CII National Energy Award for Excellence in Energy Management

(Silver Jubilee year)

JK LAKSHMI CEMENT LTD, AHIWARA, DURG (CG)

S.No.	Name	Designation	Email	Mobile No.
1.	Vikas Jain	DGM-Electrical	vikas.jain@durg.jkmail.com	7611106244
2.	Saurabh Sharma	Sr Manager(QC)	saurabh.Sharma@durg.jkmail.com	8966909196
3.	Binay Prakash Yadav	Manager (Process)	binay.yadav@durg.jkmail.com	7747013815

About the Organisation

- JK Organisation, is reputed and diversified group in business for over 125 years with a Turnover of $ 4.0 billion.
- Committed to excellence, driven by a mission to serve the Society with integrity, fairness and trust.
- JK Lakshmi Cement Durg ISO certified **9001:2015,14001:2015,45001:2018 & 50001:2018** .
- JKLC Management is committed to achieve **NET ZERO CARBON** by Y**2047**.
- JKLC Management start a campaign towards improving energy efficiency & sustainability **"GREEN PAHAL ,BEHTAR KAL".**

OUR BRANDS

JK Paper Ltd. | JK Lakshmi Cement Ltd. | JK Fenner India Ltd. | Umang Dairies Ltd. | JK Agri Genetics Ltd. | CliniRx Research | Strategic Technologies Ltd.

WE REPRESENT : CEMENT BUSINESS

Capacity

16.4 Million MT of cement with major plants located at Sirohi(RJ),Udaipur (RJ), Durg (CG), Kalol (GJ), Jhajjar (HR) & Cuttack (OD)

Milestone

Energy Efficiency

63.5 Kwh/MT of cement
(Stands among Top 3 Cement Plant in India)

Appreciation (Large Sector) under Best Managed Electrical System for Energy Efficiency in the 7th Edition of CII 2023

Winner in category Best case study on safe & reliable electrical distribution system (CII 2022)

Winner in category Best Energy Efficient organization (CII 2020)

About Durg Unit

The JK Lakshmi Cements Durg plant, a state-of-the-art facility spanning 1,200 acres, operates using an advanced dry cement process. With a production capacity of 1.98 million metric tons per annum (MMTPA) of clinker and 2.7 MMTPA of cement, the plant demonstrates its commitment to sustainability, operational excellence, and a positive workplace culture through multiple initiatives and practices.

Remarkably, it is the **only cement plant in India where ~80% of the plant's power consumption** is derived from **renewable energy sources**, aligning with our group vision for net zero by 2047.

Plant is located very strategically that it caters all the context of operational efficiency:

Central Market Access

Centrally situated, the plant is strategically positioned to efficiently distribute cement to major markets in Madhya Pradesh, Maharashtra, Odisha, and West Bengal.

Industrial belts (proximity)

Located within a well-established industrial hub, the plant enjoys access to robust infrastructure, supporting seamless operations and quick response to market demands.

Proximity to Raw Materials

The Durg plant's location in Chhattisgarh provides easy access to high-quality limestone, ensuring a consistent and cost-effective supply of critical raw materials.

Logistical Efficiency

The plant benefits from excellent road and rail connectivity, reducing transportation costs and enhancing distribution efficiency across India.

Salient features of Durg Unit

Energy Efficiency & Benchmarking:

Recognized for **outstanding power consumption standards, utilizing advanced technologies** to minimize energy use and environmental impact. **(Top 5 in country)**

Advanced Technology

Utilizes a 5-stage inline calciner preheater, AI-driven process optimization with **Smarta-MPC, AI-based predictive maintenance**, and advanced energy **management** systems.

Exemplary ESG Efforts

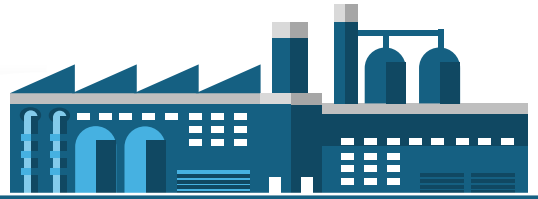
Produces higher **blended cement (~90%)**; **~80% of the plant's power consumption** is derived from **renewable energy sources.**

People Practices

Focuses on employee well-being, work-life balance, rewards and recognition, and health. Emphasizes **Visible Felt Leadership, especially in safety practices like Working at Heights (WAH) and Confined Space Entry (CSE).**

Environmental Stewardship

Achieves approximately **three times water positivity, 100% environmental compliance**, energy and water conservation, and accommodates diverse fuel types in the kiln.



Major Process equipment's Specification

Equipment	Supplier	Rated(TPH)	Operating (TPH)
Crusher	L & T	1000	476
Raw Mill	UBE	400	485
Coal Mill	UBE	50	55
Kiln	FLSmidth	4500 TPD	6000 TPD
Slag Mill (OPC)	UBE	100 TPH(100% Slag)	150
Slag Mill (PPC)	UBE		175
Slag Mill (PSC)	UBE		135
Slag Mill (COC)	UBE		155
CM1 PPC	LNVT	100	120
CM2 PPC	LNVT	100	120

What we did…. To make our process Robust

1 ENPi Display in Contol Room

Result!

Cost displayed In Rs/t product for each electrical / thermal energy consumption patterns

2 Robust Bench Marking

Result!

Bench marking with competitors with detailed action plan to explore uncharted territories

3 Implementation of Golden Principles

Result!

Rules for significant energy usage defined & tracked on daily basis. This has strengthen the KPI.

4 Mass Awareness among the people

Result!

Elevated focus on every aspects resulted in increased efficiency

5 Training Sessions

Result!

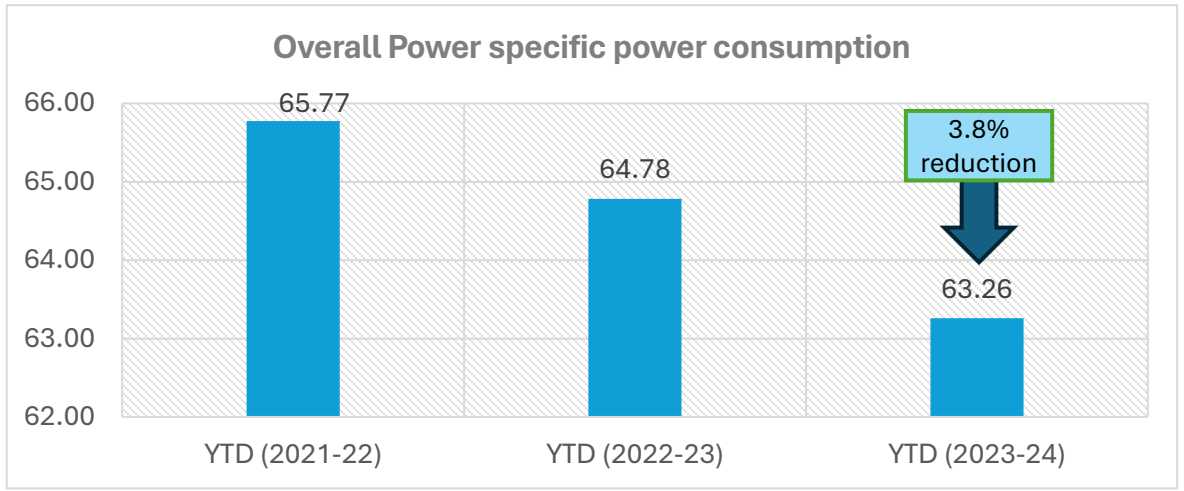
Yearly Training programs are embedded with employees training need assessment

6 Success Celebration & Recognitions

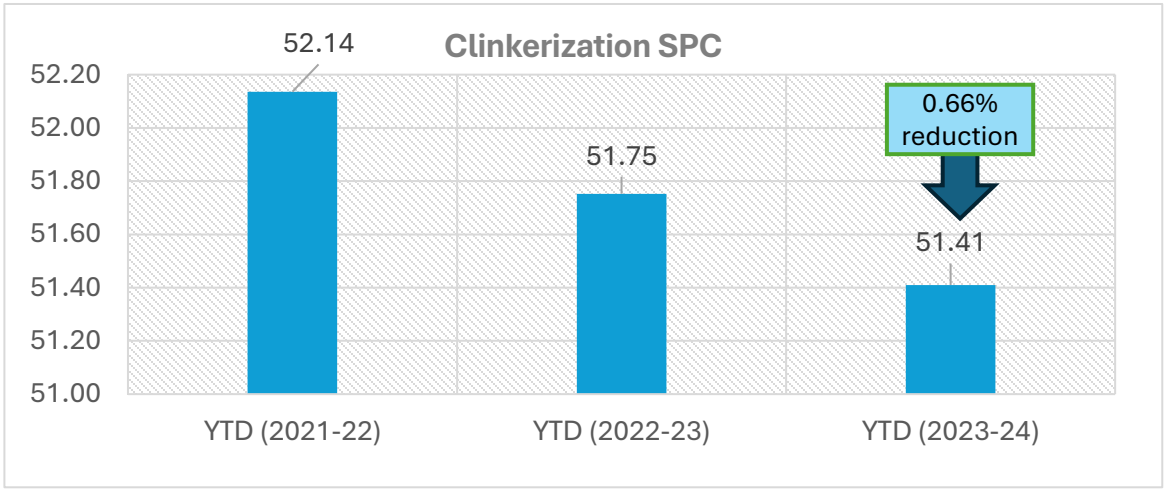
Result!

Enhanced motivation for staff & workmen which is key pillar for continual improvement.

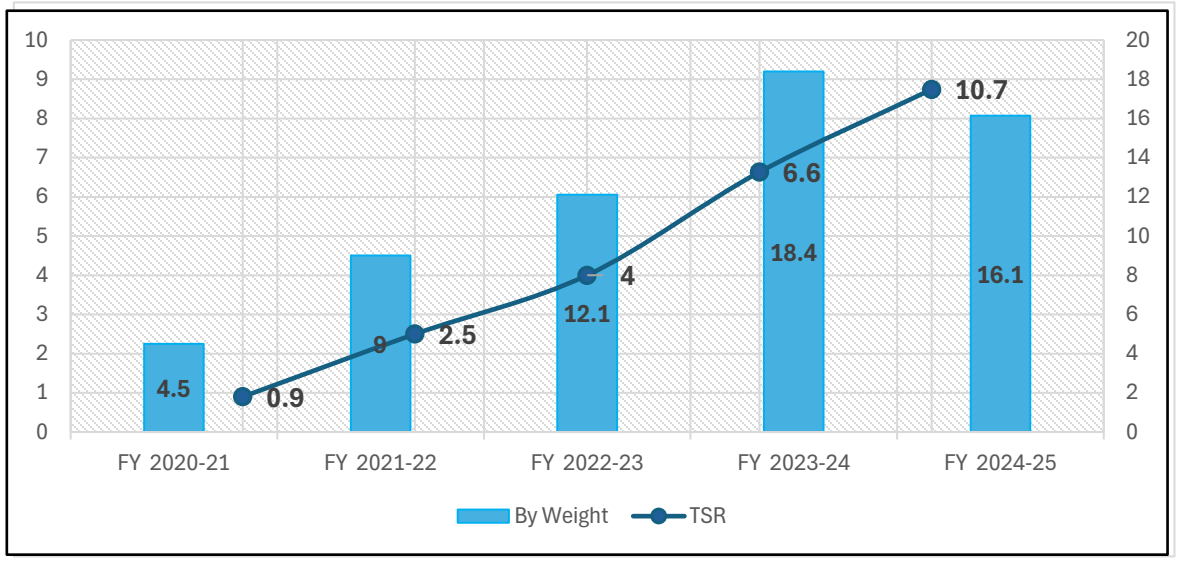
JKLC Durg Unit : Major performance indexes Last three Years



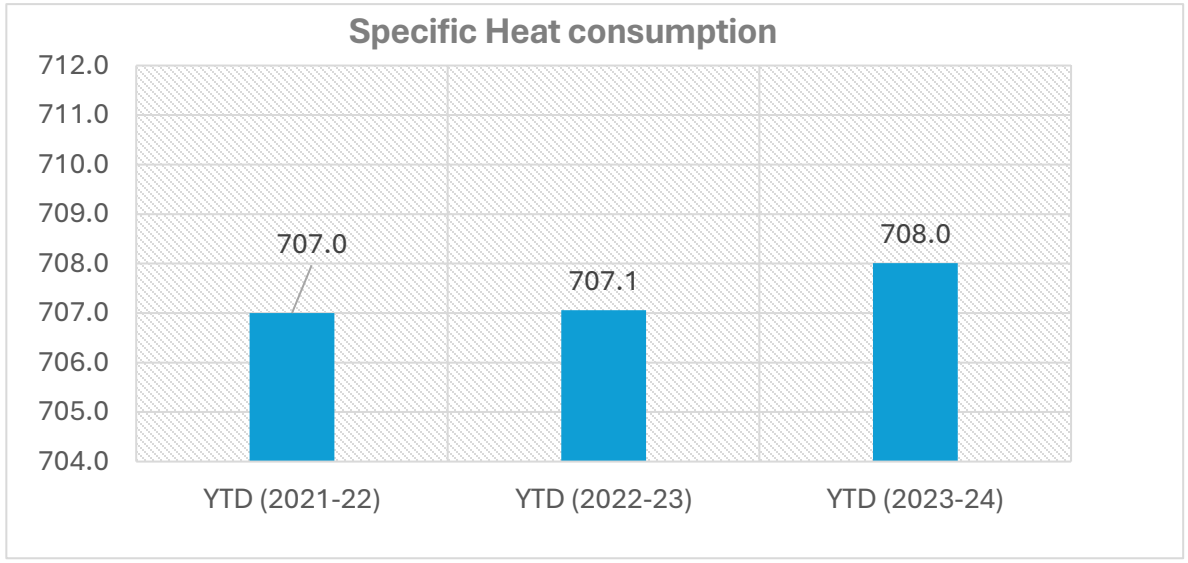
Owing to improved grinding efficiency, automation, process optimization



Owing to continues process optimization, real time power correction, Model predictive control

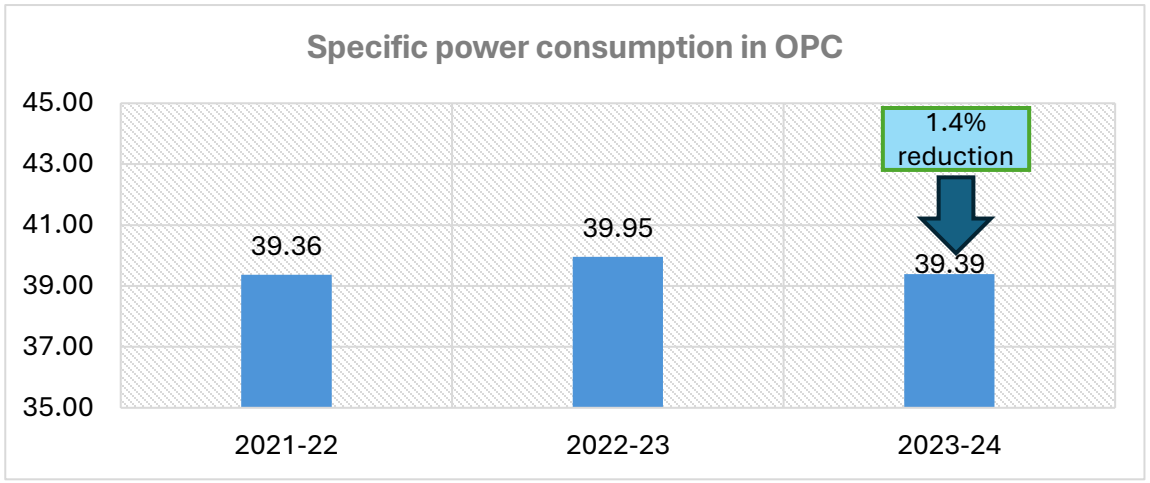


Maximizing AFR in rudimentary circuit, without any substantial capex, tailored made solutions

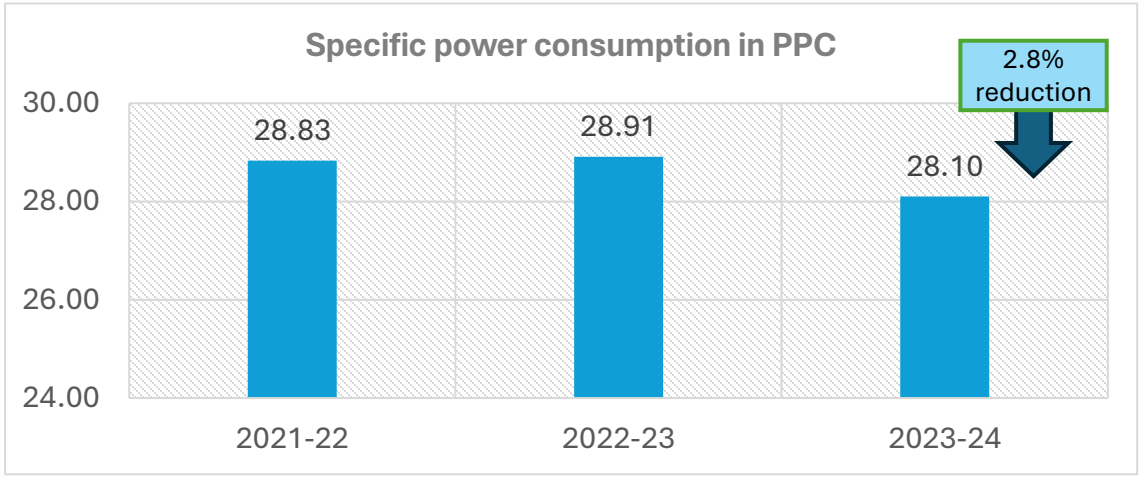


Sustenance of heat consumption even with elevated AFR usage (high moisture content)

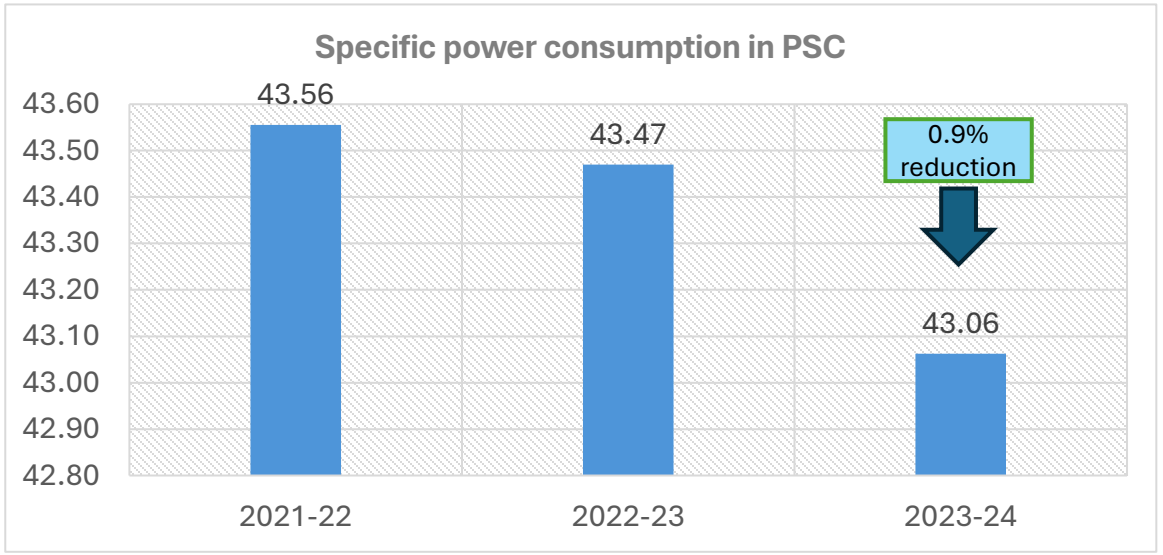
JKLC Durg Unit : Major performance indexes Last three Years



Owing to improved grinding efficiency, automation, process optimization (MPC)



Owing to media optimization, clinker grindability , real time power correction



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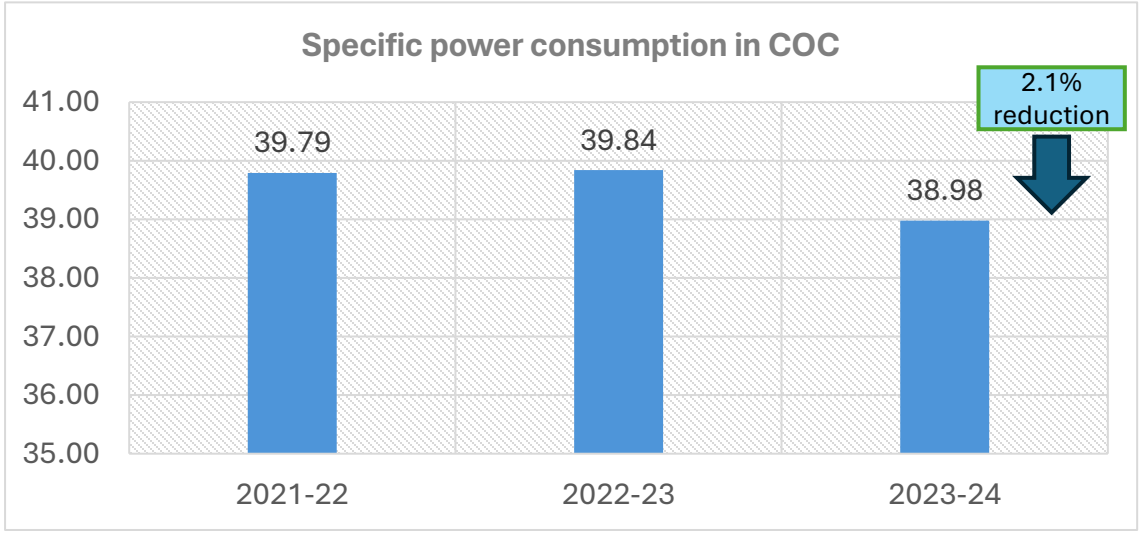
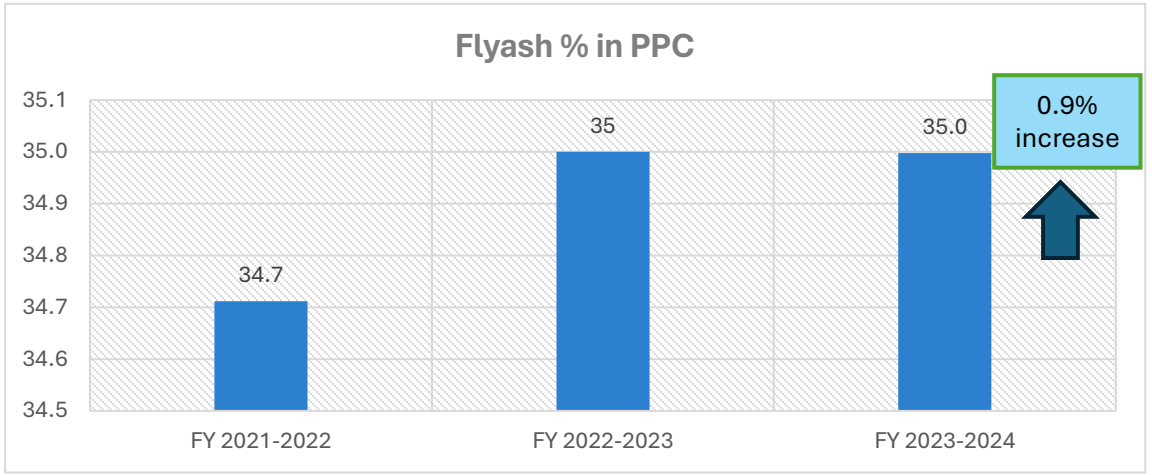


Sustenance of heat consumption even with elevated AFR usage (high moisture content)

In the year 2022-23 power consumption of OPC and PPC marginally increased due to OPC grinding in ball mill.

JKLC Durg Unit : Major performance indexes Last three Years



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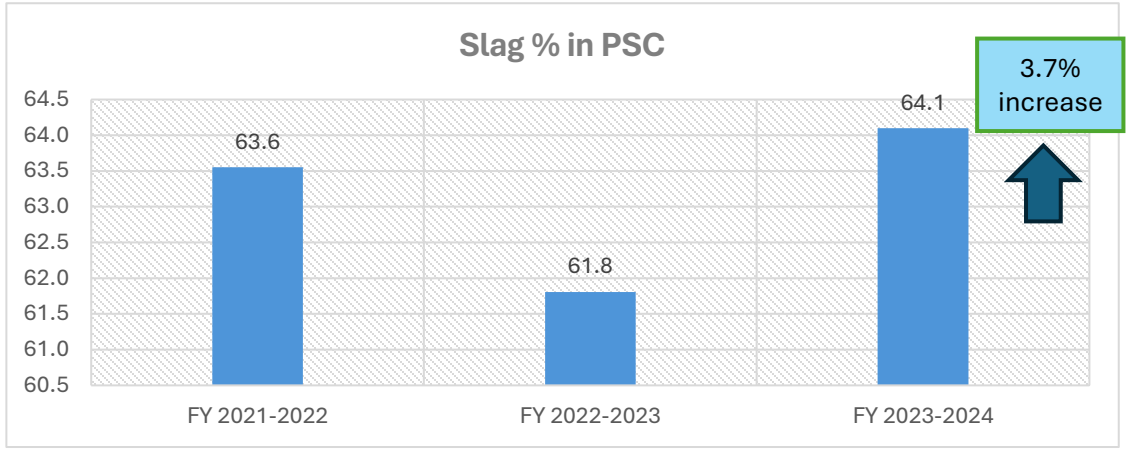

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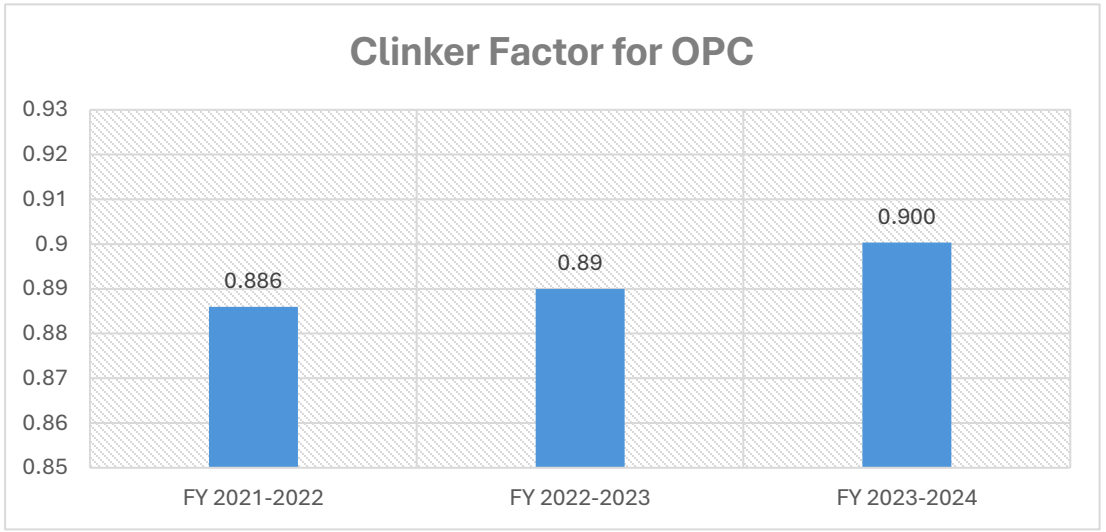
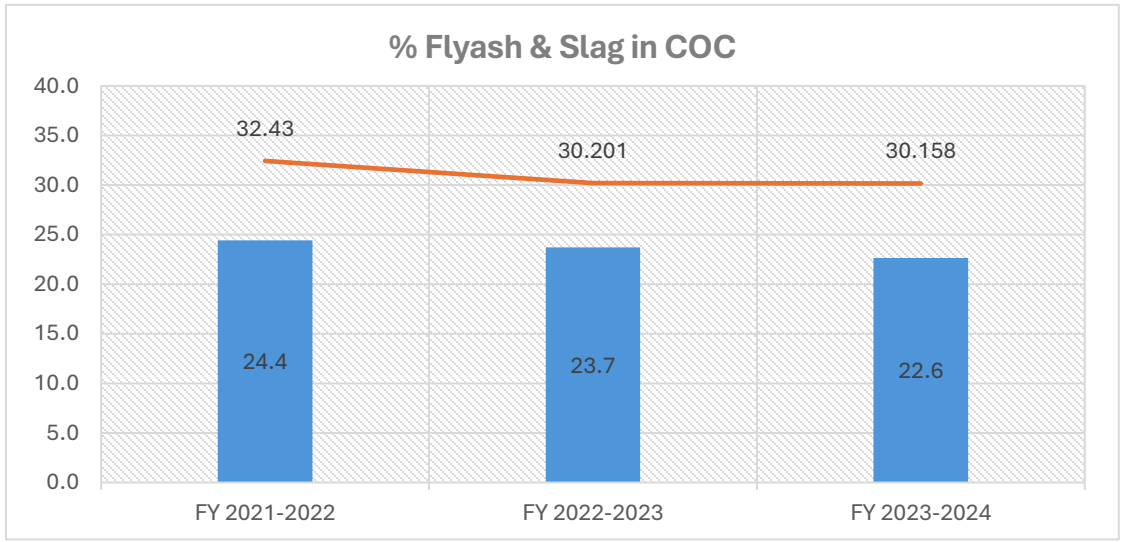


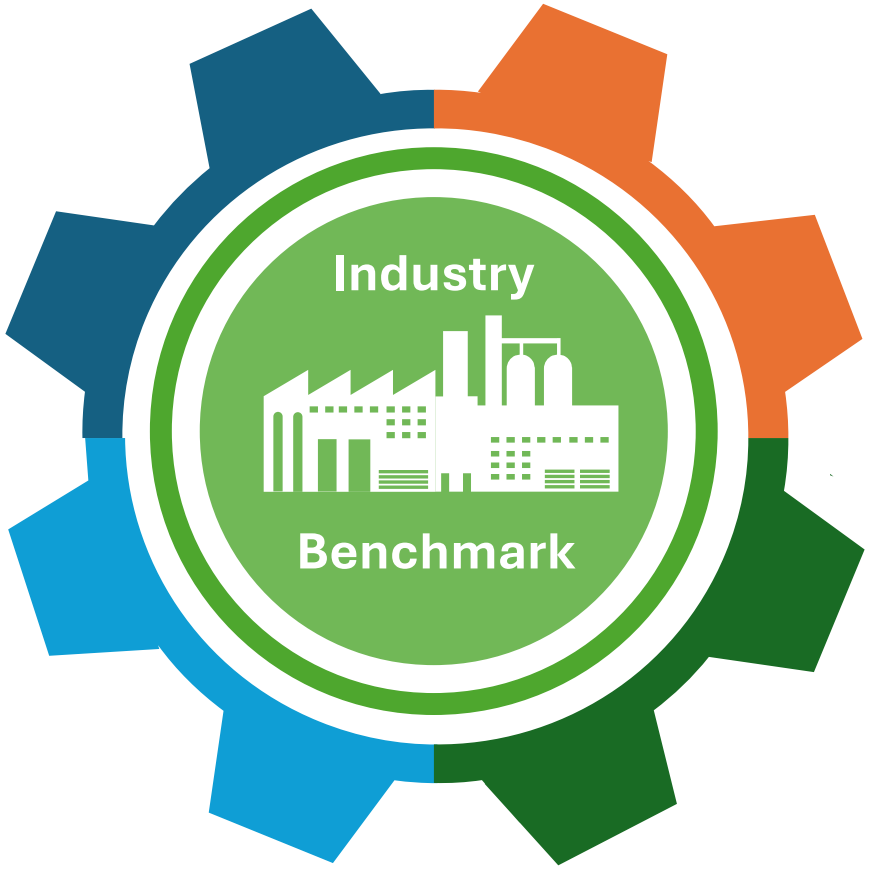
Factors are optimal in view of market requirement particularly for strength & durability



Factors are optimal in view of market requirement particularly for strength & durability

In the year 2022-23 the factor OPC and COC had marginally increased owing to market demand, durability. The aim is to achieve maximum utilization of cementitious by improving clinker reactivity & modulating the clinker phase reactions.

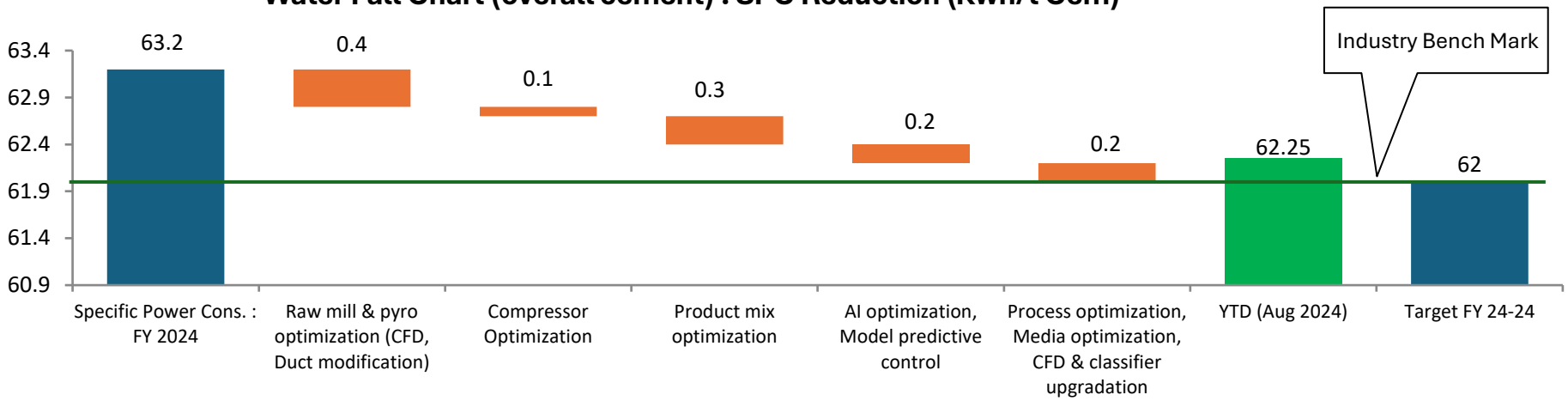
JKLC Durg Unit : National / cluster Benchmark



Benchmark	SPC. (Clinkerisation)	SPC (Over all cement)	SHC With WHRS & 5th Stage Preheater
Our Company	51.41(Cluster Best)	63.25 (Third in Country)	708 (Best in Country)
Competitor 1	44.7	62.0	736
Competitor 2	45.6	63.0	766
Competitor 3	46.5	64.0	726
Competitor 4	47.2	64.1	745
Competitor 5	47.5	64.5	755
Short term vision for our company	**49.5**	**62.0**	**705**
	With in house modifications and automation MPC, process optimization	**Macro study of the energy consumption pattern, optimized circuit, MPC, prod. Mix**	**Burner upgradation, minimize radition loss, cooler optimization,**

JKLC Durg Unit : Road map for Energy excellence

Water Fall Chart (overall cement) : SPC Reduction (Kwh/t Cem)

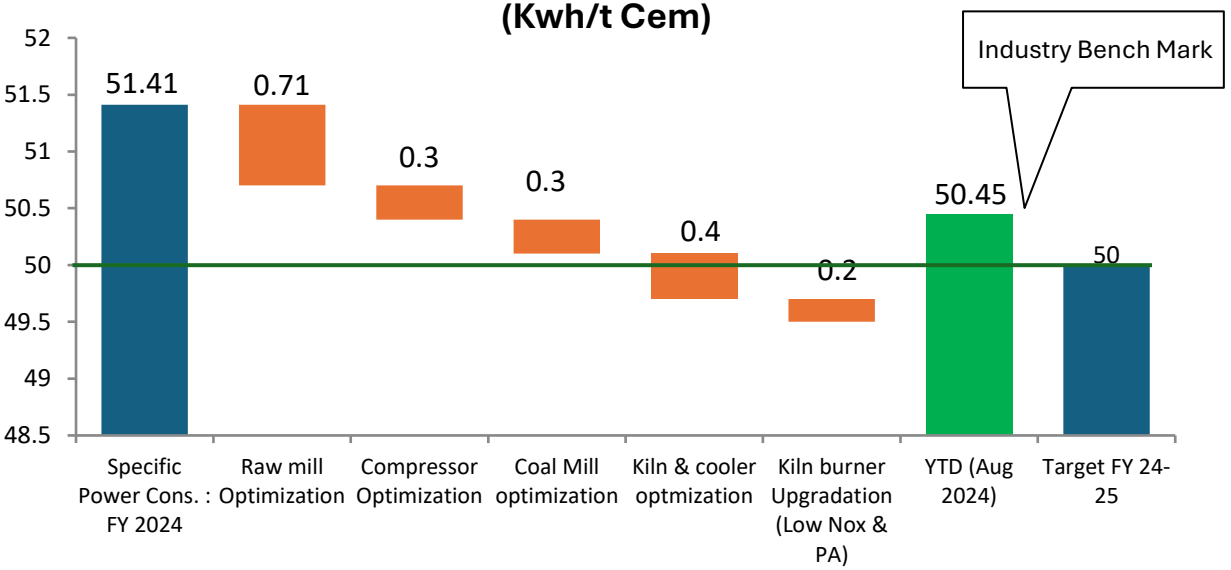


Energy Efficiency & Benchmarking:

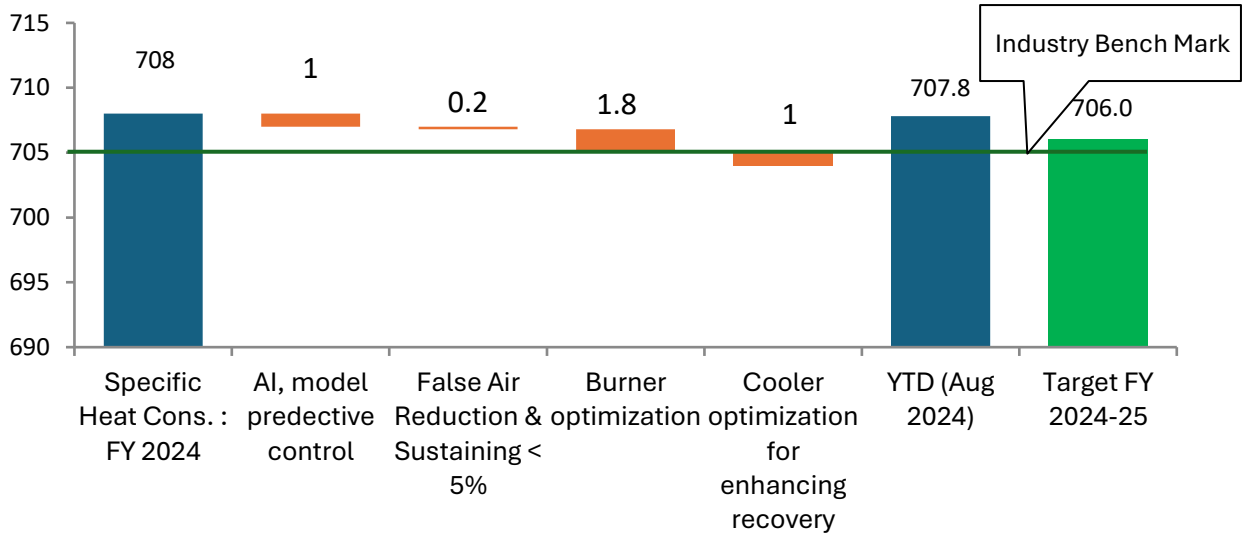
We **at JK Lakshmi Cement** Limited Focus on Energy savings initiatives by **Collaborating and working with peers towards** continuous improvement.

"Looking to the Tough Market Competition we at JK Lakshmi Cement limited are focusing on energy saving initiatives at all the levels to be best among all the companies"

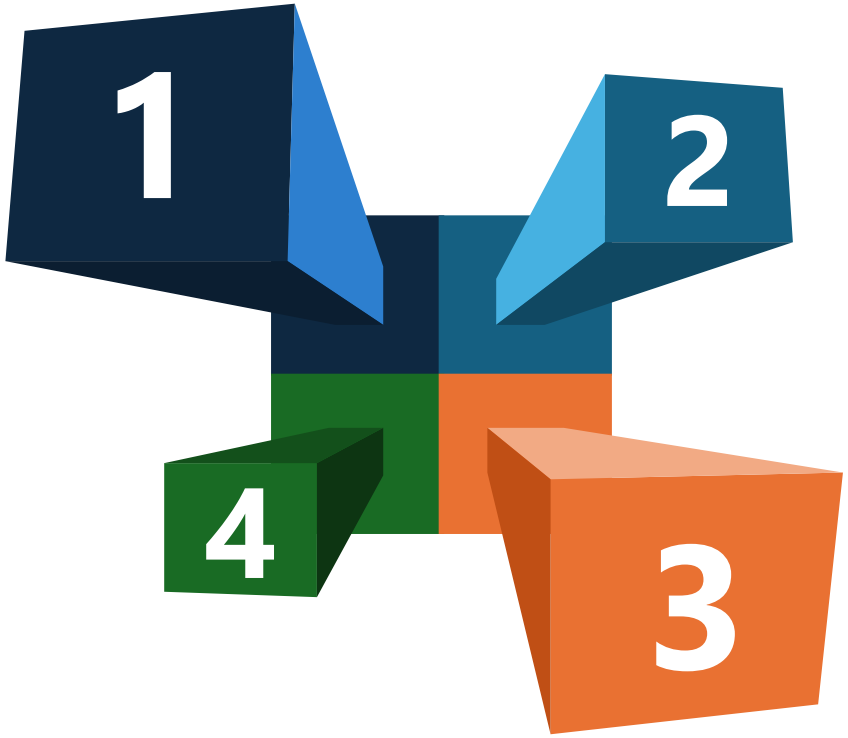
Water Fall Chart (Clinkerisation power) : SPC Reduction (Kwh/t Cem)



Water Fall Chart : SHC Reduction (Kcal/ kg clk)



List of Major ENCONS planned for FY 2024-25



Maximizing AFR

Enhanced Thermal substitution Rate by Reducing usage of fossil fuel ~ 12%

Kiln burner upgradation

Focus to enhance the clinker reactivity with low primary air & higher impingement for better heat recovery.

Ducting & pressure loss reduction

Slag mill booster fan by pass arrangement for power optimization.

Enhancing recovery & Robust operation

Fluidized bed Hot air generator for Slag mill

In house development Job:

AI (MPC) tunning for process optimization.

Usage of AFR with out process disturbance.

CFD : Ducting pressure drop reduction.

Product & power mix optimization.

Raw mill optimization (dam ring, scatter ring, nozzle ring)

Slag VRM maximization of additives

Major Modifications For Enhancing Plant Energy Efficiency

Total Number of projects Implemented 2021-24 : **20**	Investment (Lakh Rs)	Overall Savings Lakhs (Rs)	Pay Back Period (Years)	Carbon Emission Reduction (MT CO2)
	2172	2275	1.0	80025

FY 2021-22	FY 2022-23	FY 2023-24
Number of projects Implemented: 12	**Number of projects Implemented: 04**	**Number of projects Implemented: 04**
Monetary Savings **113.6 Lakhs/annum**	Monetary Savings **88.4 Lakhs/annum**	Monetary Savings **2028 Lakhs/annum**

Major Modifications For Enhancing Plant Energy Efficiency

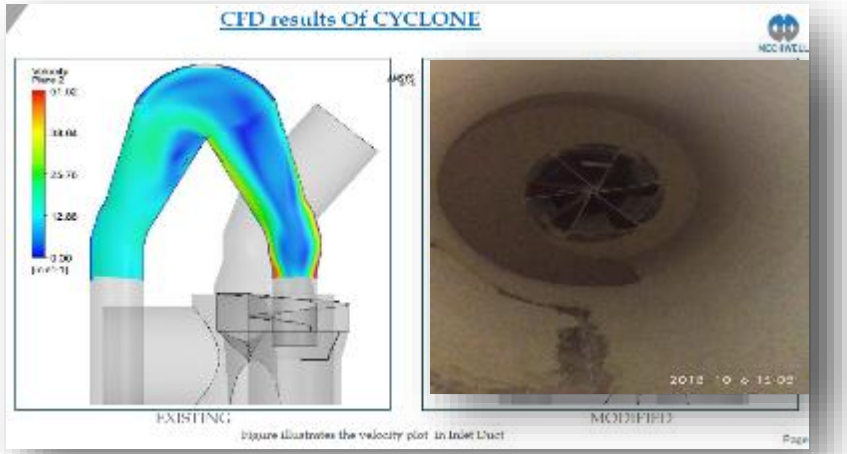
		Identified Energy Saving Measures	Annual Savings Lakhs (Rs)	Capex / In house	Investment Lakh Rs	Pay Back Period (year)	CO2 Reduction MT/annum
2016-21	1	Cement Mill 1, 2 separtor upgradation with High efficiency separator	194.1	Capex	800	4.12	1189
	2	CFD in Vertical roller mill for minimizing the pressure drop	15.1	Capex	20	1.32	191
	3	Installation of CM1 Inlet crusher to precrush the clinker	11.5	Capex	30	2.7	1410
	4	Installation of Basic bricks in kiln to minimze the radition loss	20.8	Capex	30	1.44	1134
	5	TAD damged expansion joint & refractory replaced to minimze the radiation loss.	13.8	Capex	5	0.36	756
	6	Online Silo chage over logic developed to minimize idle running of mill Circuit	92.9	In house	-	-	1175
	7	Compressor optimization of Pyro & Cement Mill	72.4	In house	2	0.03	915
	8	Auto loop i.e. PC temperature, cooler speed, Hood draft, PH fan ID draft etc were taken in ciruit and controlled.	38.1	In house	-	-	2080
	9	False Air arrested at PH top cyclone expansion joint	10.4	In house	1	0.1	567
		Total Savings	**469.1**		**888**	**1.89**	**9417**
2021-22	10	Model predictive control (SMARTA) Installation	23.7	Capex	30	0.79	1072
	11	Arresting of pressure drop across in mill bag filter in slag mill (Checking bags in the filter)	18.9	Capex	9.7	0.51	254
	12	To avoid pressure, drop across damper Install VFD for Packing Plant Bag-Filter Fan (662 FN-8)	2.2	Capex	3	1.35	30
	13	To avoid pressure, drop across damper Install VFD for Packing Plant Bag-Filter Fan (661 FN-7)	2.4	Capex	3	1.23	33
	14	HPSV replacement with LED lamp	0.4	Capex	3		364
	15	To avoid pressure, drop across damper Install VFD for Packing Plant Bag-Filter Fan (662 FN-7)	0.7	Capex	3		0
	16	To avoid pressure, drop across damper Install VFD for Packing Plant Bag-Filter Fan (661 FN-7)	0.7	Capex	3		0
	17	Arrest the false air ingression between Raw mill inlet to Raw mill fan inlet. False Air Ingression of 3.08% (Raw Mill)	7.1	In house	0	0	96
	18	To avoid pressure, drop across damper Install VFD for Bag House RA Fan (421FN-2)	6.7	In house	-	-	90
	19	Replacement of HPSV with LED lamp	2.8	Capex	3	1.06	46
	20	Flyash bin installation in slag mill to avoid pneumatic conveying (rehandling)	46.5	Capex	80	1.73	745
	21	Reduce system Pressure setting 7.5 bar to 7 bar in 661CP-1, 661CP-2 & 661CP-3 Packing Plant Compressors. Every 1 bar in pressure reduction produces a 6-7% energy saving	1.5	In house	-	-	20
		Total Savings	**113.6**		**137.7**	**1.21**	**2750**

Major Modifications For Enhancing Plant Energy Efficiency

2022-23	22	**Optimization of Waste Heat recovery power plant**	**79.2**	**In house**	**-**	**-**	**1269**
	23	HPSV replacement with LED lamp	5.2	Capex	3	0.57	84
	24	Install VFD for Boiler feed (90KW) pump-02 of WHR	3.2	In house	-	-	52
	25	Install VFD in firing blower (160KW) of coal firing circuit	1	In house	3	3	16
		Total Savings	**88.6**		**6.0**	**0.07**	**1421**
2023-24	26	Replacement of HPSV with LED lamp	2.8	Capex	3.0	1.1	46
	27	40 MW solar power (off site)	1500	Capex	2000	0.8	72000
	28	AFR maximation with in house optimization	560	In house	20	-	3808
	29	Auxillary Power Reduction of CPP	10	In house	5	-	-
		Total Savings	**2072**		**2028**	**1.0**	**75854**

Glimpses of modification carried out

Cement Mill Classfier & CA Fan Upgradation



Coal Mill CFD : Modification

Raw Mill CFD : Modification

AQC : Booster Fan Bypassed Route After Modification

Cooler Fan Upgradation for higher production rate

Cooler Mechanical Flow Regulator Optimized

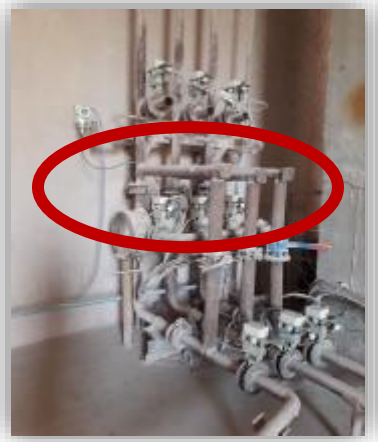
Glimpses of modification carried out

SNCR Installation

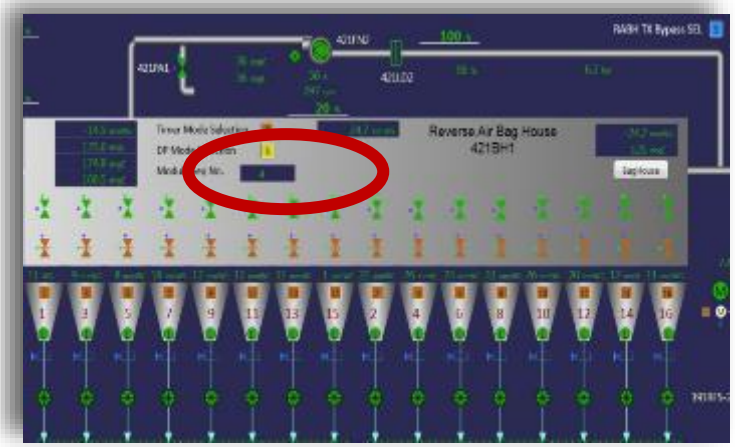
SP & AQC Boiler Damper Louver Modification:

SP Boiler Drag Chain modification

Preheater top feeding airslide modification



Raw meal Silo Aeration System Optimization



RABH DP mode Operation & RA Fan VFD Installation

Recent innovative projects

Sl No	Name of the Project	Brief description on why innovative (within 450 Characters)	Trigger for implementing the project (within 450 Characters)	Select Project category (A/B/C/D)	Replicability	Impact on SEC
1	Installation of IOT sensor (approximately 105) in all of plant key equipment's such as Kiln main drive, PH fan, Raw mill main drive, slag mill main drive and other critical drive)	Smart sensor installed in 105 equipment's continuously check the health of the key equipment's and anticipates issues if any.All the smart sensor parameters are being stored in cloud with easy access. It also have alert messaging system for concern. There are 2 major sensors alpha core and infinity	Real time monitoring of all equipment unable to anticipate the issues and there timely corrective / preventive actions. Enhanced equipment reliability. As real time message are float in case of deviation from standard parameters.	B	yes	0.01
2	Use of Model predictive control in kiln operation	Model predictive control is AI based tool and is programmed in a manner to anticipate the actions to be taken for process operations in an effective manner rather than operator taking actions to enhance process efficiency.	Due to real time corrective actions and artificial intelligence, it anticipate all the relevant action to enhance heat consumption.	C	yes	2 kcal
3	Installation of In-house liquid firing system with essential interlocks with DCS	The system was developed in-house and successful trial taken. All the key interlocks placed for equipment safety in DCS.	Ensured system in house system commissioning with safety aspects are meet as per standard.	D	Yes	-
4	Installation of VFD in belt conveyor of AFR system with interlocks.	This VFD enable to optimise the flow rate of the waste being fed into the calciner, hence regulate the optimised flow rate based on kiln conditions.	Enhance AFR usage in kiln system.	D	Yes	1 kcal
5	Installation off site solar of 40MW	To achieve the net zero target we should go for renewable energy. By this our plant durg reached 70% electrical energy consumption from renewable source.	Our company management decided to acheved net zero atrget till 2047.	C	Yes	-
6	Incorporation of PIDs in cement mill	PID installed in cement mill ie. Feed versus main drive load to enhance mill productivity and take real time action	+1% enhancement of mill productivity.	D	Yes	0.3

Renewable Energy : Aspects of Durg Unit

WHR & Solar Power:

The Durg unit operates a 10 MW Waste Heat Recovery (WHR) plant and a 5 MW on-site solar plant, installed in 2019, demonstrating a commitment to sustainable energy.

New Offsite Renewable Power:

A 40 MW offsite renewable power plant was commissioned in September 2023, significantly increasing the unit's renewable energy capacity.

80% Renewable Energy:

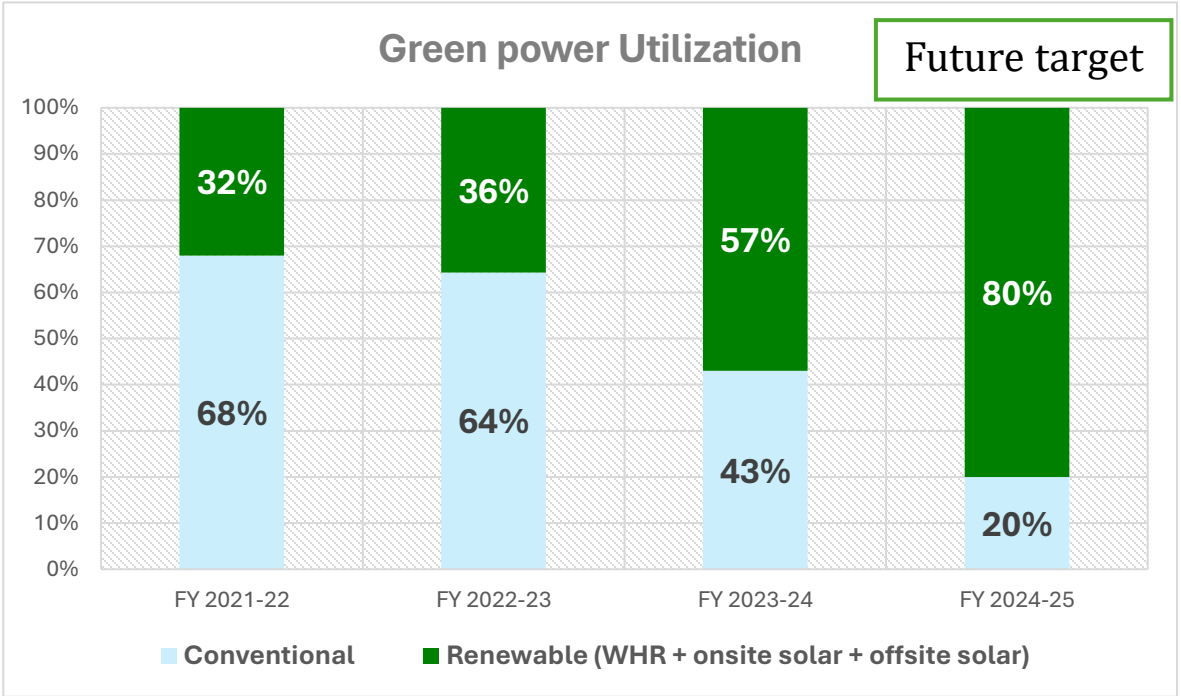
With the new installations, approximately 80% of the Durg unit's power now comes from renewable sources, significantly reducing reliance on fossil fuels.

CO2 Emissions Reduction:

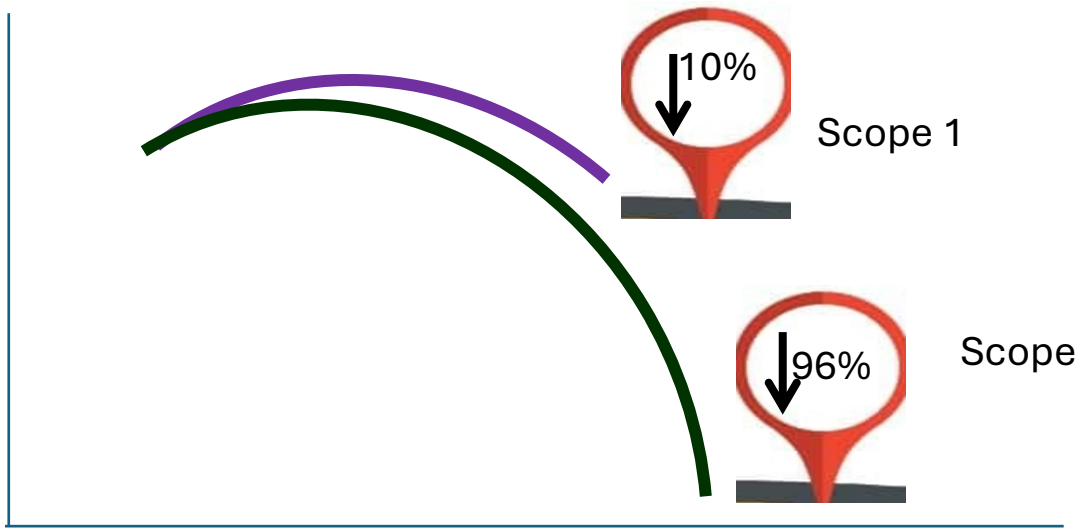
The shift to renewable energy sources has substantially lowered the Durg unit's carbon footprint, aligning with global CO2 reduction targets.

ESG Leadership:

These initiatives underline the Durg unit's strong commitment to Environmental, Social, and Governance (ESG) principles, setting a benchmark for sustainability in the industry.



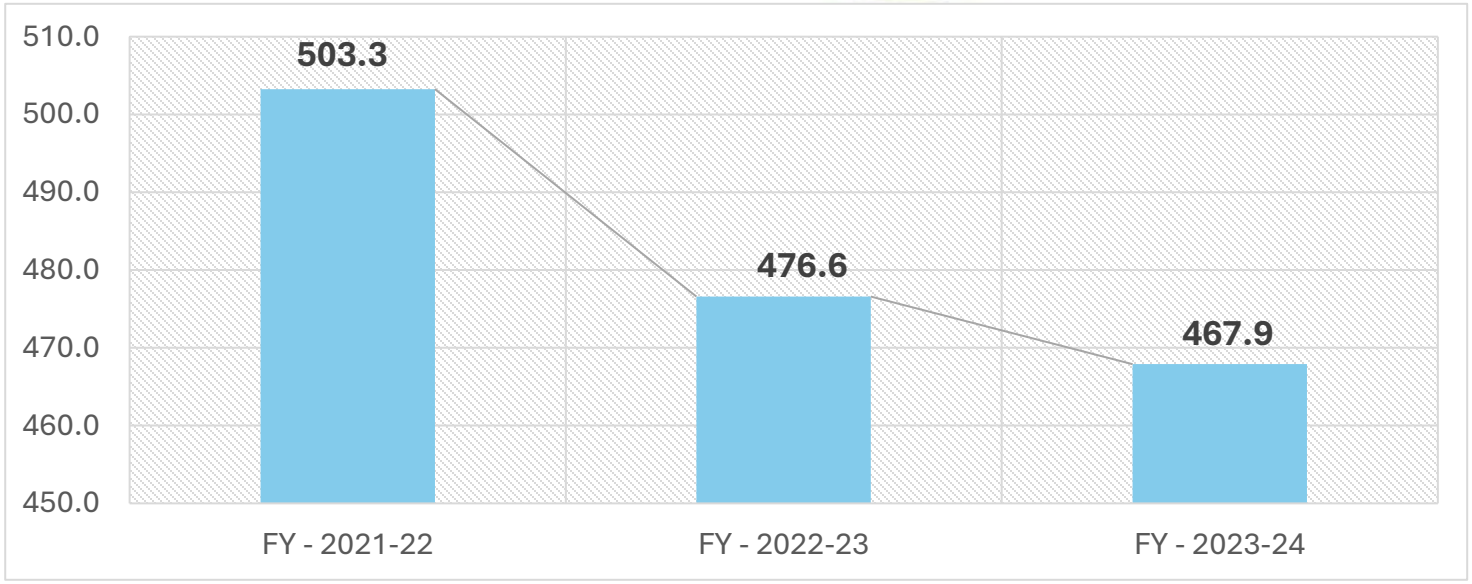
CO2 Reduction :



Carbon foot prints

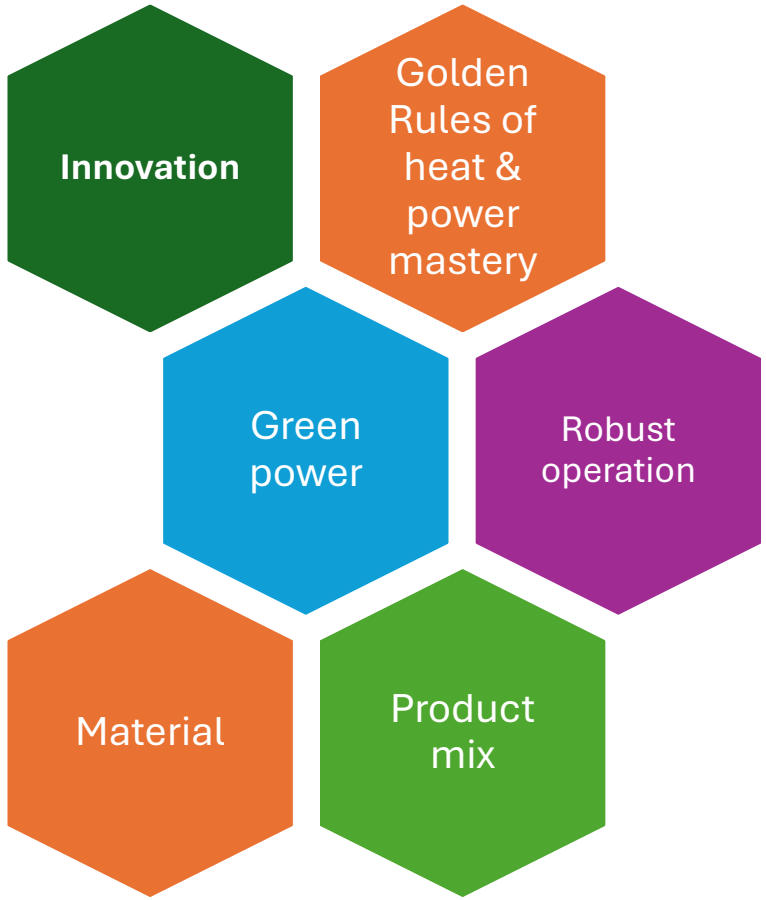
Specific Gross CO2
468 kg / t cement @
Durg Unit

~ 7.03% Reduction in CO2



*Gross = CO2 emission per MT major equivalent product @ Durg Unit

Driving Pillars



Carbon Neutral Road map

Deep Decarbonization

Sr.No	Levers	UoM	Baseline	Target			
			2023	2025	2030	2040	2050
1	Overall Electrical SEC	kWh/tn cement	64	63.8	63.5	63.12	62.80
1.1	Up to clinkerisation	kWh/tn Clk	51.75	50.72	50.21	50.21	50.21
				2.00%	1.00%	0.00%	0.00%
1.2	cement grinding	kWh/tn cement	37.44	37.25	36.88	36.42	35.87
				0.50%	1.00%	1.25%	1.50%
2	Thermal SEC	kcal/kg clinker	707	712	718	736	759
				0.75%	1.0%	1.25%	1.5%
3	AFR	%	6.60%	8.6%	12.9%	25.7%	41.2%
				30.0%	50.0%	100.0%	60.0%
4	WHR	%	31%	31%	31%	31%	31%
5	Own Power Generation	%	29%	25%	15%	10%	0%
6	RE	%	31.30%	34.77%	38.64%	48.3%	69%
				10.0%	10.0%	20.0%	30.0%
7	Clinker factor	%	0.53	0.53	0.52	0.52	0.51
				0.25%	0.75%	1.00%	1.50%
8	Fuel used in process Heating	%	0	0%	2%	30%	50%
9	EV deployment	%	0	0%	20%	50%	100%
10	Advance Technology	%	0	0%	0%	10%	15%
	CCUS	%	0	0%	0%	5%	10%

The Durg plant stands out for its exemplary Environmental, Social, and Governance (ESG) efforts. Key initiatives include producing higher blended cement (~90%) and ranking among the top five plants in India for best power consumption, according to the CII benchmark study

Thank You