adani
Cement

ENERGY EFFICIENCY SUMMIT -2024

ACC Limited, Jamul Cement Works

Presented By

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ACC

Company profile

- Plant Name- ACC Limited, Jamul Cement Works
- Owner- Adani Cement
- Products-PPC, PSC & Composite Cement
- Year of Establishment of Plant 1965
- New Plant commissioned- 2016
- Clinker production Capacity -3.6 Million Ton
- Grinding Capacity -3.0 Million Ton
- 25 MW Captive Power Plant
- 10 MW WHRS

Overview

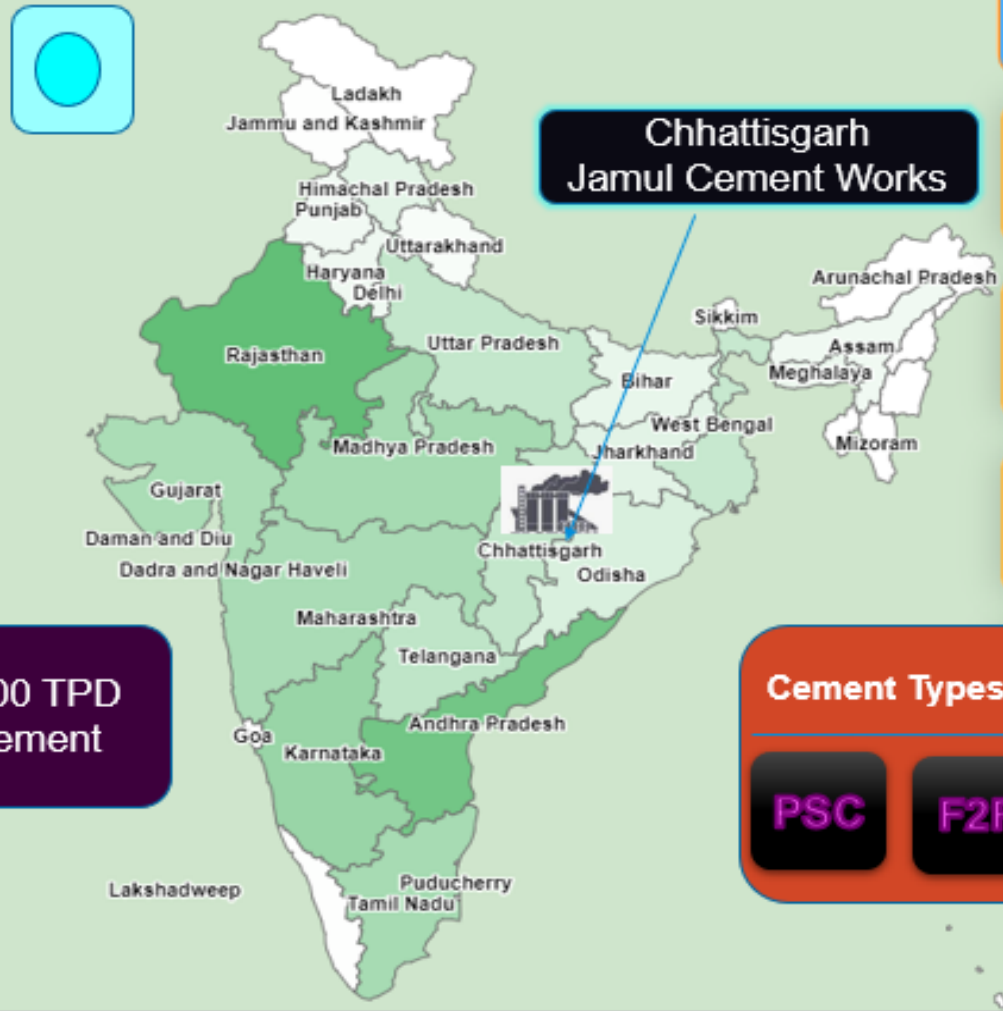
Old Jamul Commissioned in 1965
New Jamul Commissioned in 2016

1 No Kiln
9000 TPD

1 No Cement VRM
5000 TPD

6 No Ball Mill
3500 TPD

Plant Overview



8500 TPD Cement

3.6 MTPA
Clinker Capacity

3 MTPA
cement capacity

10 MW
Installed capacity of WHRS

25 MW
Installed Capacity : CPP

Cement Types

PSC | F2R | Gold | PSC

Jamul Plant Overview

- **Kiln** : 1 No. (9000 TPD)
- **Raw Mills** : 2 Roller Press (350 TPH each)

- **Cement Mills :**
  - Cement VRM : 1 No. (200 TPH)
  - Ball Mills : 6 Nos. (35 TPH each)
- **Packing house :**
  - 6 Nos single disch. (100 TPH)
  - 2 Nos double dish. (240 TPH

- **Cement dispatch facility**
  - By Road : 40%
  - By Rail : 55 %
  - By Bulk : 5%
- **Total area (Acres) : 1513**
  - Mines : 1052 Acres
  - Plant : 257 Acres,
  - Colony : 204 Acres
- **Mines contribution :** Daily target 16000 T
  - Jamul mines : 50%
  - Patharia 1 & 2 : 35%
  - NK Mines : 15%

JAMUL : MAJOR EQUIPMENT & CAPACITY

Quarry

- Jamul Mines
- Pathariya Mines
- SMPL
- Nandini Kundhini Mines

Crusher

Limestone Crusher
Type-Impactor -1600 TPH
Make: L&T Hazemag
Product size: 95%<40mm

Raw Mill

- Type -RP -700 TPH (350 TPH*2)
  Make- KHD
- Drive-2X 2000 KW
- Product size -15 % on 90 Mic

Blending Silo

- 1 X 16500 MT
- Inverted cone type

Kiln

- Pre-heater-Type: 6 stage ILC
- Make KHD
- Kiln – Length -82 m, Dia-3.6m, Cap:9000 TPD,
- Cooler -IKN Pendulum Cooler

Clinker Silo

- Capacity : 75,000 tons
- Dia :
- Height :

Coal Mill

- Type- VRM -Make- Loesche ,Model -LM43.5 , Cap -90 TPH, Drive 1200 KW

Cement Mill- 1CVRM+6 Ball Mills

Type- VRM-Make Loesche, Model LM56.3+3CS, Cap -195tph, Product size <8% on 45 µ

Type-Closed Circuit Mills
Cap-30 TPH X6 mills
Make- 3 BM-Taylor,
3 BM Vickers

Cement Silo

5 Cement Silos
Silo 1-16 (1000 tn each)
Silo1/PPC: 5500 tn
Silo2/ F2R: 5500 tn
Int.PSC: 5000 tn
Int. F2r: 5000 tn
Silo 19,20& 21:3000 tn

Packing House

- 8 Packers Machine
- 6 X 100 TPH –8 spouts single discharge
- 2 X 240 TPH, 16 spots, double discharge packer

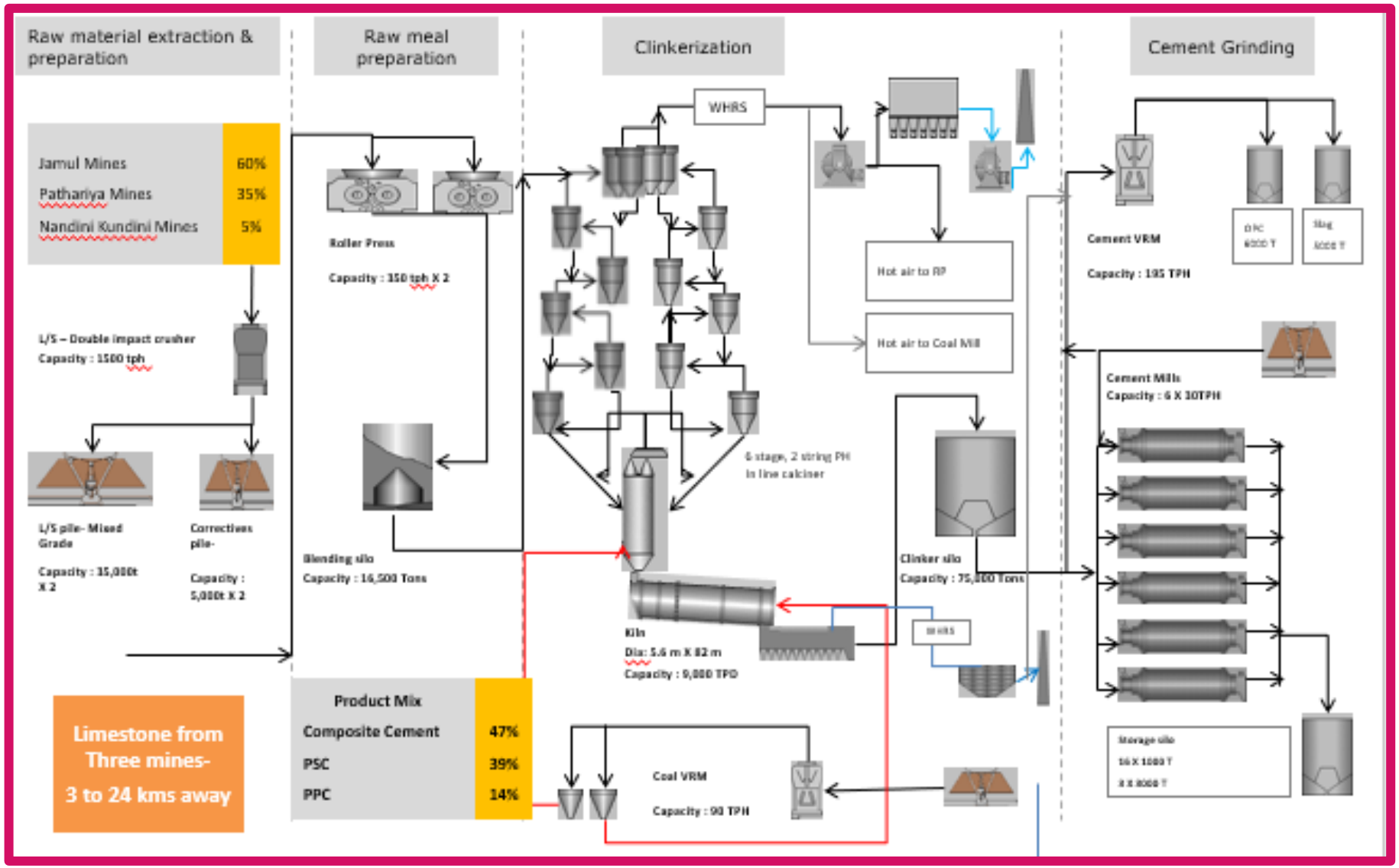
Dispatch

12 Wagon Loader 120 TPH,
10 Truck Loader, 120 TPH
Bulk Loading, 100 TPH

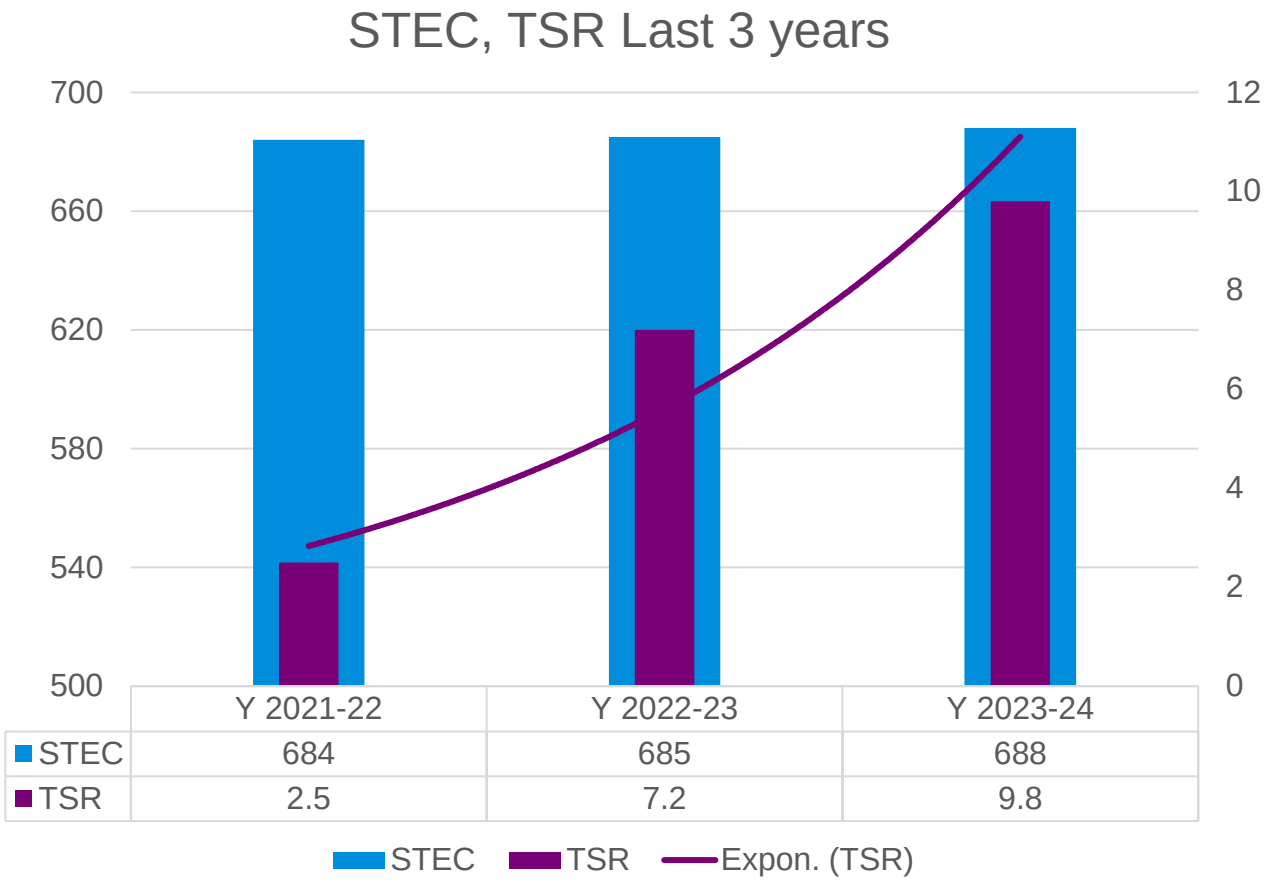
ACC

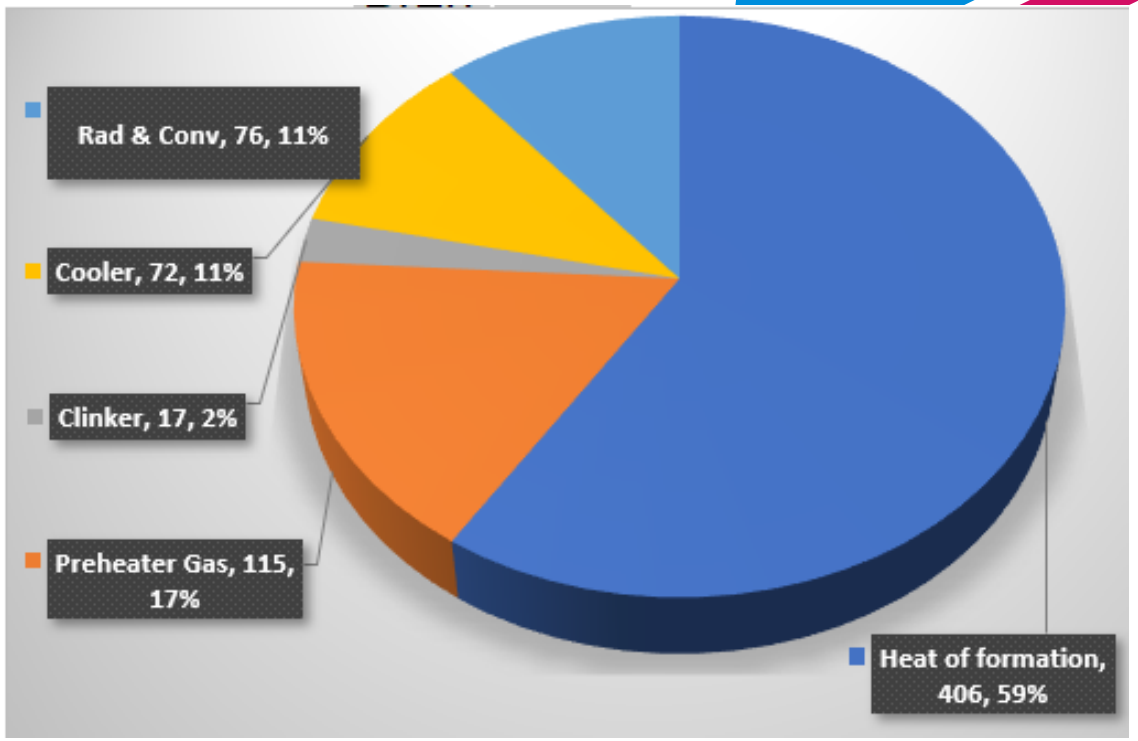
CPP 25 MW **WHRS** 10 MW **Solar** 5.35 MW

Process/Technology/Specification/Jamul plant



Thermal, SEEC, kcal/kg Clinker with AFR

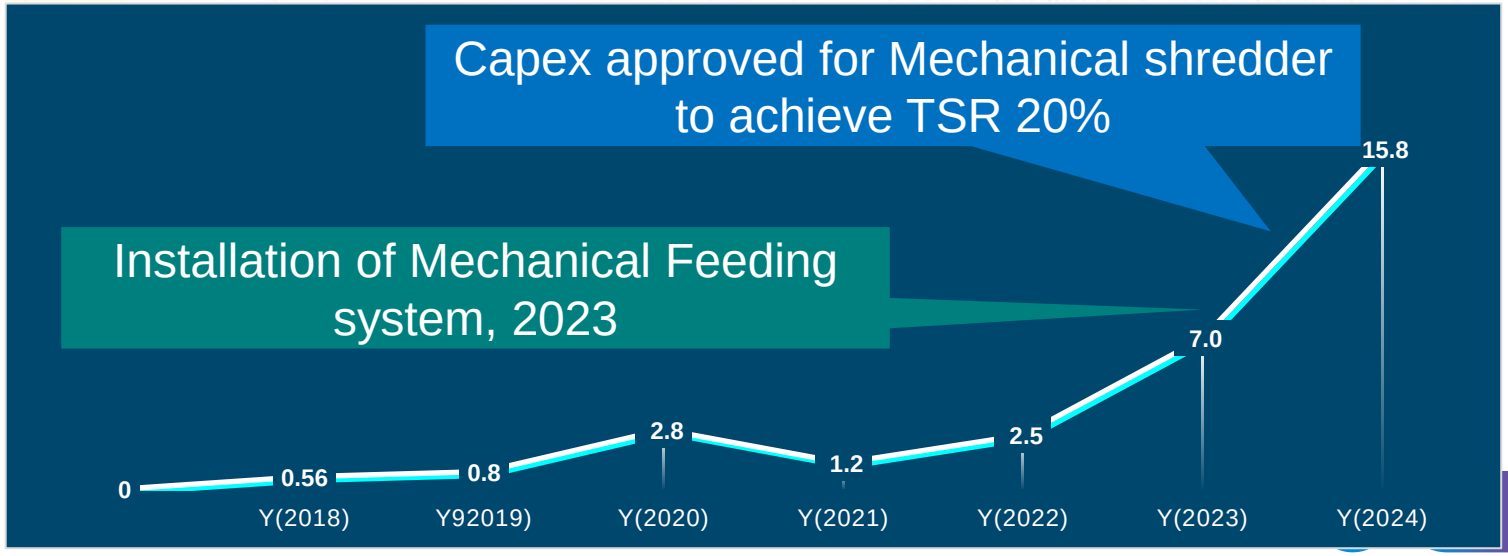




The increase in STEC is due to the usage of higher AF% gradually, target TSR is 20% with installation of shredder.

Alternate Fuel Pre-processing Facility- Jamul

The commissioning of the Jamul Cement Works in 2016 marked a significant milestone with a kiln capacity of 10,000 tons per day (tpd). The adoption of Alternative Fuel (AFR) usage began in 2018 at a modest rate of 0.56% through manual methods. Over the years, the utilization increased to a commendable 2.5% by 2022. However, the real breakthrough occurred in 2023 with the implementation of a mechanized feeding system, leading to a remarkable increase in AFR usage to 12.5%. The plant team now aspires to achieve an ambitious target of surpassing 20% AFR usage while maintaining clinker production volume.

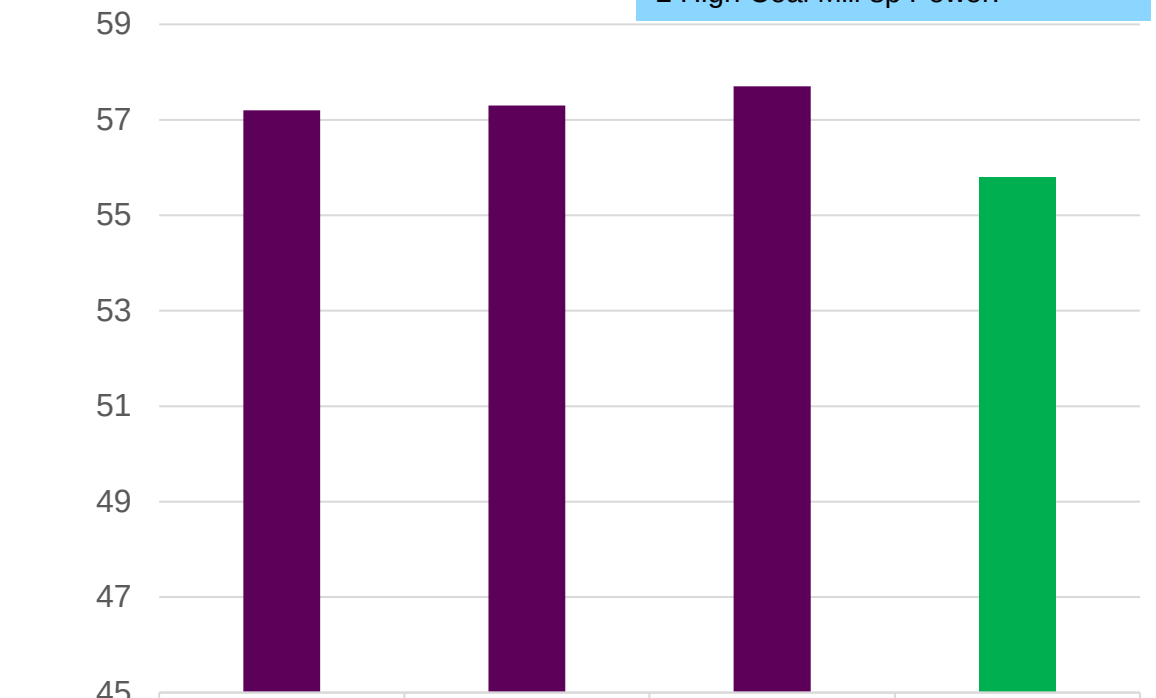


Heat Balance

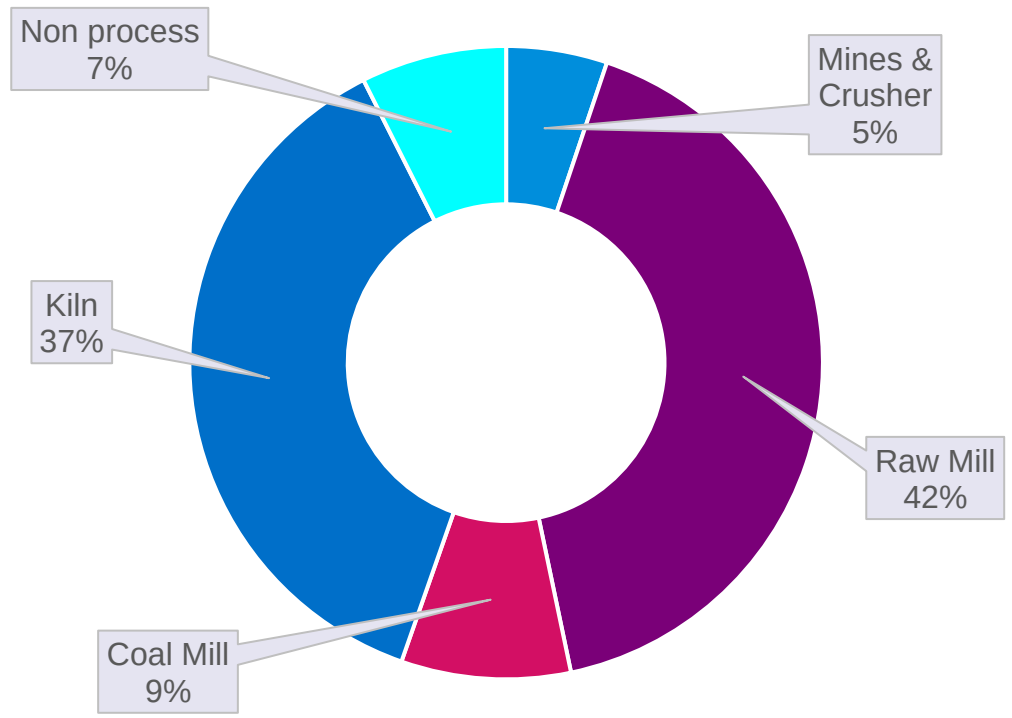
SN	Areas	Heat Output	Comment
1	Heat of formation	406	Al2O3 ,-5.5%,Mg0-3.5%,Ca0-62%,Si02 -22%, Fe203-3.8%
2	Preheater Gas	115	Gas Temp 250 Deg C, Gas Flow 1.3 Nm3/kg clk, O2- 1.8%
3	Clinker	17	Clinker Temp 110 De c
4	Cooler	72	Mid Air Temp 310, waste Air 125, Air Flow 0.95 Nm3/kg clk
5	Rad & Conv	76	Kiln+ Preheater+ Cooler=TAD
	Total	685	Operating at average TSR 9.8%.

SEEC- Clinkering

1 Increasing TSR from 7 to 14 %
2 High Coal Mill sp Power.



	2021-22	2022-23	2023-24	target
SEEC-Clk	57.2	57.3	57.7	55.8



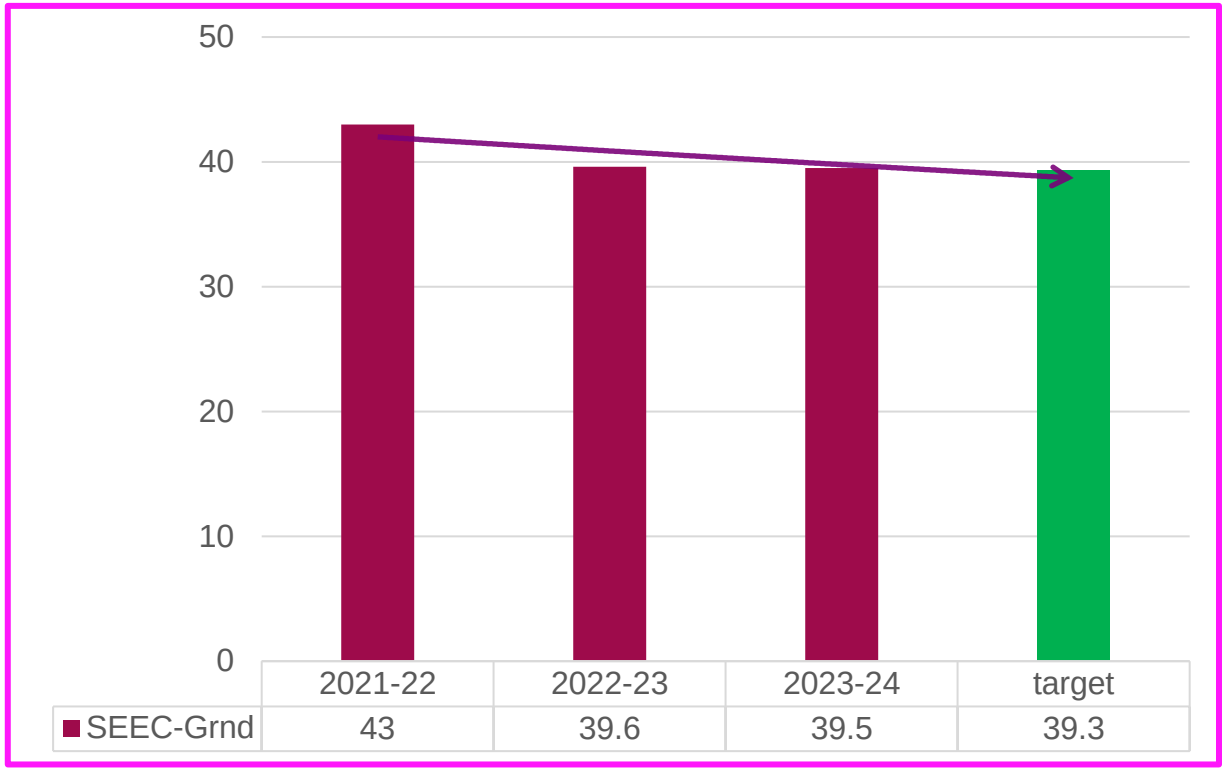
Planning to reduce Clinkering SEEC by taking action majors like increasing clinker prdn tpd from 9500 to 10000 average TPD, Roller and Motor replacement of Raw Mill, Coal VRM grinding tools replacement etc.

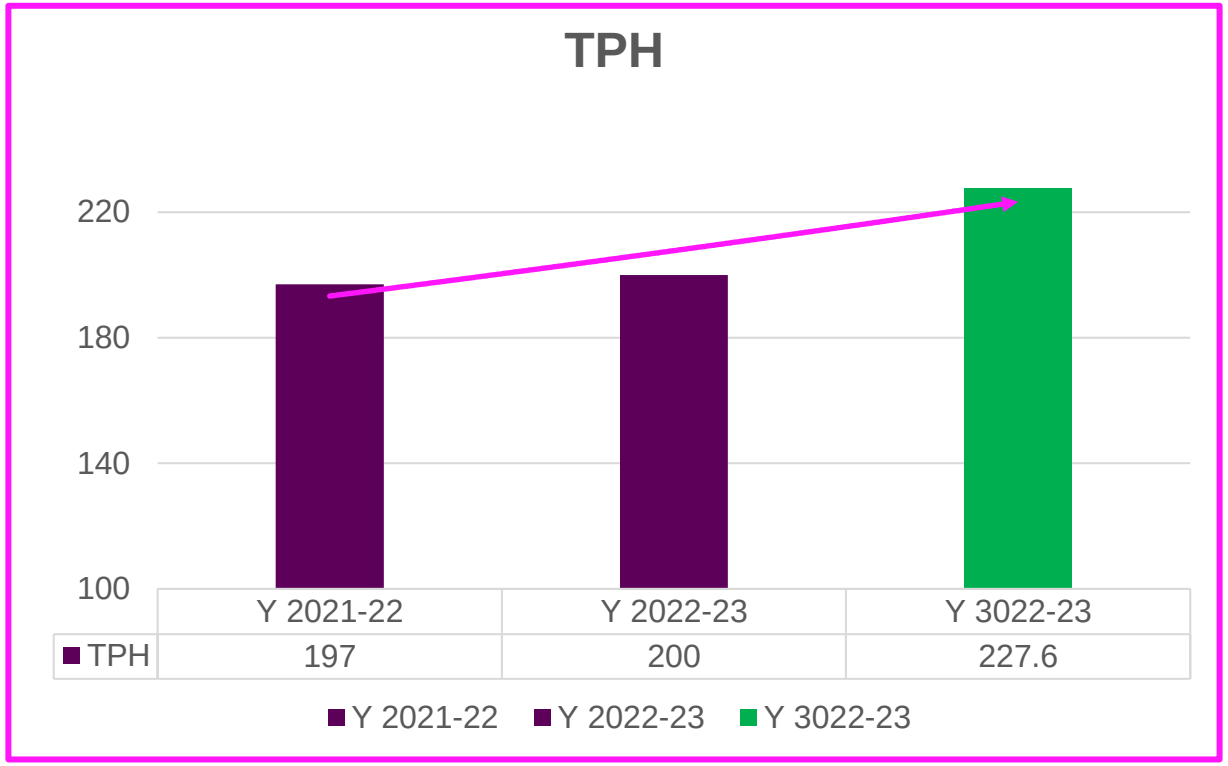
Clinkering Power: Reduction target by 3 unit

Section	Kwh/t Mat	Factor	Kwh/t Clinker
Mines and Crusher	1.9	1.57	3
Raw Mill	15.8	1.52	24
Coal Mill	50	10%	5
Kiln	21.5	1	21.5
Non process	4.3	1	4.3
TOTAL			57.8

Kwh/t Mat	Factor	Kwh/t Clinker
1.7	1.57	2.7
15	1.52	22.8
40	10%	4
21.3	1	21.3
4	1	4
		54.8

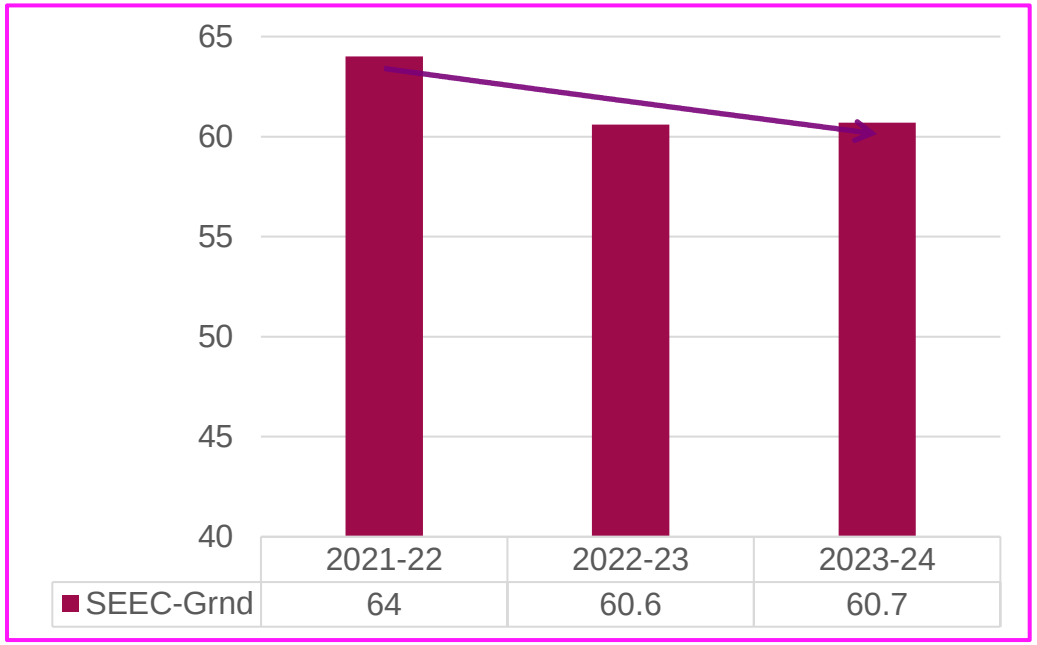
SEEC- Grinding

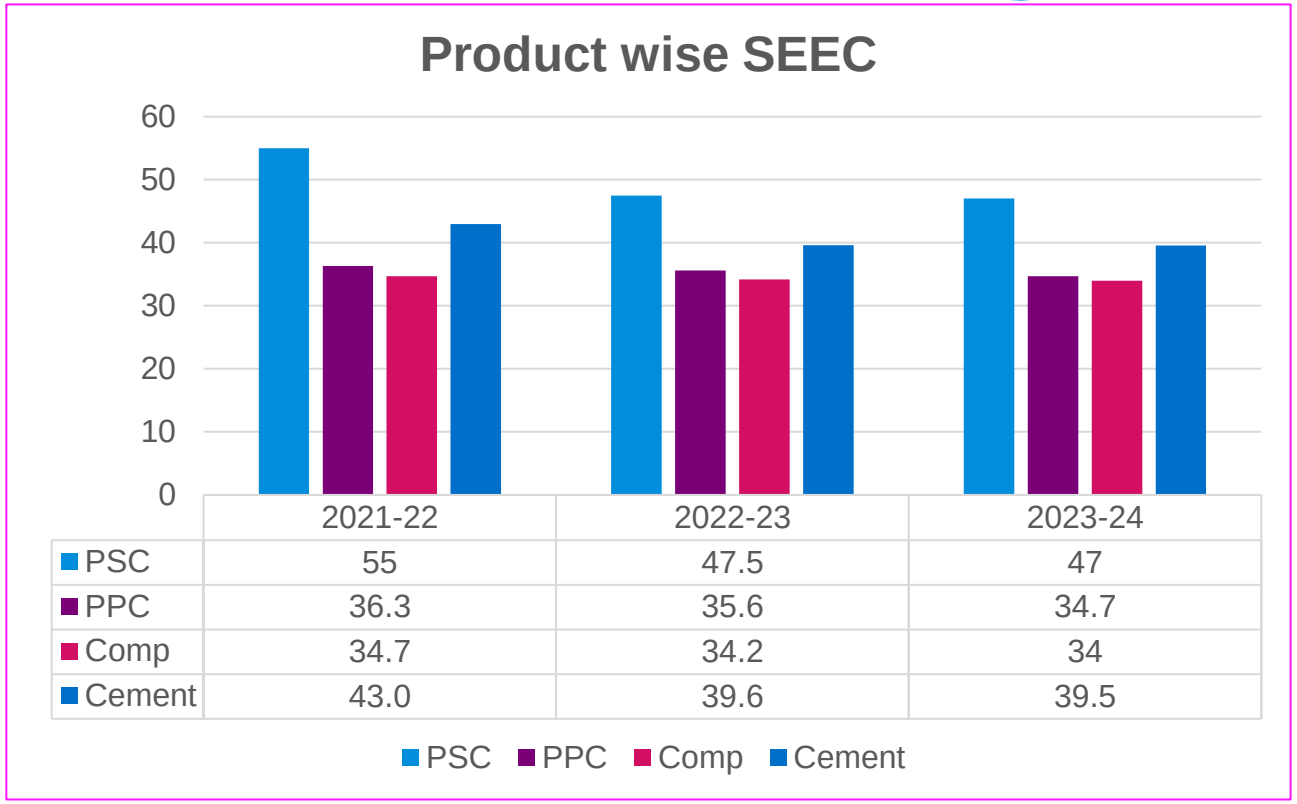




Grinding Electrical Energy for Cement Production has gradually reduced over the years by taking optimisation majors like increasing tph of CVRM and reducing running hours of old Cement Ball Mills consuming sp power > 50 kwh/t

SEEC- Cement





The reduction in overall power consumption is due to reduction of cement grinding power. Planned to reduce the power by 1 unit with replacement of low efficient CVM Booster fan and optimizing Ball Mills till replacement.

SEEC- Cement product wise

Period	Volume in tons				Volume in %			
	PSC	PPC	Composite	Total	PSC	PPC	Composite	Total
2021-22	7,00,488	2,39,519	8,27,343	17,67,350	39.6	13.6	46.8	100
2022-23	7,23,811	2,53,187	8,71,242	18,48,240	39.2	13.7	47.1	100
2023-24	9,47,740	2,46,930	10,59,485	22,54,155	42	11.0	47.0	100

Period	Grinding power, kwh/t				Comment
	PSC	PPC	Composite	Total	
2021-22	55	36.3	34.7	43.0	Ball Mill having Very Old and obsolete Circuit
2022-23	47.5	35.6	34.2	39.6	CVRM TPH as well Ball Mill power reduction
2023-24	47	34.7	34	39.5	Optimisation of CVRM TPH

The reduction in overall power consumption is due to reduction of cement grinding power

TEAM

CRUSHER

1 Looking after to maximise Crusher TPH > 1300 tph

2 Replacement of High Capacity Compressor to avoid idle /unloading hours

3 Reverse interlock for avoiding Idle Hours.

RAW MILL

1 Replacement of damaged RP roller.

2 Increasing Hydraulic pressure above 120 bar

3 Increasing Roller RPM

4 Modification of Mill fan inlet box to reduce pressure drop

COAL MILL

1 Replacement of worn our Roller and Tires.

2 Replacement of scatter ring

KILN

1 Increasing Kiln feed to average 10,000 tpd.

2 Modification of preheater fan inlet box to reduce pressure drop by 50 mmwg

Internal and external Bench marking

Parameters	Electrrical SEEC	Thermal STEC
SEEC value of JCW	55.8	698
UOM	Kwh/t Clk	Kcal/kg Clk
Competitor 1- Internal	A	A
SEEC Value for competitor	42.6	696
Competitor 2- Internal	B	B
SEEC Value for competitor	42.7	692
Competitor 3- Internal	C	C
SEEC Value for competitor	44.8	692

SHORT TERM AND LONG TERM TARGET AND ROAD MAP

SHORT TERM: ACTION PLAN

1 Crusher : Replacement of Over Capacity Compressor to suitable size and Increasing Crusher TPH from 1200 to 1350 average with supply chain management from Mines

2 Replacement of Raw Mill Damaged Roller to increase feed from 650 to 700 tph. With increasing roller rpm and hyd pr.

4 Modification of Raw Mill separator fan/Preheater fan inlet box to reduce pressure drop

5 Replacement of HighCapacity preheater fan to accommodate more TSR

5 Replacement of wornout grinding tool and Internals of Coal and Cement VRM

LONG TERM ACTION PLAN

1 Enhancement in WHRS Power generation capacity from 10 MW to 15 MW

2 Modification of inclined V Separator to Vertical V separator

3 RP power consumption- implementation of study report points of OEM, Conversion of Complex circuit (2 RP + 1 Separator) to separate circuits (2 RP +2 separator)

5 Replacement of low efficiency Preheater fan with high efficiency PH fan with increased KW and volume

6 Replacement of High power consuming old Ball Mills with new VRM

List of Major Encon projects Planned in 2024-25

SN	Project Title	Annual Elect saving, Million kwh	Annual Thermal Saving ,Million kcal	Saving in Million/Annum	Investment Rs in Million
1	Replacement of Damaged Roller of RP1.	5	0	32.8	30
2	Modification of RP separator fan inletbox to reduce pressure drop about 50 mmwg	1.2	0	0.7	0.1
3	Replacement of Roller and tyres of CVRM to increase production from 210 to 225 tph ,Modification of damring by loesche to reduce frequent worn out	3.3	0	21	15
4	Removal of Preheater downcomer damper with slide gate to reduce pressure drop.	0.8	0	5	0.1
5	Cement VRM low efficient Booster fan replacement.	0.7	0	4.8	10
6	Increasing Coal Mill TPH from 50 to 65 tph with necessary replacement of grinding tools and internals.	2.7	0	17	10
8	Use of AI for optimizing coal firing fuel tph with flame image analysis.	0	5991	13	10

Summary of Projects implemented in last 3 years

Year	Title of Project	Investment Made (Rs million)	Annual Electrical Saving (Million kWh)	Annual Thermal Saving Million Kcal/kg	Total Annual Savings (Rs million)	Impact on SEC/ SHC (Electrical kWh /MT cement
2021-22	9	46.32	3935	0	17.04	2223.2
2022-23	4	1101.2	82	0	478.06	44.5
2023-24	3	85	4.1	0	57	1.2

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List of Major Projects Implemented in FY 2021-22

No	Title of Project	Investment Made (Rs million)	Annual Electrical Saving (Million kWh)	Annual Thermal Saving Million Kcal/kg	Total Annual Savings (Rs million)	Impact on SEC/ SHC (Electrical kWh /MT cement
1	Condensor tube replacement in 25 MW TG	9.5	3933.0	0	4.9	2222.034
2	High efficient BFP installed and operate 1 out of 2 existing running BFP in CPP	10	0.816	0	4.896	0.461
3	Installation Energy Efficient Cooling water pumps with VFD in place of existing pumps	17	0.816	0	4.81	0.461
4	PID optimization in Pyro section	0.22	0.285	0	2	0.161
5	High Efficiency Motor and VVFD installation of ball CA Fan to improved PRI	3.3	0.01504	0	0.10528	0.008
6	High Efficiency Motor (IE3) and VVFD installation in Ball Mill Separators to improved PRI	2.2	0.0144	0	0.1008	0.008
7	High Efficiency Motor (IE3) and VVFD installation in slag dryer	2.9	0.012	0	0.084	0.007
8	Installation of VVFD in Clinker silo top Bag filter	0.65	0.010560	0	0.07392	0.006
9	Installation of VVFD in Raw Mill blending silo aeration blowers	0.55	0.0099	0	0.0693	0.006
		46.32	3934.9789	0	17.0393	2223.152

ACC

List of Major Projects Implemented in FY 2022-23

No	Title of Project	Investment Made (Rs million)	Annual Electrical Saving (Million kWh)	Annual Thermal Saving Million Kcal/kg	Total Annual Savings (Rs million)	Impact on SEC/ SHC (Electrical kWh /MT cement
1	10 MW WHRS Installation	1100	81.5	0	472.5	44.04
2	VFD Installation in Blower, Bagfilters in Clinkering section	1.2	0.55	0	3.63	0.3
3	Auto PID Logic developed for CEP running at optimum Discharge pressure	0	0.10	0	0.73	0.06
4	Auto PID Logic developed for BFP running at optimum Discharge pressure	0	0.20	0	1.2	0.11
		1101.2	82.33	0	478.06	44.5

List of Major Projects Implemented in FY 2023-24

No	Title of Project	Investment Made (Rs million)	Annual Electrical Saving (Million kWh)	Annual Thermal Saving Million Kcal/kg	Total Annual Savings (Rs million)	Impact on SEC/ SHC (Electrical kWh /MT cement
1	Modification of AFR Circuit to increase TSR upto 20%	60	0	0	30	0
2	CVRM Optmisation process to increase feed from 205 to 225 tph	20	3.2	0	21	1
3	Replacement of 6 no of Bag filter fan constant Drive Motor to VFD Drives	5	0.9	0	5	0.2

Innovative Project 2024

- **Name of the Project**- Installation of Solid AF feeding system
- **Year of Implementation**- 2024
- **Brief description-** To achieve TSR upto 20 %
- **Trigger for implementing the project-** To improve reduce overall fuel mix cost by 10 paise /1000 Kcal
- **Replicability**- Yes

Innovative Project 2024

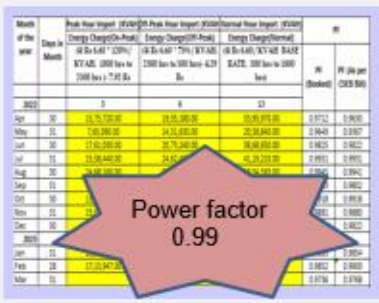
- **Name of the Project**- Reduction in SACC by adopting the alternative power sourcing
- **Year of Implementation**- 2024
- **Brief description-** The majority of cost element are Fuel & Power. Since Fuel totally depends on market and hence, team has focused on power mix optimization and reduction in SEEC. Team has taken target to achieve >50% (2000 MWH) of scheduling solar energy.
- **Replicability**- Yes

Potential Contributors :

1. Frequent stoppage of equipment. (unplanned stoppages)
2. Gaps in inter departmental communication
3. CPP load reduction below 8 MW
4. Advance planning for planned stoppage, resulting improvement in forecasting of off solar power requirement.
5. High power consumption of equipment in utility department.

Actions implemented -

Rescheduling done in continuous basis as per plant load



Close monitoring of every 15 minutes

Awareness regarding off solar power

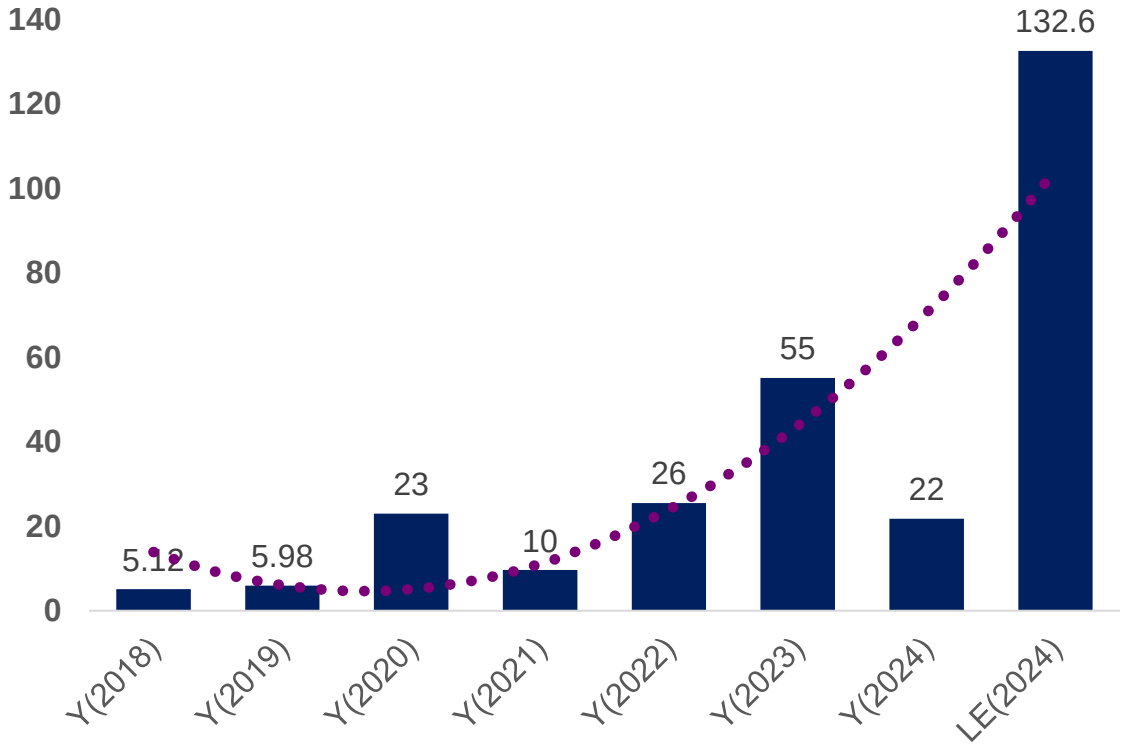
New Identified Jobs...

OBSERVATION REPORT & PROPOSED ACTION PLANS- PROCESS FANS

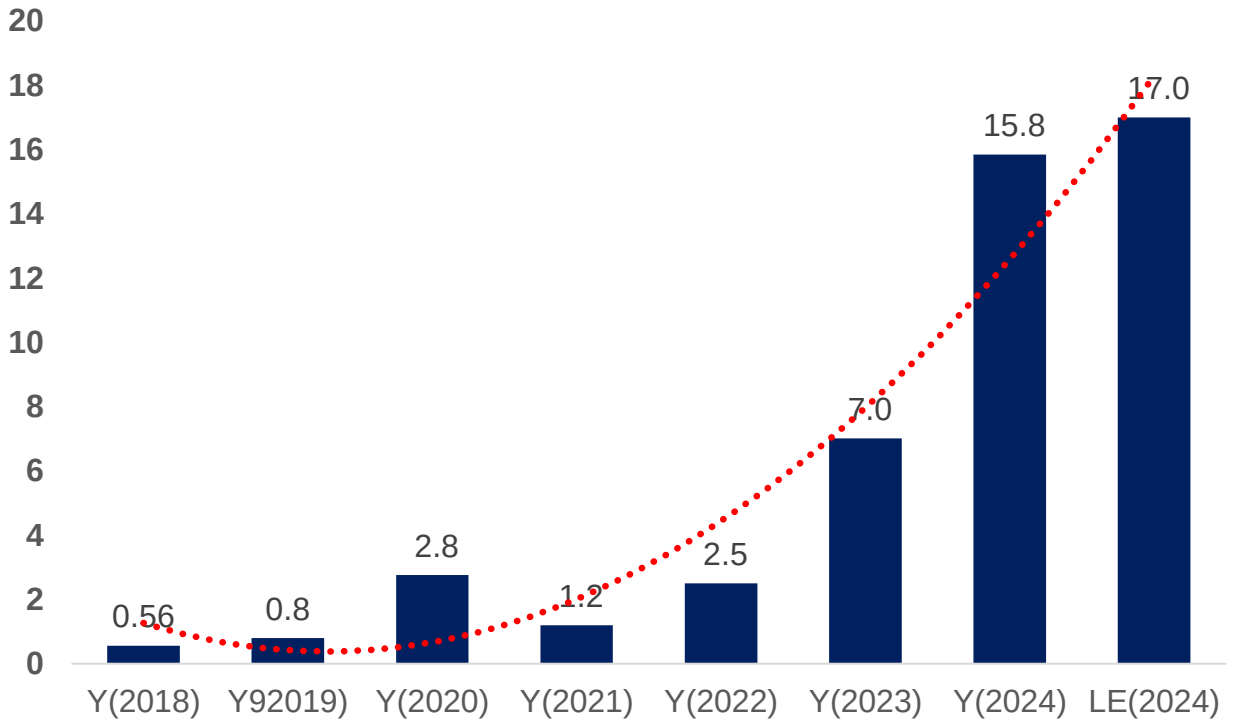
FANS	STATUS	PROPOSED ACTION PLAN	REMARKS
PH FAN	Margin available on Design	Fan Inlet Box Modification (In house)	Estimated Potential:
	Flow : 10%, Pressure: NIL & Speed: > 10%	To reduce gap between Fan Inlet & Duct Velocities	60-70 Kw at existing Oprn Parameters
	Efficiency : > 78% against Design 78%	may have reduction in Fan Speed & Power	>25-30 Lacs INR / Year
	Velocity Profile: Fan I/L: 30 m/s	at present parameters	
	Fan I/ Duct: 18 m/s		
	Motor: 4100 Kw Drive: VFD & No Damper		
RP SEP FAN	Margin available on Design	Fan Inlet Box Modification (In house)	Estimated Potential:
	Flow : 10%, Pressure: NIL & Speed: NIL	To reduce gap between Fan Inlet & Duct Velocities	60-70 Kw at existing Oprn Parameters
	Efficiency : > 75% against Design 73%	may have reduction in Fan Speed & Power	>25-30 Lacs INR / Year
	Velocity Profile: Fan I/L: 31m/s	at present parameters	
	Fan I/ Duct: 16 m/s	For future Plan on Production upgradation	
	Motor: 3865 Kw, 745 RPM Drive: VFD No Damper	Consider Retrofit (Long Term)	
CM VRM BOOSTER FAN	Margin available on Design	Retrofit with optimized	Estimated Potential:
	Flow : > 10%, Pressure: > 70% & Speed: <35%	parameters	> 100 Kwh
	Efficiency : <45% against Design: 78%	Retrofit Shaft & Impeller	> 30 lacs / year
	Velocity Profile: Fan I/L: 25 m/s	utilizing existing Casing	
	Fan I/ Duct: 15 m/s	Motor/ Drive etc.	
	Motor: 850 Kw, 990 RPM Drive: VFD		

Waste Co-process in Jamul Kiln

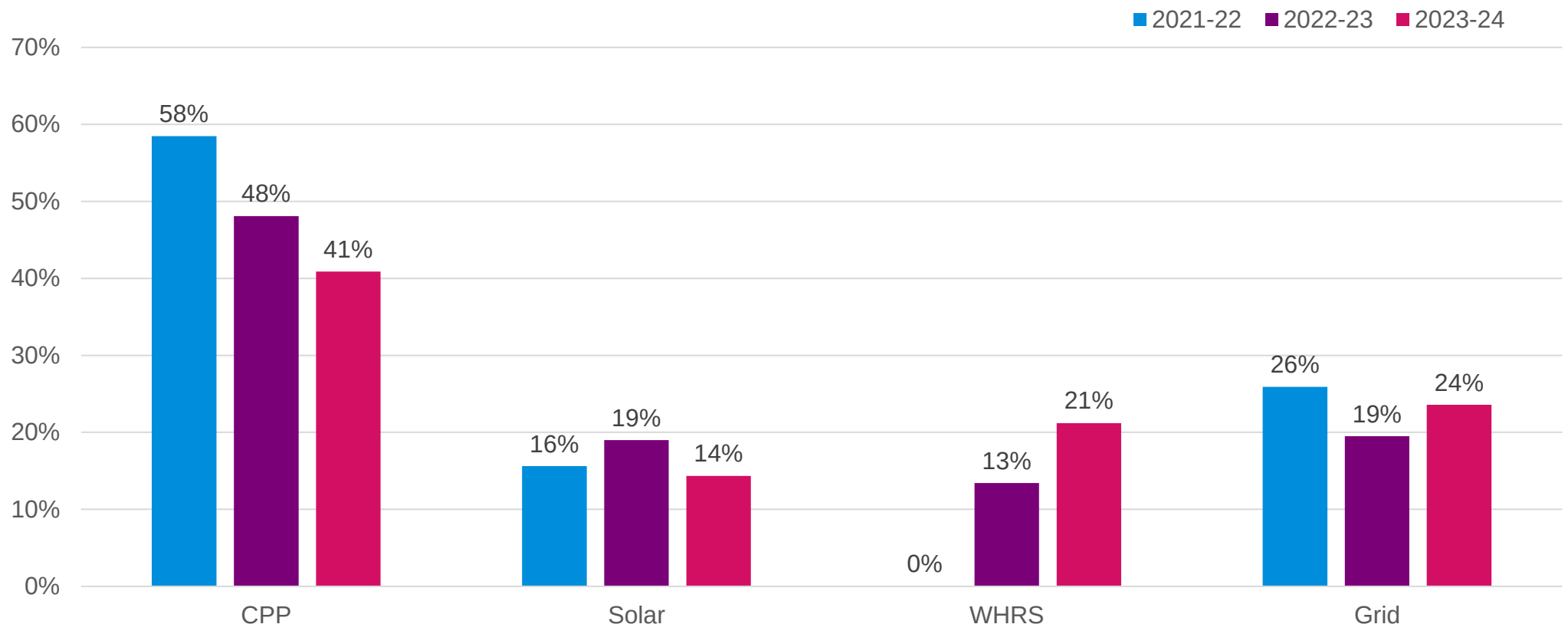
AFR Usage.kt



TSR %



Power Source Breakup



Power Breakup

	2021-22	2022-23	2023-24			2021-22	2022-23	2023-24
Source	Consumption	Consumption	Consumption		Source	Consumption	Consumption	Consumption
CPP	167.7	128.8	133.6		CPP	58%	48%	41%
Solar	44.8	50.9	46.9		Solar	16%	19%	14%
WHRS	0	35.9	69.3		WHRS	0%	13%	21%
Grid	74.3	52.2	77.1		Grid	26%	19%	24%
Total	286.8	267.8	326.9		Total	100%	100%	100%

Power consumption in Million kwh unit

Utilisation of Renewable Energy Resources

Onsite Generation

Year	Technology (Solar, wind biomass etc)	Installed Capacity (MW)	Generation (in Million kWh)	Consmption (million kWh)	% of overall electrical energy consumption	Share%
2021-22	Solar	5.35	7.575	7.575	3	100
2022-23	Solar	5.35	7.644	7.644	2.88	100
2023-24	Solar	5.35	7.406	7.406	2.26	100

Year	Technology (Solar, wind biomass etc)	Installed Capacity (MW)	Generation (in Million kWh)	Consmption (million kWh)	% of overall electrical energy consumption	Share%
2021-22	WHRS	0	0	0	0	0
2022-23	WHRS	10	38.3	36	13.55	100
2023-24	WHRS	10	73.85	69.32	21.20	100

Capacity addition in FY 2020-2023- Installation of 10MW WHRS Power plant
Year of addition- 2022
Investment made Rs. In Lakhs- 11000

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Utilisation of Renewable Energy Resources

Offsite Generation

Year	Technology (Solar, wind biomass etc)	Total offsite Installed capacity (MW)	Contract demand of the Company (MW)	Consumption by the company(million kWh)	% of overall electrical energy consumption	Share%
2021-22	Solar	30	20	37.33	15	100
2022-23	Solar	30	20	43.33	16.3	100
2023-24	Solar	30	20	39.49	12.08	100

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Power break up Million kwh

Source	2021-22	2021-22	2022-23	2022-23	2023-24	2023-24
	Generation	Consumption	Generation	Consumption	Generation	Consumption
CPP	185.8	167.7	142.3	128.8	148.4	133.6
On site Solar	7.5	7.5	7.6	7.6	7.4	7.4
Off Site Solar	37.3	37.3	43.3	43.3	39.5	39.5
WHRS	0	0	38.37	35.9	73.8	69.3
Grid	74.3	74.3	52.2	52.2	77.1	77.1
Total	304.9	286.8	283.8	267.8	346.2	326.9

GHG Inventorisation

Year	Scope 1 Emission	Scope 2 Emission	Scope 3 Emission	Total Emission	Unit
2021-22	622	19.54	107.6	749.2	Kg C02/t
2022-23	639	12.45	86.14	737.6	Kg C02/t
2023-24	595	17.45	83.7	696.1	Kg C02/t

GHG Emission Intensity (Kg CO2 / Ton of Product) of peers/competitors- 576.05 (kg CO2 / t cem mat)

Emission Intensity of last 3 years

Year	NOx (Mg/Nm3)	SO2 (Mg/Nm3)	CO (Mg/Nm3)	VOC (Mg/Nm3)
2021-2022	322	17	10.49	4.5
2022-2023	318	22	16.04	4.7
2023-2024	380	21	17	2.1

Target and Action plan for CO2 Emission reduction

Target :

1. **Scope -1 :**
   - Short term Target year 2024-25 will be 520 kg CO2 /T product
   - Long term Target year 2025-26 will be 470 kgCO2/T Product
2. **Scope -2**
   - Short term Target year 2024-25 will be 15 kg CO2 /T product
   - Long term Target year 2025-26 will 12 kgCO2/T Product

Action Plan for CO2 Emission Reduction

- To reduce CO2 emission maximum production of PSC will be done around 50% for 2024-25 followed by Composite Cement with production around 35% and PPC production will be around 10%.
- Subsequently in the coming financial years of 2025-26 and 2026-27 PSC and Composite Cement production will increase and PPC production will reduce
- Use of Alternate Fuel in the year 2024-25 will be around 15% of the total fuel consumption and the same will increase up to 20% by 2025-26

Emission Intensity FY 2022-23	Cement Group-1	ACC	Cement Group-2	Cement Group-3	Cement Group-4
Scope1 Co2 Emission (Kg CO2 /T Cmnt Mte	513 (Excluding CPP)	466 (Excluding CPP)	557 (Excluding CPP)	521 (Excluding CPP)	463(Excluding CPP)

EMS System and Other requirement

1. Existing energy monitoring system / IOT system-Yes

a) Level of monitoring- Up to Individual Sectional Power
b) Challenges and upgradation- IOT system

2 Green Co certification- Yes
3 ISO 50001 certification- Yes
4 Learning from CII or any other award program-

- Explore possibility to adopt the program learning in our existing installation for improvement
- Use of latest technology to reduce power consumption
- Further enhancement of WHR generation
- Further enhancement in AF co processing capacity
- Further increase in slag based cement production to reduce clinker consumption in cement.
- Install more solar power generation capacity

Net Zero Commitment

Roadmap for achieving the target-

1- 5.35 MWP onsite Solar plant installed ,
2 -20 MW offsite solar under PPA contract installed
3- Solid AFR started from 1.5% in 2021, targeting to achieve 25% in 2024-25.
4- Increasing WHRS Capacity from 10 to 12 MW with further modification in circuit.
5 Increasing PSC Cement proportion from 42 to 50%.
6 Migration towards Mines transport vehicles to EV .

Coming Projects

(1) Preheater fan inlet box modification to lower pressure dop by 50 mmwg, saving : 70 kwh.
(2) Bag House fan inlet Box Modification to lower pressure drop by 50 mmwg ,saving 60 kwh
(3) Replacement of low efficient (52%) CVRM booster by an efficient fan,saving 100 kwh
(4) Replacement of old High power consuming Ball Mills (SEEC> 55 kwh/t) with new VRM.
(5) Pumping of Dry flyash to CVRM classifier to increase feed tph and lower SEEC.
(6) Modification of PC and Orifice to increase residence time and orifice velocity to accomodate TSR > 25%.

Coming Projects: AI Level

(1) AI image processing of kiln flame to control kiln coal firing tph. Besides the project identified for Tracking for operation parameters to best fit the operation using heatmap and other machine learning tool.
(2) Discussion in line for building Automation Systems (BAS) for controlling Energy Management.
(3) Predictive Maintenance : Time series analysis, machine learning algorithms, and sensor data fusion for forecasting replacement of critical equipment component and minimising inventory.
(4) Quality Control and Assurance:
(5) Inventory Management: To optimise inventory control inline with maintenance management.
(7) Safety and Risk Management.: Identifying people violating the safety norms
(8) Connecting Kiln operation, Energy and Quality parameters to predict the deviation trend.

BAS implementation in Cement Plant

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