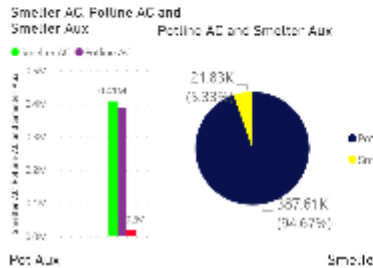
Smart Energy Meters

Data Modelling



Data Visualization

Day	Smelter AC	Smelter Aux	Polline AC	Rectifier Efficiency %
1	13,000.00	12,803.57	12,700.17	44.02
2	12,100.00	12,599.42	12,210.52	18.48
3	13,100.00	12,331.74	12,218.22	36.61
4	13,070.00	12,807.93	12,317.97	44.23
5	12,280.00	12,568.94	12,222.42	18.86
6	11,770.00	12,473.72	12,221.22	35.46
7	12,100.00	12,382.92	12,206.11	35.38
8	12,100.00	12,573.22	12,207.52	35.81
9	11,770.00	12,387.22	12,211.17	37.54
10	12,050.00	12,494.14	12,213.92	35.41
11	12,110.00	12,595.22	12,194.22	35.62
12	11,770.00	12,357.11	12,161.17	40.13
13	12,100.00	12,578.22	12,280.42	18.68
14	11,100.00	12,485.42	12,171.22	35.28
15	11,170.00	12,430.14	12,168.17	44.70
16	12,180.00	12,470.14	12,262.42	18.49
Total	4,26,410.00	3,07,602.03	3,01,991.02	50.55



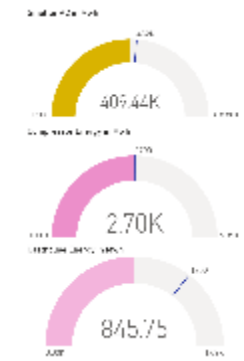
Smelter AC Mwh
409.44K
 Goal: 431.94K (-5.17%)

Smelter Aux Mwh
21,833.12
 Goal: 22,971 (2.1%)

Rectifier Efficiency %
98.55

Polline AC Mwh
387.61K
 Goal: 406.26K (-5.25%)

Date: 01-01-2020 to 31-06-2022

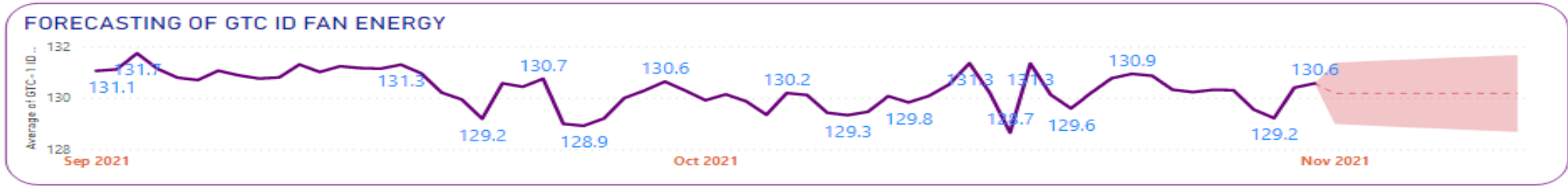


Mobile View

Data Visualization

Home Insert Modeling View Help

Get data Refresh New visual New measure



AI prediction

Key influencers Top segments

What influences GTC-1 ID Fan Energy to Decrease ?

When...

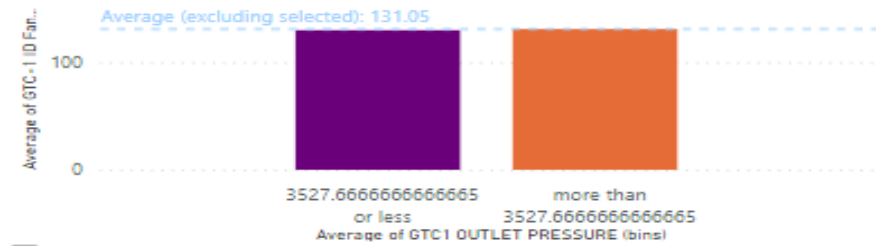
Average of GTC1 OUTLET PRESSURE is 3527.6666666666665 or less

...the average of GTC-1 ID Fan Energy decreases by

1.05

Sort by: Impact Count

← GTC-1 ID Fan Energy is more likely to decrease when Average of GTC1 OUTLET PRESSURE is 3527.6666666666665 or less than otherwise (on average).



Only show values that are influencers

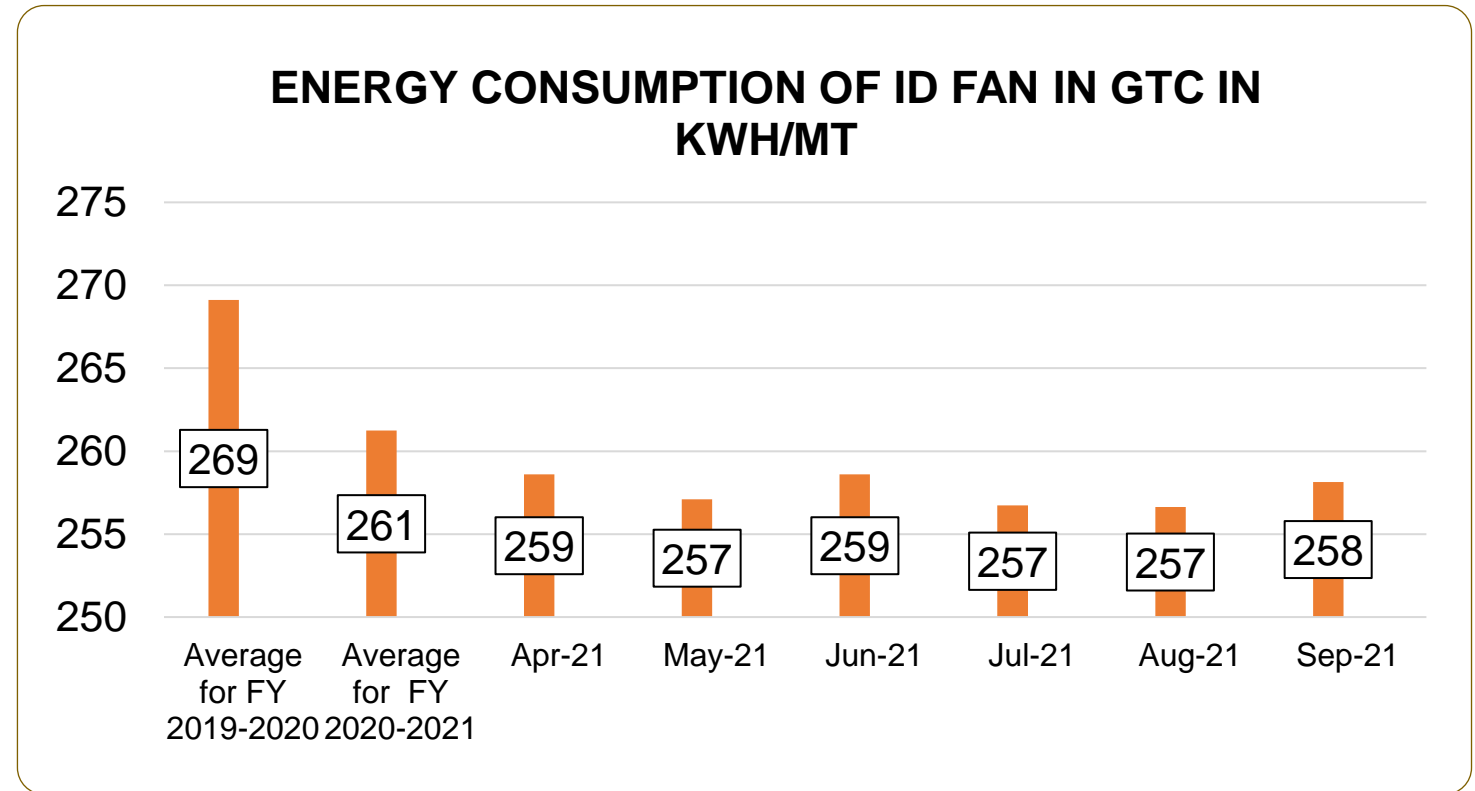
Result – Energy saving

Opportunity to save energy - Gas

Treatment Center ID Fans

- BI helped in predicting the excess energy usage among the running ID fans with different combinations (3 W + 1 S)
- Insights helped in saving Auxiliary energy consumption in GTC – 10 kWh/t*

Reduction in smelter auxiliary energy to the tune of 10 kWh/t* in the Gas treatment centre ID Fans. Apart from this, there is a reduction of energy consumption in compressed air system.

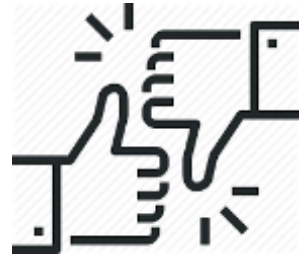


* excl. Apr-Jul'21 due to Covid, Aug'20 – Jul'21

Copper Insert Pots

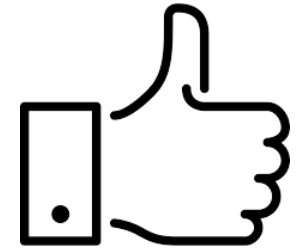
Proposed by Tech. supplier

- ❖ Energy reduction ✓
- ❖ Huge investment ✗
- ❖ Poor performance during power outage ✗



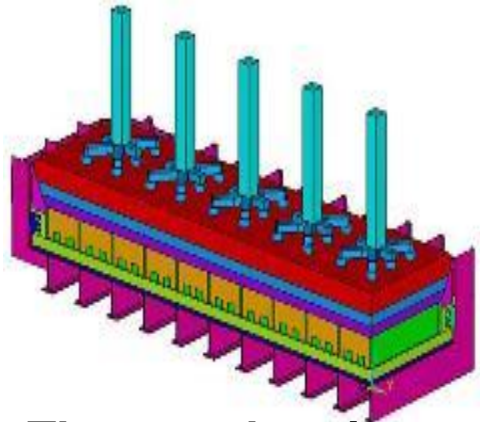
Own tech with ABSTC

- ❖ Energy reduction ✓
- ❖ Optimum investment ✓
- ❖ Robustness towards power outages ✓
- ❖ Extended cell life ✓
- ❖ Increased current efficiency ✓

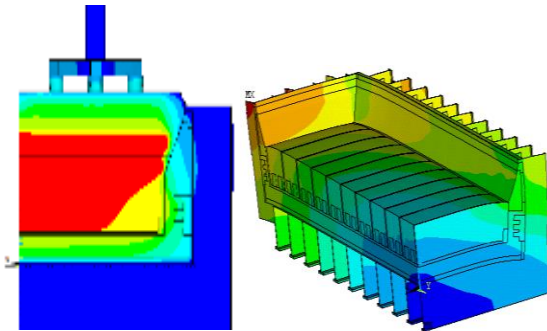


Hindalco -ABSTC Developmental Work

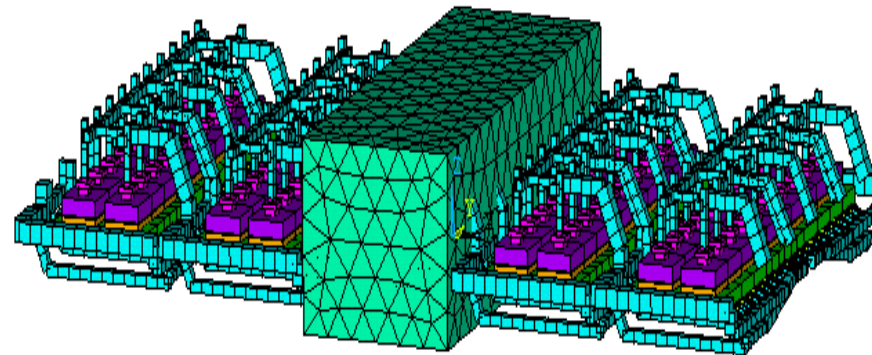
3D models using APDL & Phoenix-Ester, validated through plant measurements



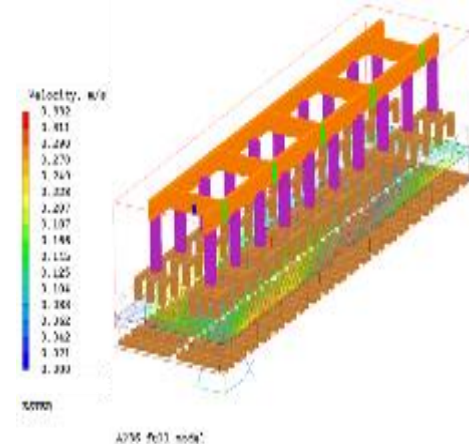
Thermo-electric



Thermo-mechanical

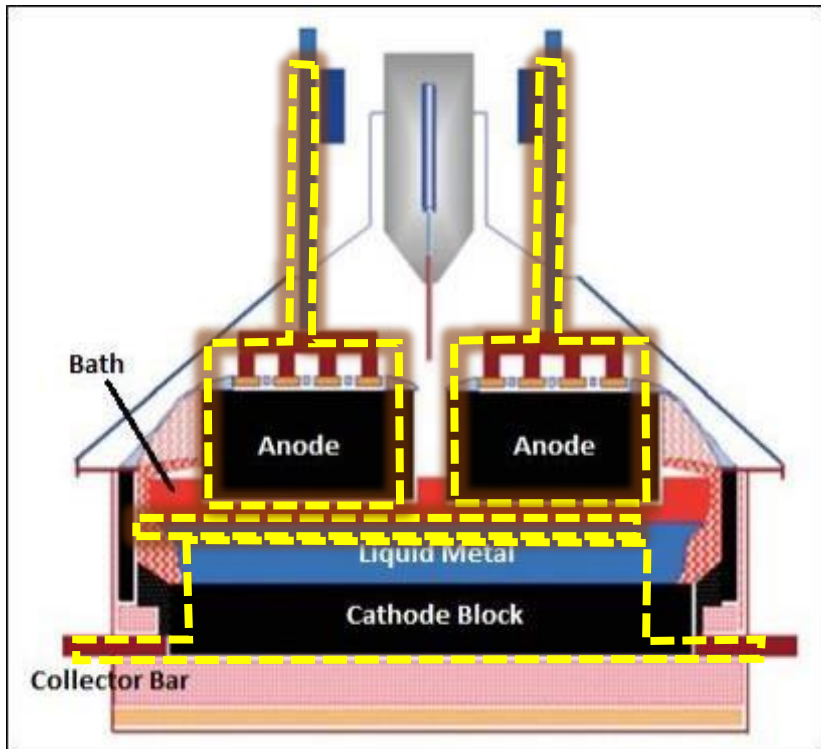


Electromagnetic



Magnetohydrodynamics

Copper Insert Pots

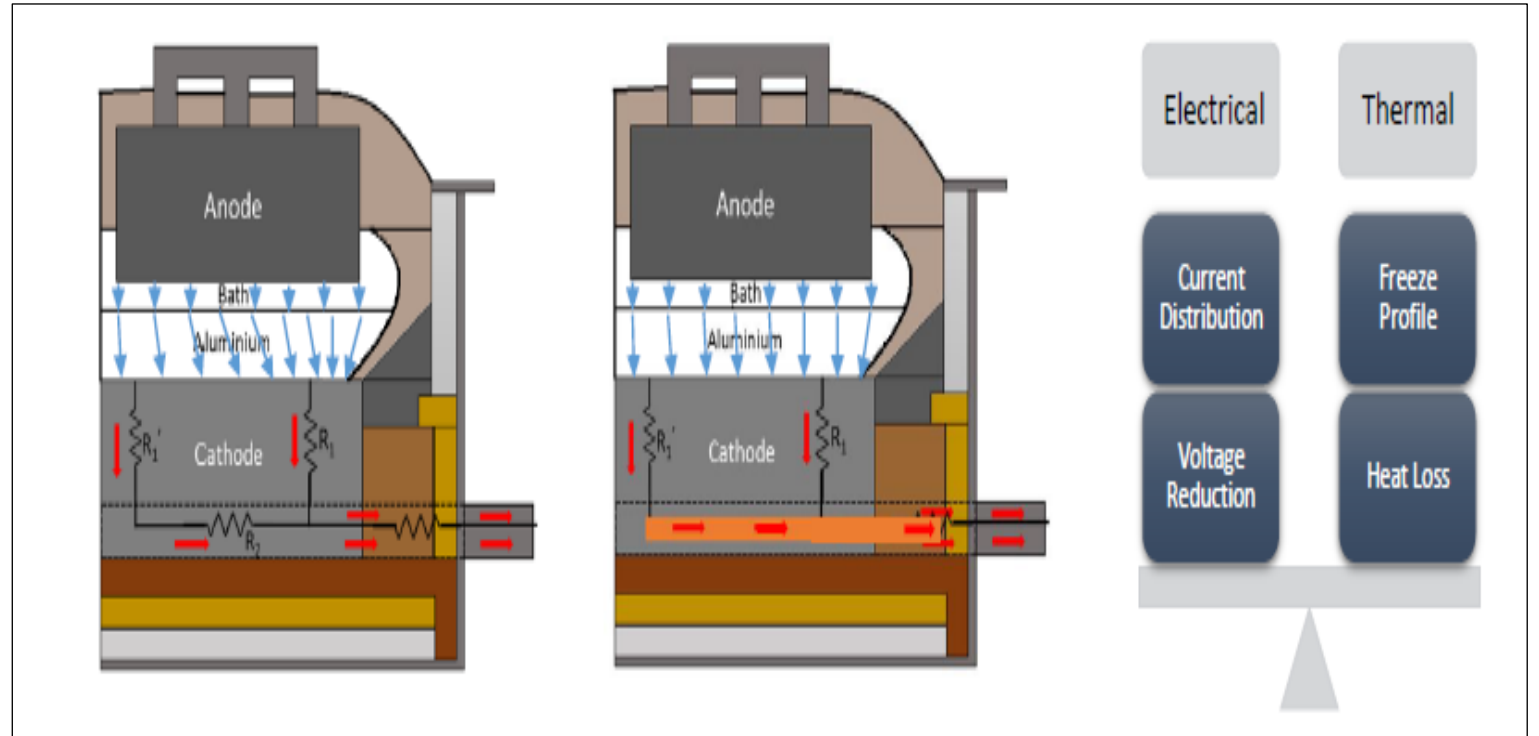


Anode Voltage – 0.365 V

Electrolyte Voltage – 1.470+1.850 V

Cathode Voltage – 0.295 V

Fixed drops – 0.270 V

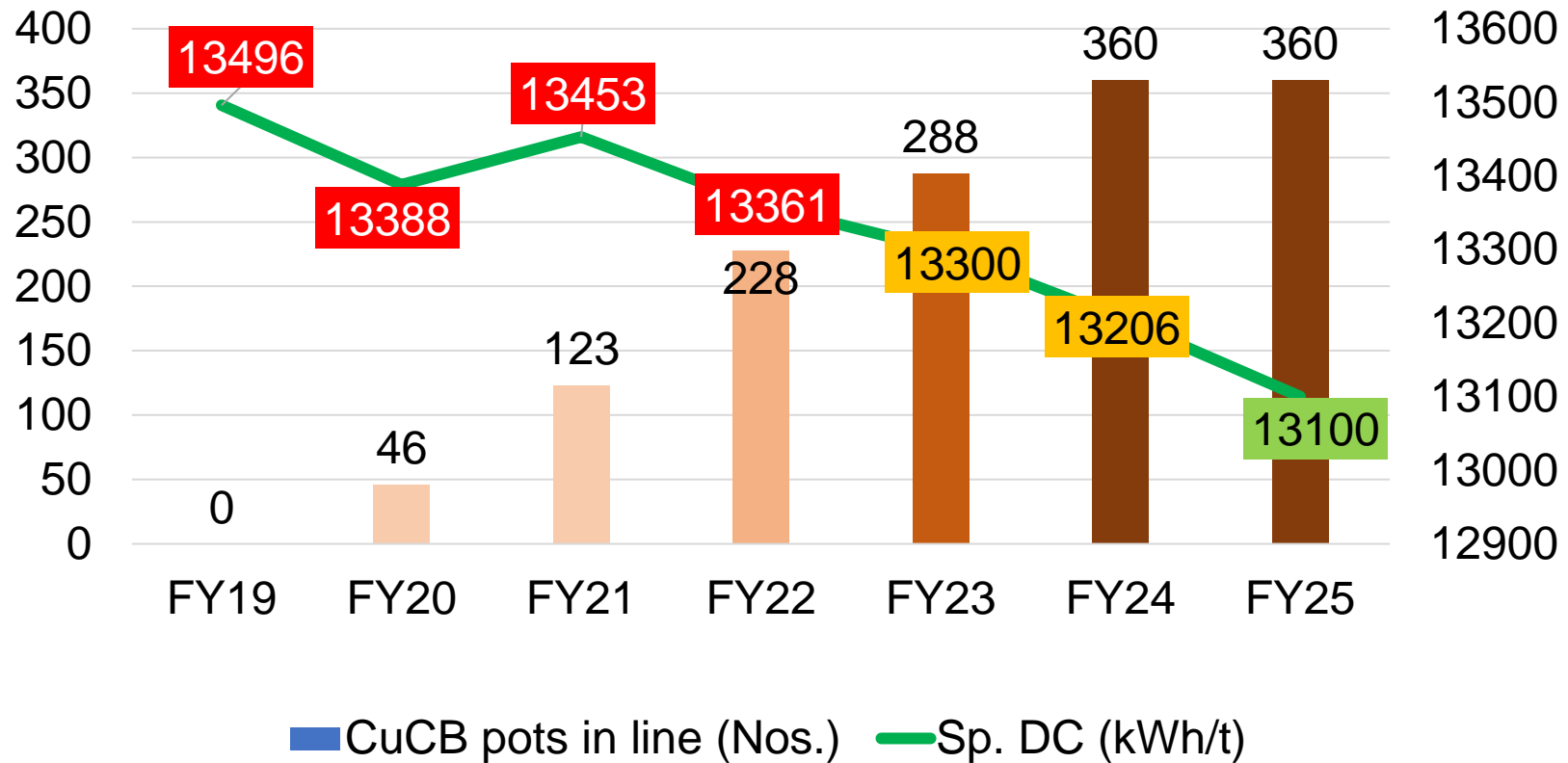


Copper Insert Pots



Energy Saving
- >150 kWh/t in
CuCB Pots
and >0.5%
higher
efficiency*

Sp. DC Energy reduction with CuCB Pots



* Results are encouraging in FY22 resulting in ~250+ kWh/t saving and efficiency gain of ~0.80%

Final Result / Outcome

Parameter	Result
Finance (report both in Cr INR and Mn USD)	
CAPEX employed*	INR 18.99 Cr
Overall Rupee/Dollar Value Saved*	INR 2.14 Cr with increasing benefit annually (IRR 26%)
Timeline	July'19 to Mar'21
Operational Efficiency	
Reduction in energy consumption (in kWh)	15.12 Million
Environment	
Reduction in CO2 emission (t CO2)	13910 t CO2 (equivalent)
Waste Reduction (Ash Generation Equivalent)	3600 t Ash reduction (equivalent)
Learning / Growth	
Scalability across units (Y/N)	Yes
Presented at any other forums internally / externally? If yes, please specify	External - Presented at TMS-2019 (CuCB Pots), CII, IIM Internal – Peer units / ABG Stride
Have you filed a patent / initiated any IPR related proceedings in any geography? (Please provide details)	Applied (MUM/2700/2014) for CuCB pots design Granted – 2020/04199 (South Africa)

Key Learnings



Learnt the basics of innovating a process of computing large amounts of data.

Data Analysis Expressions (DAX)

Modelling and Simulation of Data

Data Visualization for Decision Making



Deepen data insights that can help discover ways to reduce carbon emissions.



Transforming reactive decisions to formulate predictive and preventive strategies to enhance critical equipment and resource management.



Empowering employees to easily gather and share actionable insights at the point of impact using interactive data visualizations, live reports, and dashboards on the go and across functions.



We manufacture the materials that make the world

Greener
Stronger
Smarter

THANK YOU