CII 24th National Award for Excellence in Energy Management

13-15 September 2023

RCCPL Pvt. Ltd.

Kundanganj Unit

(An Entity of MP Birla Group)

HEART & STRENGTH

Presented by

Mr. Jayant Kandpal – Additional Vice President (Unit Head)

Mr. Amit Dixit – General Manager (Process Head)

Mr. Bir Singh – Manager (Process Engineer)

1. Brief introduction on Company/Unit

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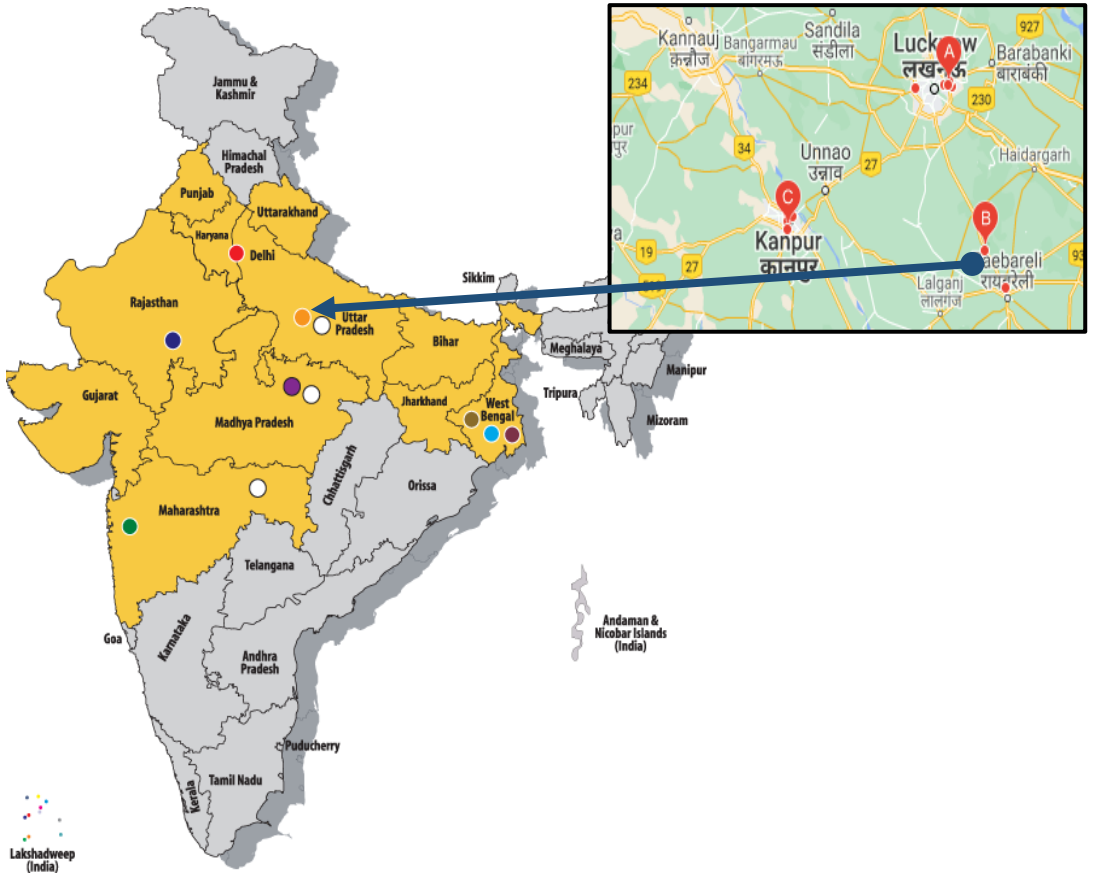
Birla Corporation Limited (BCL) is the flagship company of MP Birla Group. BCL has acquired 100% shares of Reliance Cement Company Private Limited (Reliance Cement), a subsidiary of Reliance Infrastructure Limited (RIL). After this acquisition, Reliance Cement has become a wholly-owned material subsidiary of BCL.

We are the proud owner of 11 plants spread across the nation with total production capacity of the company has reached **20 million tones per annum**.

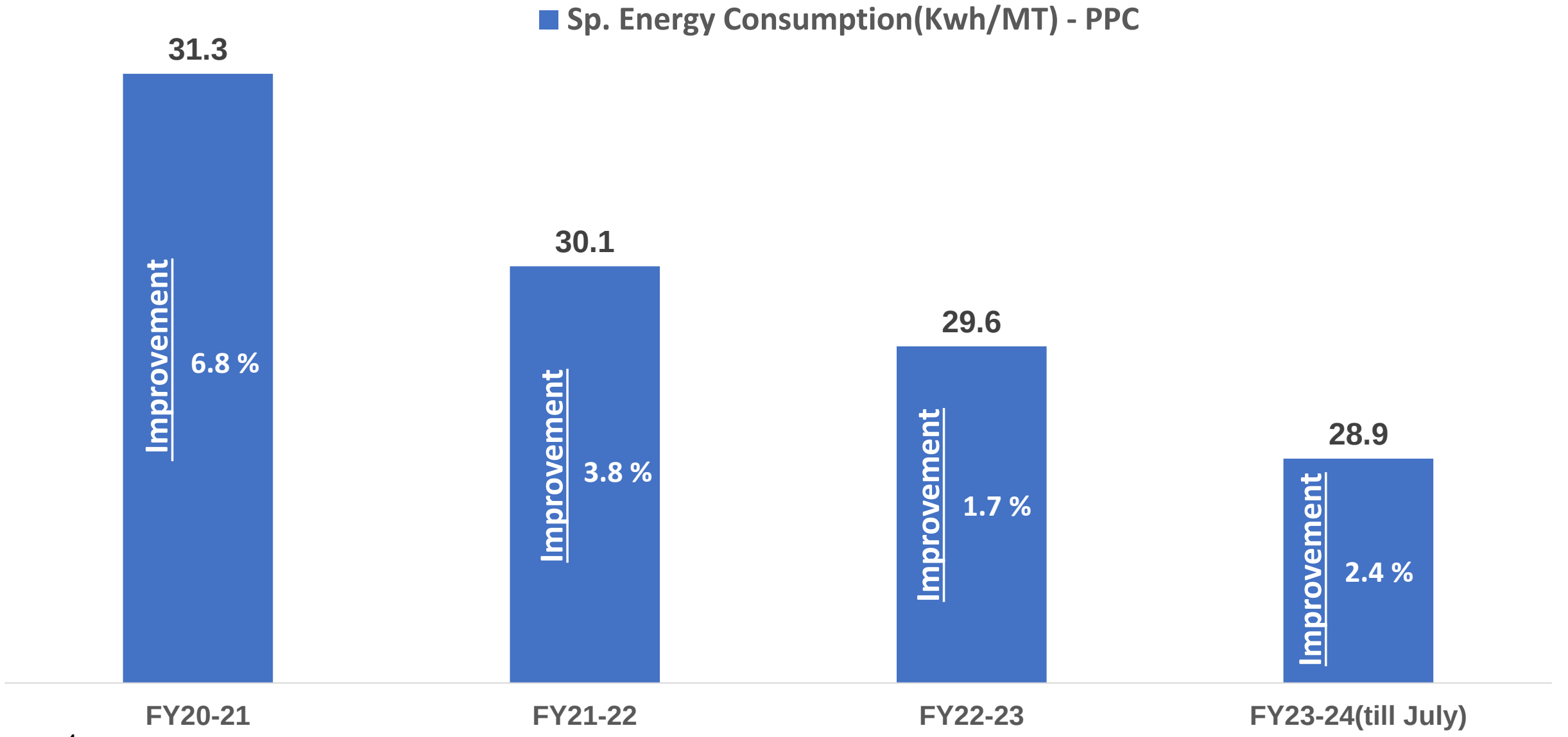
Kundanganj Unit is standalone grinding unit has a production capacity of 2.4 MTPA.
Two identical VRM's having 160 TPH capacity each and possesses certifications such as ISO 9001:2015, ISO 14001:2015 & OHSAS 18001:2007.

Product Mix %

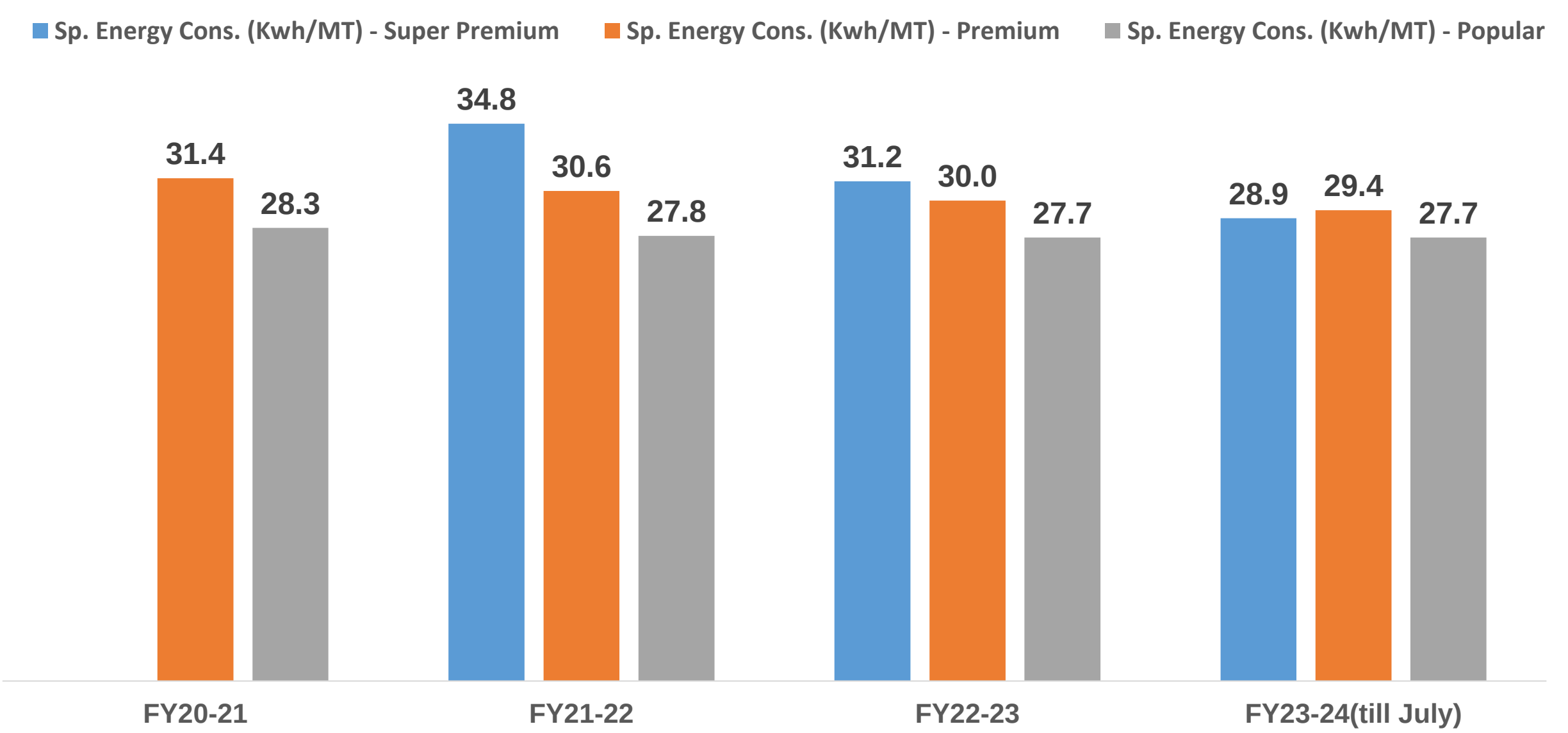
Super Premium – 5%	Premium – 65%	Popular – 30%



2. Specific Energy Consumption in last 3 years – PPC



Specific Energy Consumption in last 3 years – Product Wise



3. Target & National Benchmark

Comparison on the basis of final product Blaine/Residue at 45micron – 350m2/kg / 16%

Sl. No	Sp. Power Consumption (Kwh/MT)					
	Section	FY22-23	Target 2024	Target 2025	National Benchmarking	Road Map
1.	Mill Main Drive	15.6	15.2	14.9	**13.4**	**Target 2024 :** Increased mill output of 2.5% by implementation of Mill intellectual optimizer(AI). Target saving 0.4 Kwh/MT. **Target 2025 :** Replacement of GB mineral oil by synthetic oil. Target Saving 0.3 Kwh/MT.
2.	Mill Fan	6.7	6.2	6.2	**6.2**	**Target 2024 : i.** Modification of Process fan inlet box to reduce the pressure drop by 30-35 mmwc. Target saving 0.3 Kwh/MT ii. Installation of vortex plate at classifier, to reduce pressure drop across classifier. Target saving 0.2 Kwh/MT.
3.	Mill Classifier	0.3	0.2	0.2	**0.4**	**Target 2024 :** Installation of vortex plate at classifier, to reduce classifier load. Target saving 0.1 Kwh/MT.

3. Target & National Benchmark

Comparison on the basis of final product Blaine/Residue at 45 micron – 350m2/kg / 16%

Sl. No	Sp. Power Consumption (Kwh/MT)					
	Section	FY22-23	Target 2024	Target 2025	National Benchmarking	Road Map
4.	Mill Auxiliary	2.0	2.0	2.0	**2.3**	
5.	Plant + Fly ash Compressor	1.3	1.2	1.0	**0.8**	**Target 2024 :** Installation of Intelligent Flow Controller (Demand side controller) in main plant compressor line. Target saving 0.05 Kwh/MT. **Target 2025 :** Replacement of high pressure fly ash compressor by low pressure. Target Saving 0.2 Kwh/MT.
6.	Packing Plant	1.3	1.1	1.1	**0.7**	**Target 2024 :** Increased the packer throughput by avoiding idle running hours of belt & prioritize rake dispatch in place of road dispatch. Target saving 0.2 Kwh/MT.
7.	Utilities	0.9	0.9	0.9	**0.7**	
8.	Aux. Bag Filter	1.5	1.3	1.2	**1.2**	Optimization of fan flow & installation of VFD Target saving 0.3 Kwh/MT.

List of Major EnCon projects planned in FY2023-24

Sl. No	Project Title	Investment (INR Million)	Impact on SEC (Electrical Kwh/MT)
1.	Modification of inlet box of process fan to reduce the pressure drop to optimum level.	1.5	0.3
2.	Installation of vortex plate at classifier to reduce pressure drop across classifier & load of classifier.	0.2	0.3
3.	Modification of Mill Louvre ring to reduce pressure drop across mill body.	0.2	0.2
4.	Installation of VFD in nuisance bag filter fans.	2.0	0.2

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4. ENERGY SAVING PROJECTS

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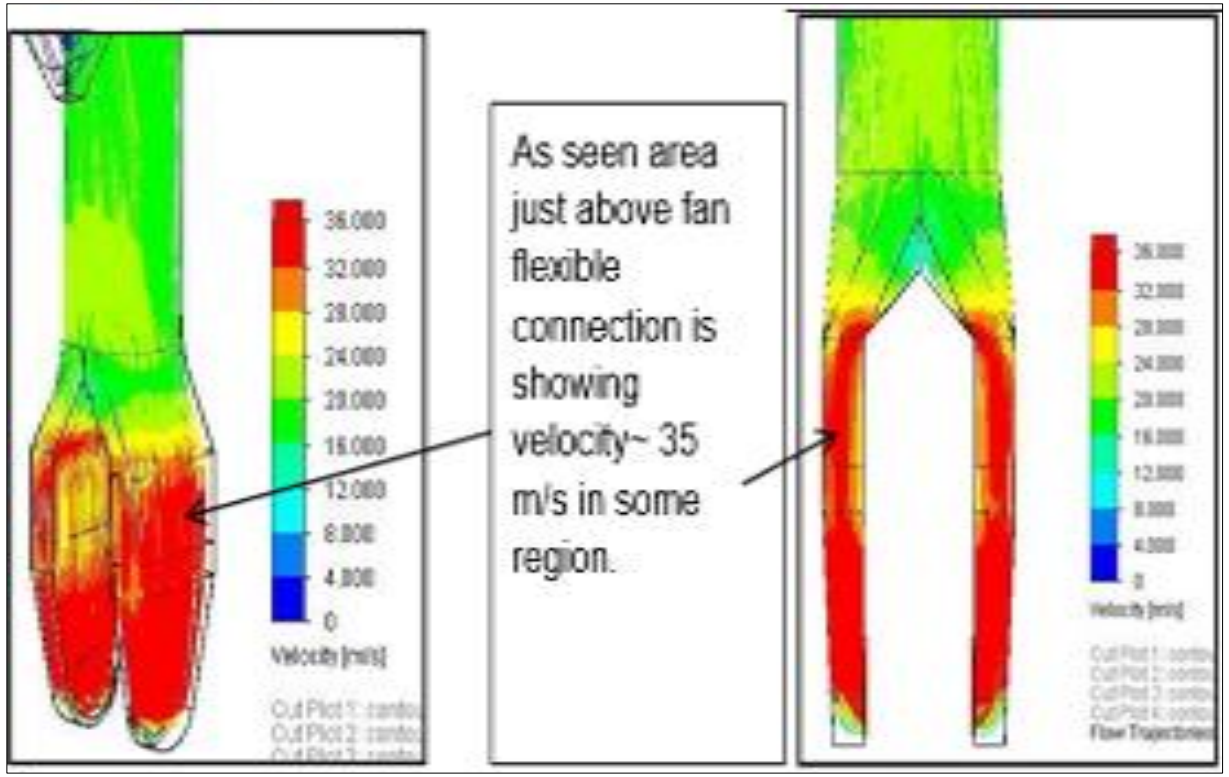
4. Energy Saving projects implemented in last three years

Year	No. of Energy saving projects	Investment (INR Million)	Electrical saving (Million Kwh)	Thermal saving (Million Kcal)	Total Savings (INR Million)	Impact on SEC /MT of Cement
FY 2020-21	11	11.1	5.1	-	36.5	2.3
FY 2021-22	8	4.5	3.0	-	18.4	1.2
FY 2022-23	6	11.2	1.3	-	7.2	0.5

Major projects implemented in FY2020-21

Year	Project Title	Investment (INR Million)	Electrical saving (Million Kwh)	Total Savings (INR Million)	Impact on SEC (Electrical Kwh/MT of Cement)
FY 2020-21	Modification of inlet Y-piece duct of process fan to reduce the pressure drop to optimum level.	1.5	1.11	8.0	0.53
	Modification of fly ash feeding arrangement in both mills from 2 points feeding at 180 degree to 4 point feeding at 90 degree.	1.0	1.05	7.5	0.50
	Optimization Of Compressor Air System - Isolation of compressed air circuit section wise through solenoid valves.	0.3	0.38	2.7	0.18

Modification of Inlet Y-Piece : CFD Study



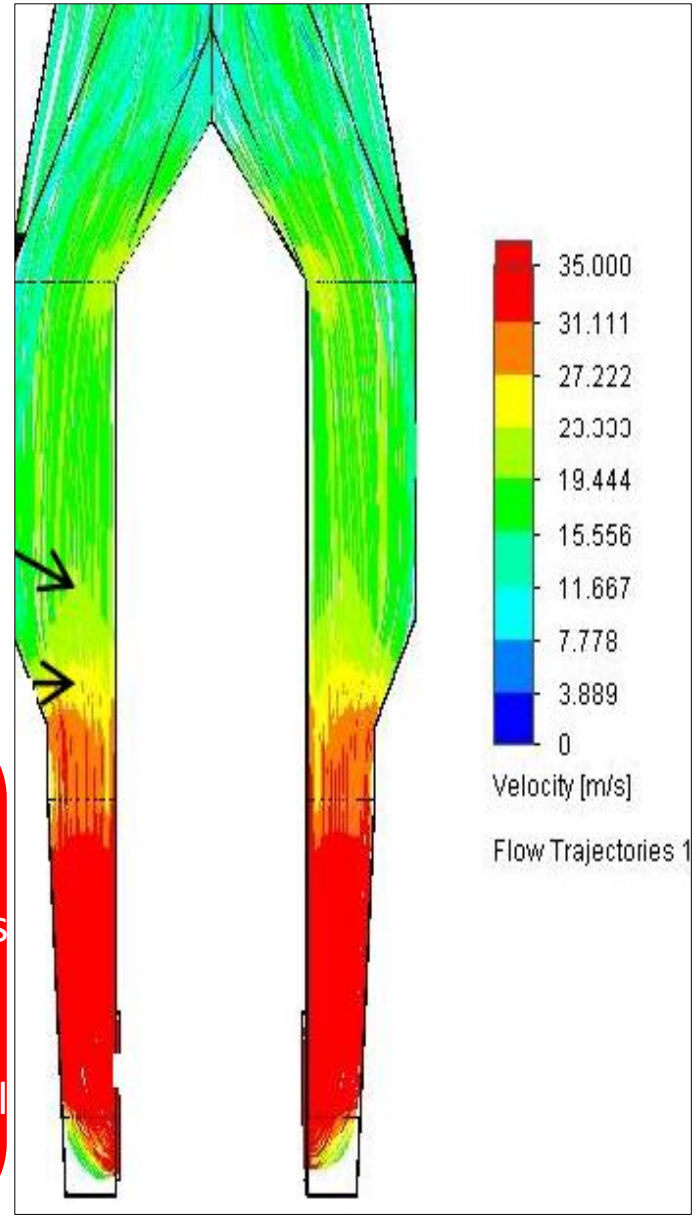
Non-Uniform Gas Flow Distribution at Bag House Fan I/L Duct

- **Flow Resistance & Turbulence in a duct causes Pressure drop.**
- **It leads to lower airflow & increased fan power.**
- **As Per Thumb rule It is assume 1 mmWC pressure drop in a duct of length 1 Meter.**
- **During Pressure Profiling 40-50 mmWC Pressure drop measured in a duct of length 6 meters.**

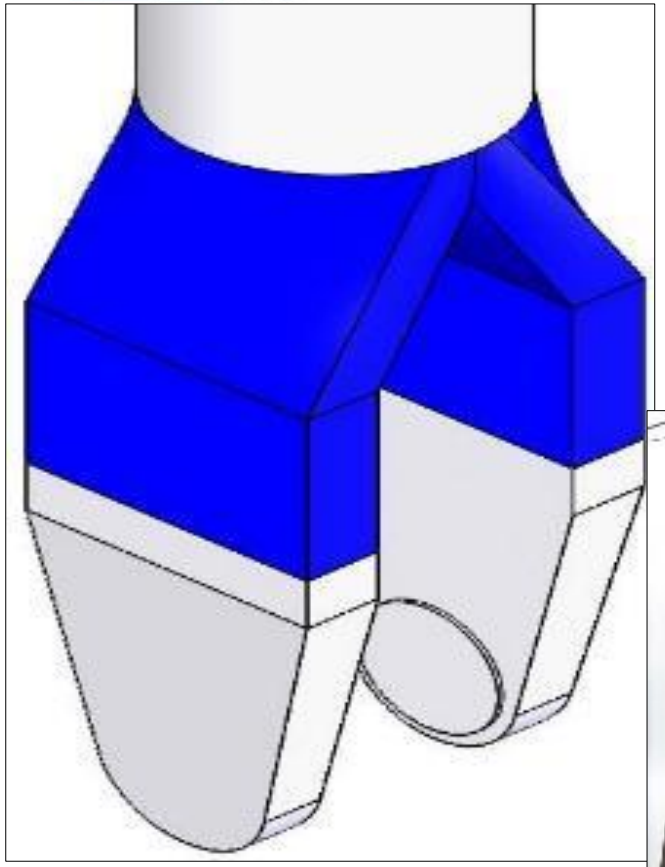
Velocity after modification of Y joint width from 750mm to 1200 mm is within 19 to 21 m/s.

Region near to flexible connection Still showing velocity greater than 22 m/s in some portion of duct.

This region modification will be planned in FY23-24.

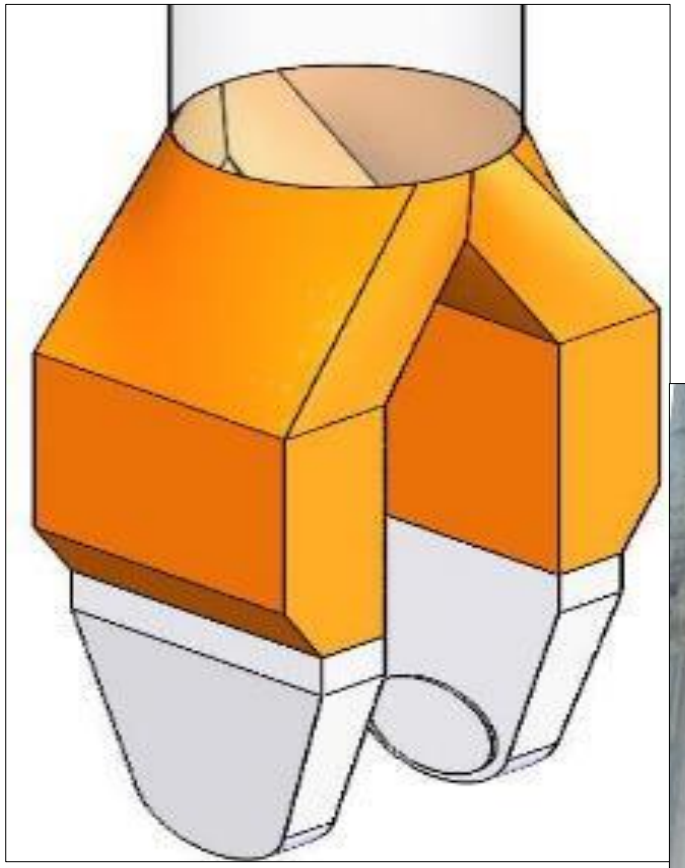


Modification of Inlet Y-Piece



Existing Y piece cross section 3000 x 750mm

BEFORE



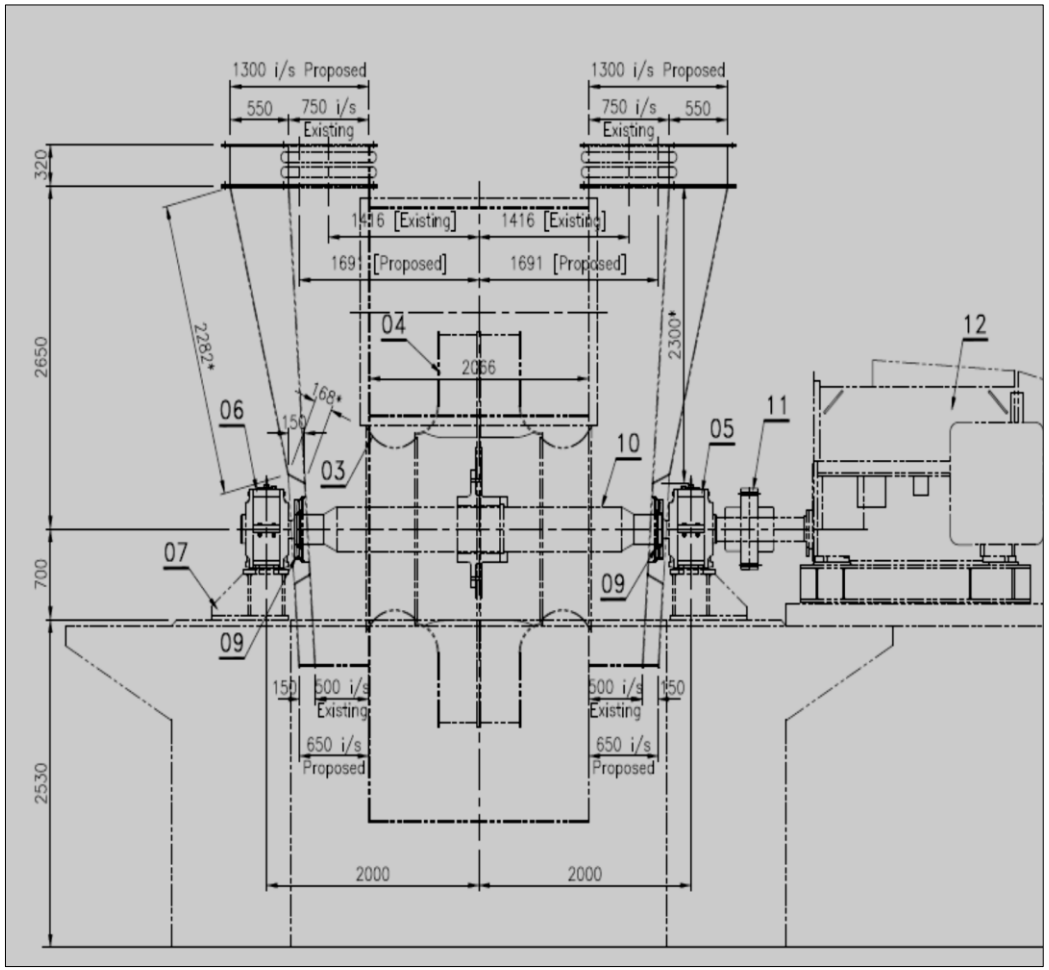
Modified Y piece cross section 3000 x 1200mm

AFTER

Modification of Fan Inlet Box – Executed in FY23-24

The acceleration and deceleration phenomenon at suction box, fan inlet, throat and fan outlet area can be coarse corrected to achieve a minimum pressure drop of 35 – 40 mmwc . Total saving of 0.30 Kwh/MT cement

Before Modificationn – 750 mm width



Modification Drawing

After Modification – 1300 mm width

Major projects implemented in FY2021-22

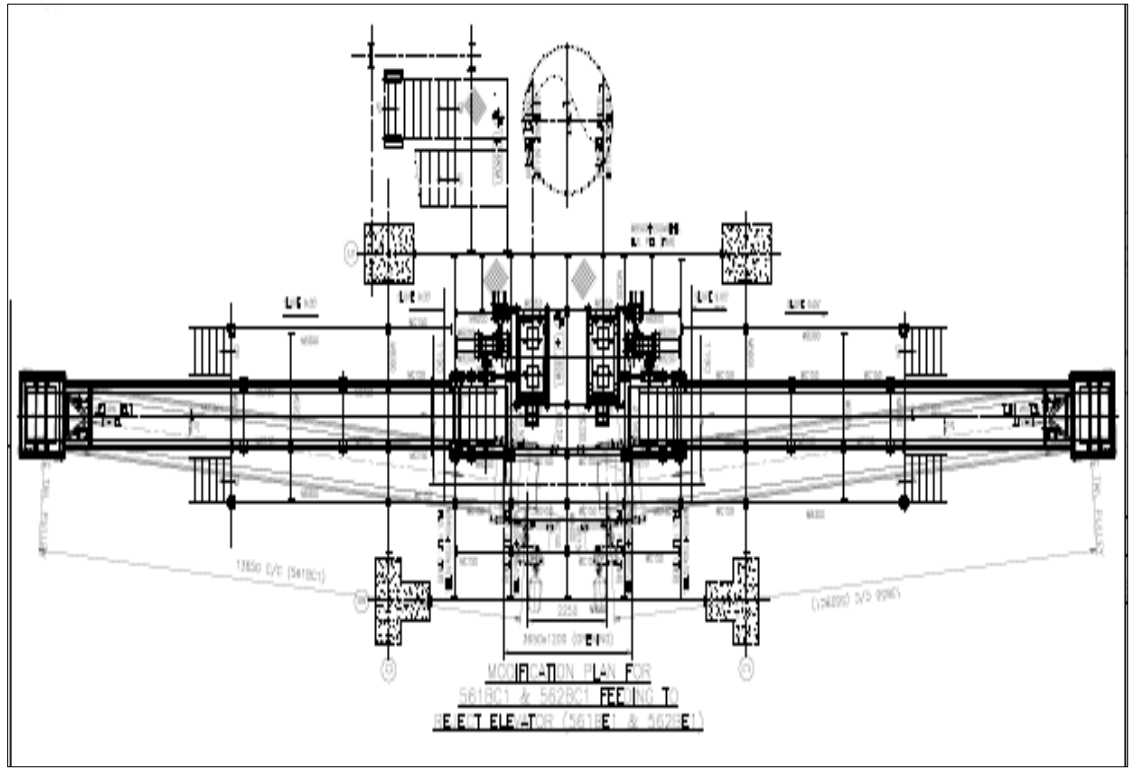
Year	Project Title	Investment (INR Million)	Electrical saving (Million Kwh)	Total Savings (INR Million)	Impact on SEC (Electrical Kwh/MT of Cement)
FY 2021-22	Modification of Classifier Seal Gap, to increase the efficiency of classifier by avoiding short circuiting of coarse into fines.	0.1	0.75	4.6	0.30
	Optimization of fly ash bulker unloading time - Installation of Separate line for individual Fly Ash unloading point.	1.5	0.23	1.4	0.09
	Installation of VFD in Auxiliary bag filter (9 nos.) fans running currently with 50%-60% load by throttling the damper.	1.3	0.24	1.5	0.10

Major projects implemented in FY2022-23

Year	Project Title	Investment (INR Million)	Electrical saving (Million Kwh)	Total Savings (INR Million)	Impact on SEC (Electrical Kwh/MT of Cement)
FY 2022-23	Implementation of Mill Intellectual Optimizer (AI). **In Progress**	9.0	0.75	4.2	Proposed – 0.6 Actual – 0.3
	Installation of Intelligent Flow Controller (Demand side controller) in main plant compressor line.	0.9	0.13	0.75	0.05
	Modification of Mill reject handling conveying circuit - Utilization of Common Elevator for both mills	1.0	0.08	0.45	0.03

Utilization of Common Elevator for both mills

The solution is to extend the existing conveyer and make a common discharge and run any single bucket elevator while both mills are running.



- With this modification we may switch to any of the elevator and stoppages can be avoided.
- Total Saving is 0.03 Kwh/MT cement.

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5. INNOVATIVE PROJECTS

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I – Modification of Classifier Seal Gap

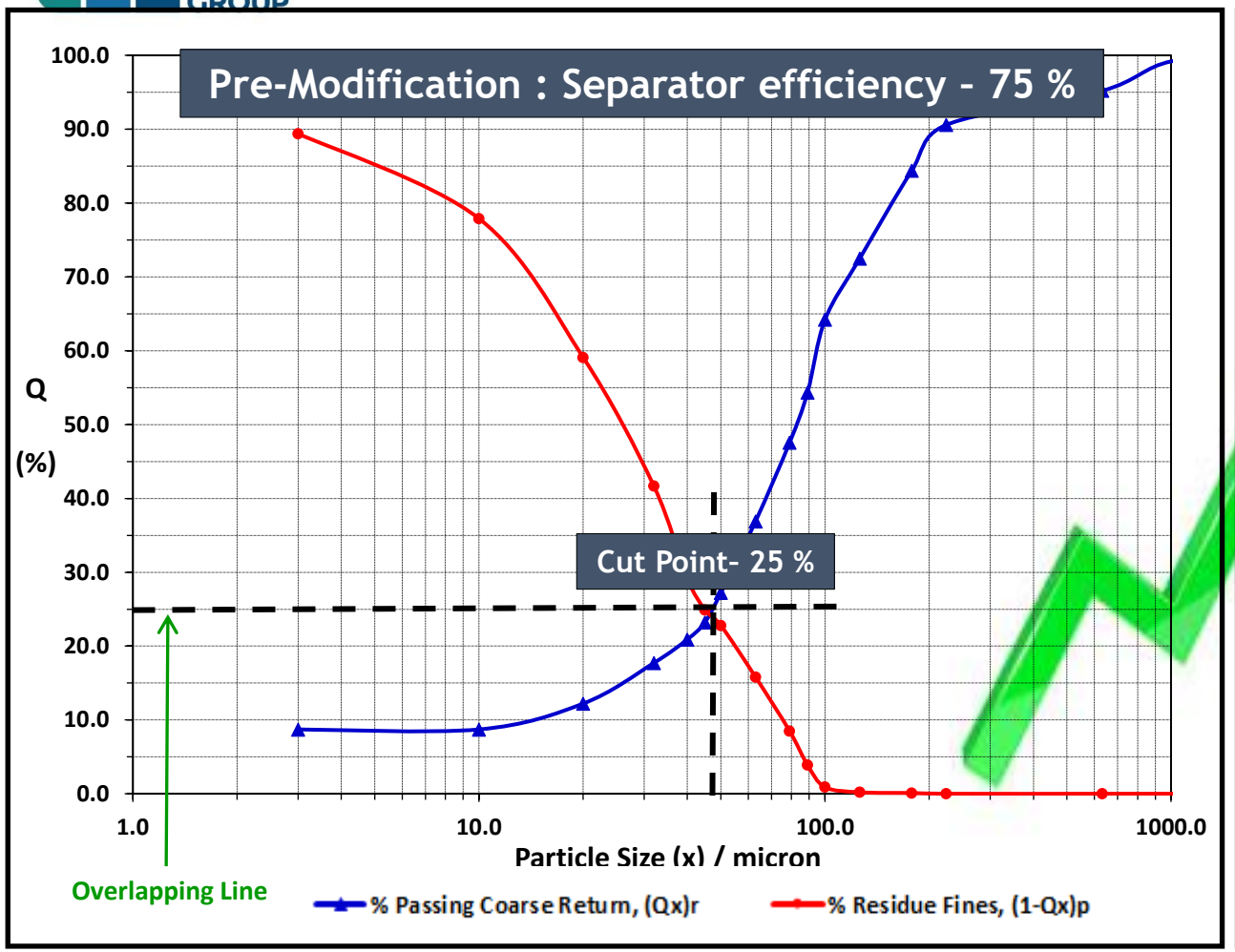
Separator is an equipment in Mill Circuit which Separates the finer & Coarser Particles from inlet Air-Dust Stream. The performance of separator is affected by short-circuiting of the particle i.e. coarser particle is being mixed along with fines through **SEAL GAP.**

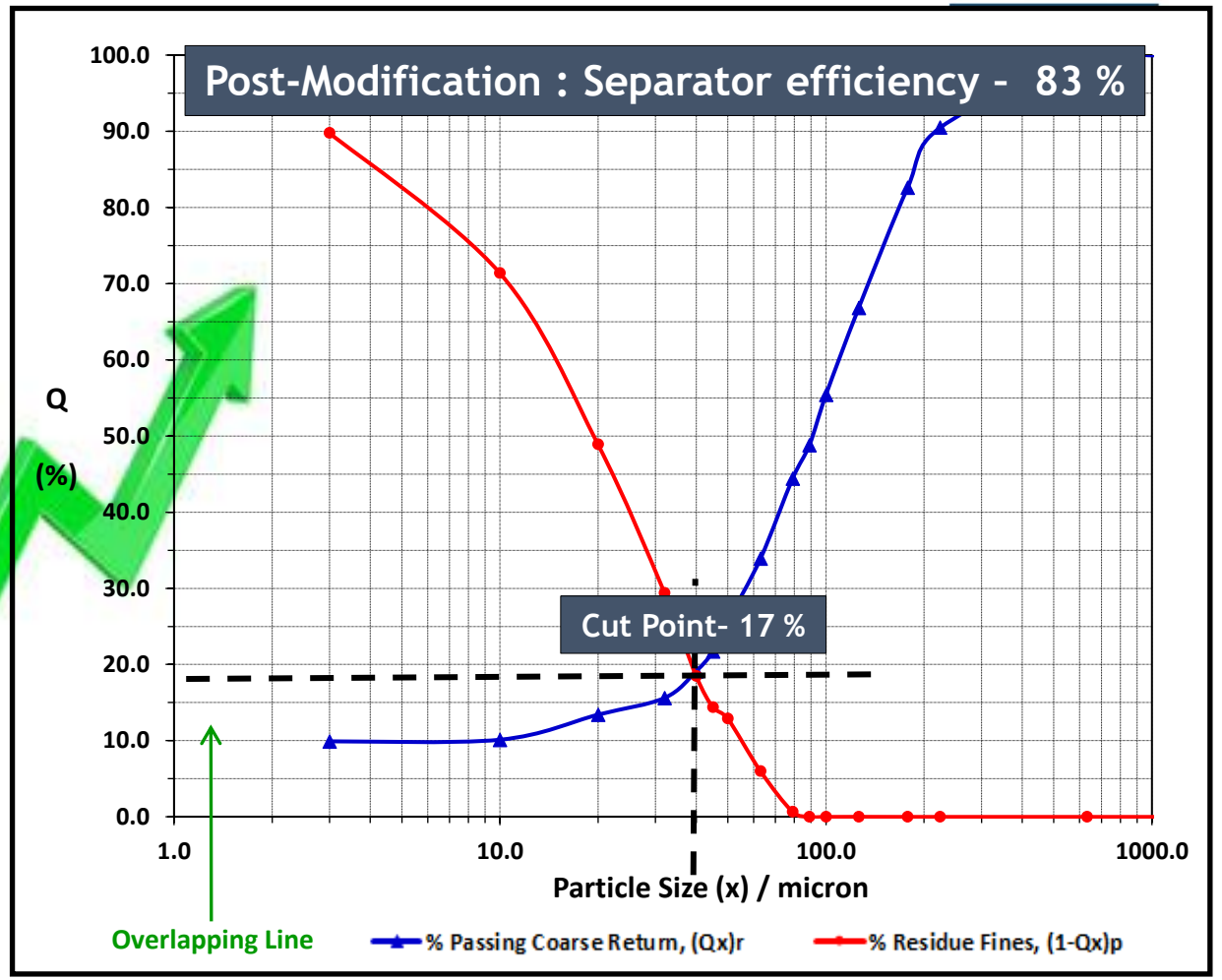
The labyrinth seal is to control the seal gap, but due to dynamic principal of the classifier, there must be some gap, which increase from time to time due to abrasive nature of the material.

Installation of additional rubber seal ring to maintain the seal gap to 2-3 mm only.

Old conveyor belts utilized for rubber seal & change in every 2 months.

I – Modification of Classifier Seal Gap





The particle size distribution of the feed to separator cage wheel can not be measured; therefore the Separator Performance can be judged by the Overlapping (ü). The Overlapping is the percentage of coarse particles in the fine and the fine particles in the reject. The above diagram shows the curve of residue of the fine $(1-Qx)_p$ and the curve of passing of the coarse return $(Qx)_r$. The point of intersection gives the Cut Point (x-T) and the Overlapping (ü) in %.

II - Implementation of Mill Intellectual Optimizer (AI)

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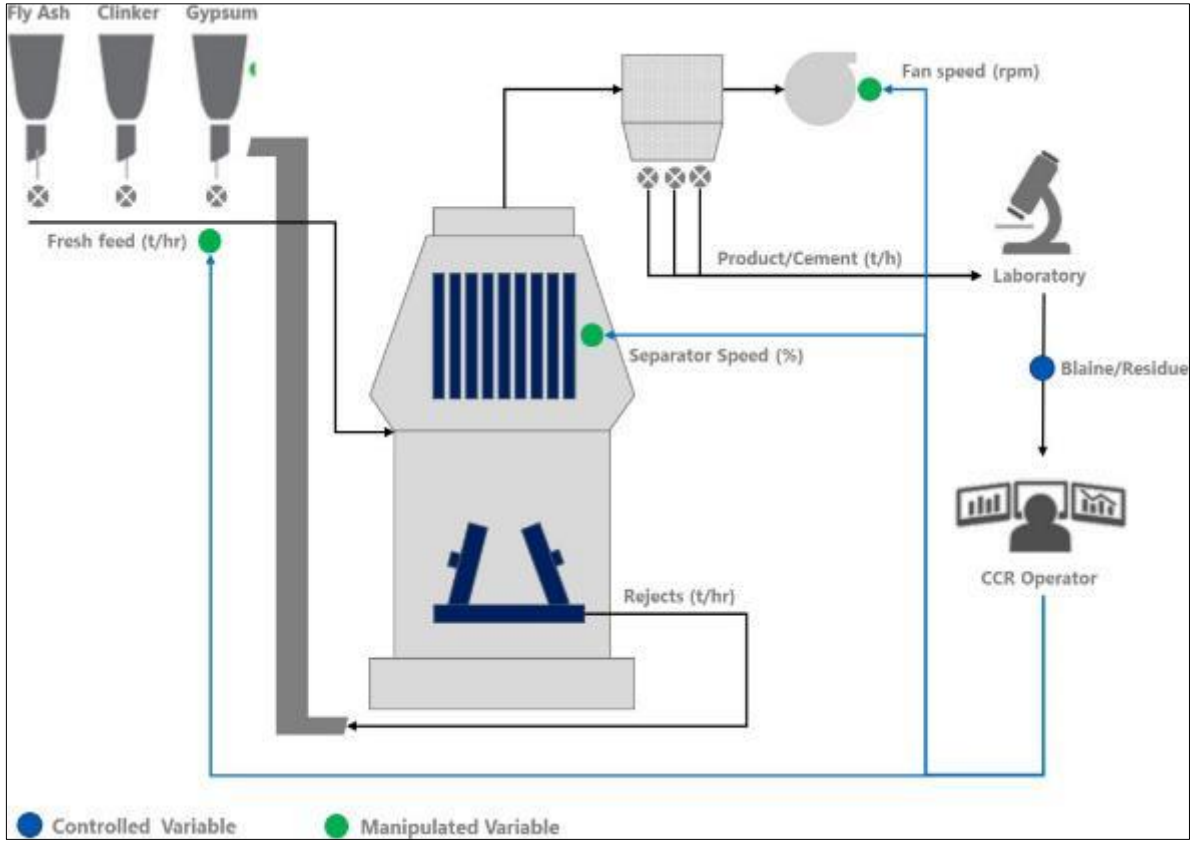
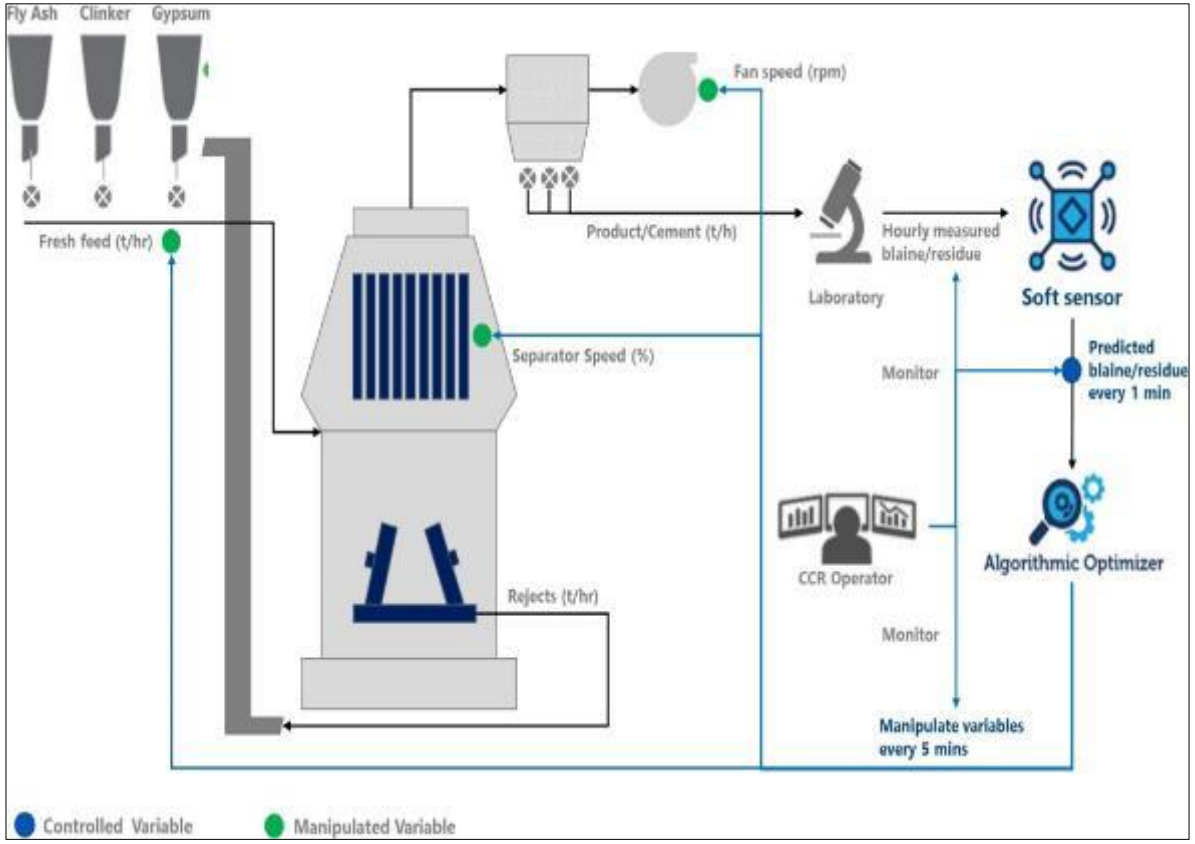
1.Present challenges: The typical process control of cement mill in a continuous grinding circuit is shown below. The existing mill circuit has below challenges:

a. Maintaining Quality parameter through manual intervention.
b. Manual control of fresh feed, Separator speed and fan flow.



2. Proposed Solution: Mill Intellectual Optimizer with Artificial Intelligence (AI).
The process control of cement mill in a closed loop grinding circuit with a proposed solution is shown below:



II - Implementation of Mill Intellectual Optimizer (AI)

The Mill Intellectual Optimizer (M-IO) has the below modules which works cohesively in a closed loop to control the major Cost variables like Cement Quality, Specific Energy & Productivity of the Mill.

Blaine/Residue Soft Sensor:

A Soft sensor build using Artificial Intelligence (AI) on the historical mill sensor data, to constantly (every 30 sec/1 min) predict the cement Blaine/Residue like a hardware sensor.

Algorithmic Optimizer:

An Algorithmic optimizer efficiently scan the search space and recommends the global optimum settings for the mill system to operate using the Blaine/residue soft sensor.

Benefits of M-IO:

i. Increased mill output by 2.5 TPH against the proposal of 5.0 TPH.

ii. Reduced Specific Power Consumption of Mill by 0.3 Kwh/MT against the proposal of 0.6 Kwh/MT.

II - Implementation of Mill Intellectual Optimizer (AI)

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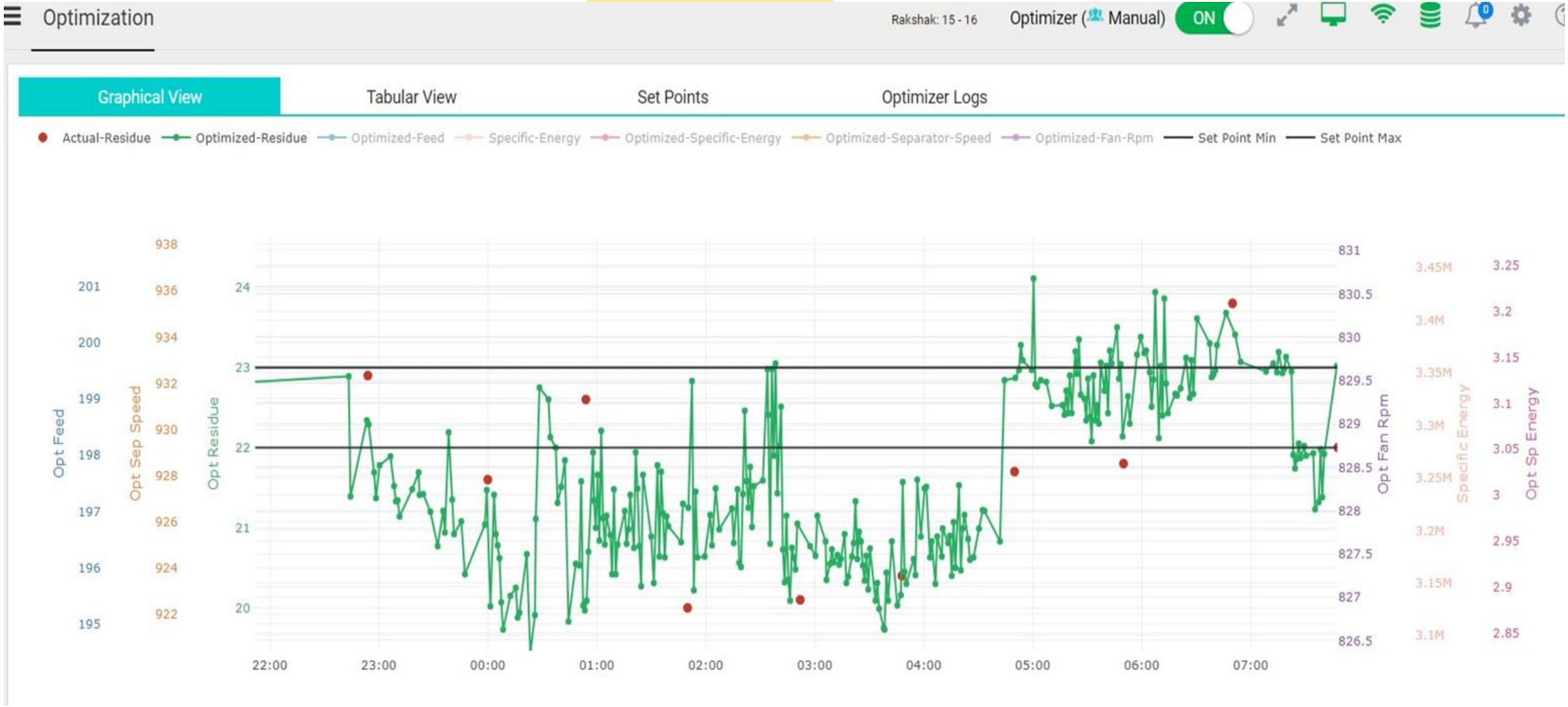
TESTING TRIALS



III - Optimization Of Compressor Air System

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Initiatives :

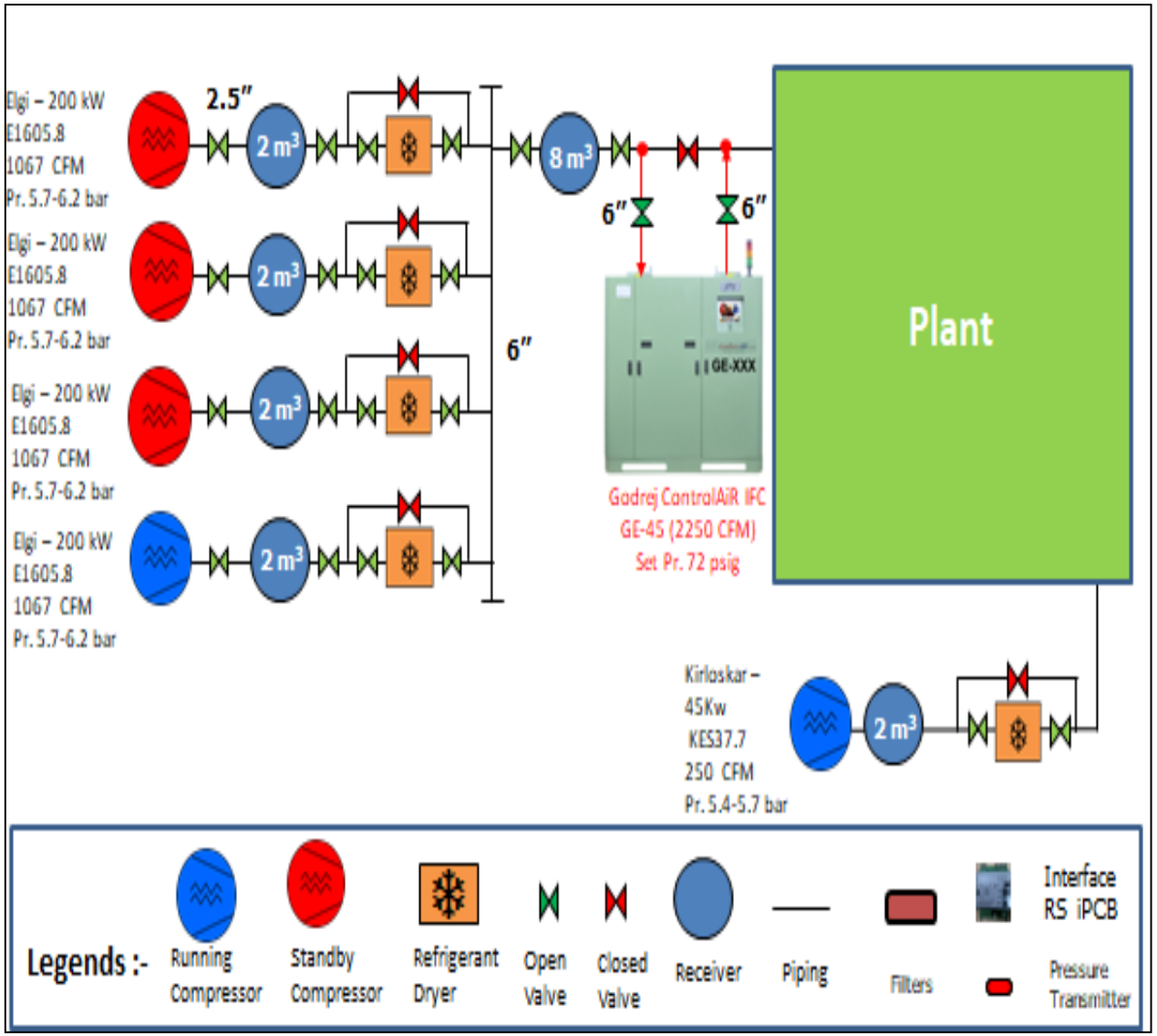
i. **Isolation of compressed air circuit section wise through solenoid valves.**

ii. **Installation of Intelligent Flow Control (Demand side controller) in compressor line.**

iii. **Installation of blower for body cleaning .**

iv. **Regular monitoring of compressed air leakage through leakage test.**

High Volume, Low pressure (<1.0 Bar).



III - Optimization Of Compressor Air System

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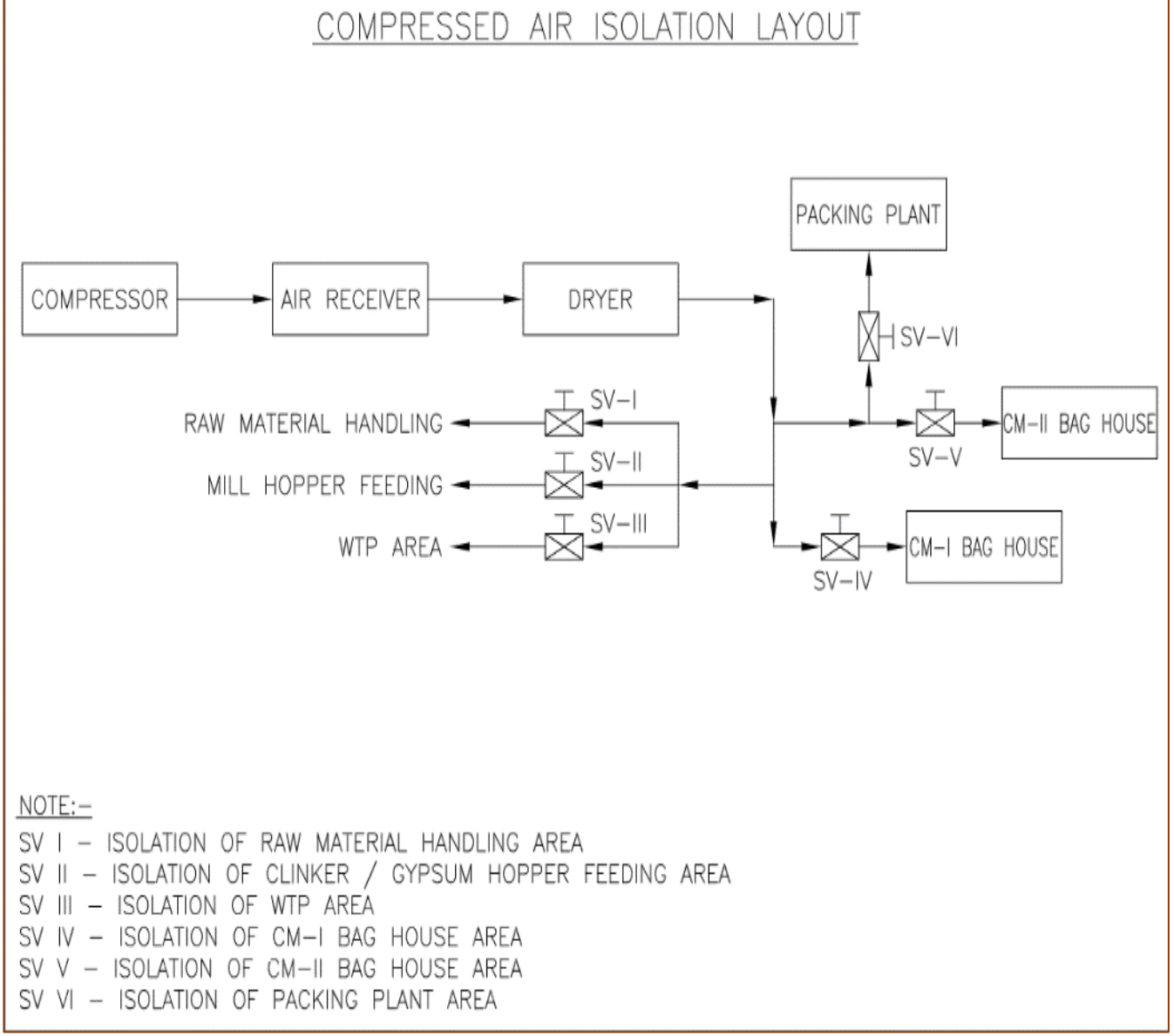
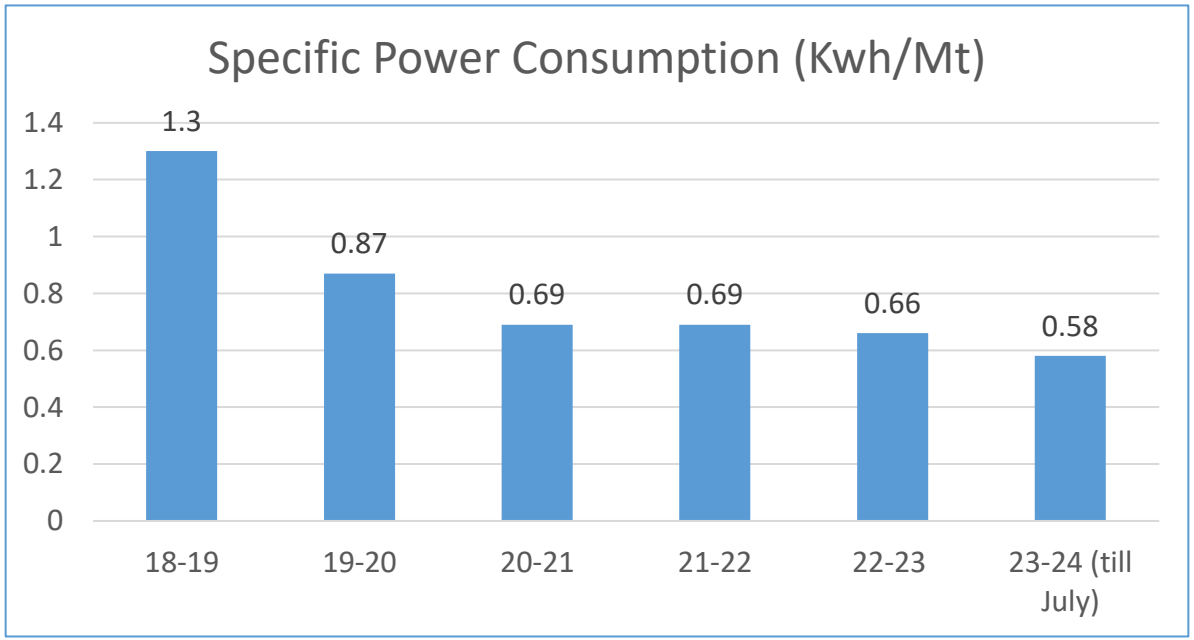


POWER SAVING DETAILS				
Details	**UOM**	**Before**	**After**	**Diff.**
Volumetric flow, delivered by compressor	CFM	1079	1079	0
Leakage Quantity	**%**	**35**	**21**	**-14**
	CFM	**377**	**226**	**-151**
Power drawn	kW	180	180	0
SEC of Compressor	kW/ CFM	0.167	0.167	0
Power consumed	kW	63.0	38.0	-25



6. Utilization of Renewable Energy sources

7. GHG Inventorisation

8. EMS System & Other requirements

9. NET ZERO Commitment

6. Utilization of Renewable Energy sources

Installation of Off-site Solar power plant 20 MWAC in collaboration with AMP Solar Clean Power Pvt. Ltd. in the month of March'21. Out of 20 MWAC, 14 MWAC allocated for Kundanganj unit.

- Total Project Cost : ₹ 5.6 Crore
- Expected Power to be generated Y-Y : 250.30 Lacs KWh.

6. Utilization of Renewable Energy sources

Commissioning of On-site new Solar captive power plant 2.0 MW to increase Solar power capacity from existing of 14.0 MW to 16.0 MW on 26th Sept 2022.

- Total Project Cost : ₹ 13.04 Crore
- Expected Power to be generated Y-Y : 35.30 Lacs KWh.

Solar Modules

6. Utilization of Renewable Energy sources

Onsite Generation

Sl. No	Year	Technology (solar/wind etc.)	Installed Capacity (MW)	Consumption (million kWh)	% of overall electrical energy consumption
1	FY 2020-21	-	-	-	-
2	FY 2021-22	-	-	-	-
3	FY 2022-23	Solar	2.0	1.8	2.0

Offsite Generation

Sl. No	Year	Technology (solar/wind etc.)	Installed Capacity (MW)	Consumption (million kWh)	% of overall electrical energy consumption
1	FY 2020-21	Solar	20.0	2.1	3.3
2	FY 2021-22	Solar	20.0	22.9	30.5
3	FY 2022-23	Solar	20.0	25.6	34.0

7. GHG Inventorisation

- **Inventorisation for Scope-1, 2 & 3 and data is being disclosed in company annual reports.**

- **Emissions intensity of last three years (FY 2020-23).**

Sl. No	Year	Units	20-21	21-22	22-23
1.	Total direct CO2: all sources (Scope 1)	[t CO2e]	181	245	209
2.	CO2 from power purchased (Scope 2)	[t CO2e]	49984	41400	39195
3.	Specific net CO2 - per ton of cementitious product	[kg CO2/t cem. prod]	521	517	517

- **GHG intensity of peers/competitors:**

  - Peer -1 : 557 kg CO2/tone of cementitious product.
  - Peer-2 : 530 kg CO2/tone of cementitious product.

- **Target (short term/long term) for GHG emission reduction.**

  - *From year 2020 to 2030, reduce our scope -1 intensity up to 20 %.*
  - *From year 2020 to 2035, reduce our scope -1 intensity up to 25 %.*

Action Plan:

- *To opt renewal energy solutions.*
- *Energy efficiency measures in plant operation.*
- *To find option for EV vehicle in place of diesel motor vehicle especially for scope-3.*
- *To maximise raw material & cement transportation through rail.*

8. EMS System & Other requirements

- ***Existing Energy parameters monitoring system***

- Energy Management System supplied by M/s FLSmidth Automation for online monitoring of energy consumption. In FY 22-23, FLS Automation upgraded from 7.0 to 8.0.
- Online Gear Box monitoring system installed in both Mill Main Drive GB for smooth operation of Mill.
- Daily discussion on plant energy consumption in production meeting. Observing day-to-day variations in energy consumption by using CUSUM charts and started predicting future energy use.
- Streamlining of internal & external audits as per pre-determined timelines. Latest detailed energy audit was conducted in FY19-20 by CII & in FY22-23 by Inventum Power.

- ***Learning from CII or any other award programs***

- Energy Award is the best platform for the organizations to explore the new ideas/innovation in the area of energy efficiency & to motivate individuals, stakeholder to strive for the best in the field.

9. NET ZERO Commitment

- **Net zero target year 2040.**

Sl. No	Road Map		
	Target 2025	Target 2030	Current Status
1.	Techno-Commercial Evaluation for use of Hydrogen Fuel	-	
2.	Pilot implementation of Electric Mobility	-	BCL's Sadhera Mines, has deployed electrical shovels from BEML.
3.		Implementation of LC3 cement subjected to the release of BIS standard by 2025	Completed the Lab Scale trial, Plant Scale trial is ongoing. BCL has received product certification for LC3.
4.	Completing IGBC Green pro labelling for all blended cements	Completing IGBC Green pro labelling for all products.	
5.	Use 5 BTAP in fleet for Bulk Transportation		Currently 4 BTAP rakes in use
6.	Pilot implementation of AI & ML in Process & Maintenance		Ongoing Pilots for Planetary Gearbox & digitization Mill Optimizer
7.	Techno commercial evaluation for CCUS projects		
8.	Techno Commercial Evaluation of energy efficiency compressor		For increasing energy efficiency of compressor-Phase 1 of the pilot is under Progress

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Awards & Accolades

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Awards & Accolades

Two National award in energy excellence & Five National award in Sustainable Development.

- **CII National award** - Excellent energy efficient unit 2021.
- **Golden Peacock Award** - Energy Efficiency 2021.
- **Apex India Foundation Gold Award** - Occupational Health and Safety 2021.
- **Sustainable Development Foundation Gold Award-** Environment Preservation 2021.
- **Indian Chamber of Commerce Silver Award** - National Occupational Health & Safety 2021
- **Apex India Green Leaf Platinum Award** - Environment Excellence 2020.
- **Apex India Foundation Gold Award** - CSR Excellence 2020.

Awards & Accolades

"Excellent energy efficient unit" award in CII National award for excellence in energy management 2021.

Winner of Golden Peacock Award for Energy Efficiency 2021.

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Thanks

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