Welcome You All
Dalmia Cement (B) Ltd, Ariyalur Plant

23rd National Award For Excellence in Energy Management 2022

Team Members:

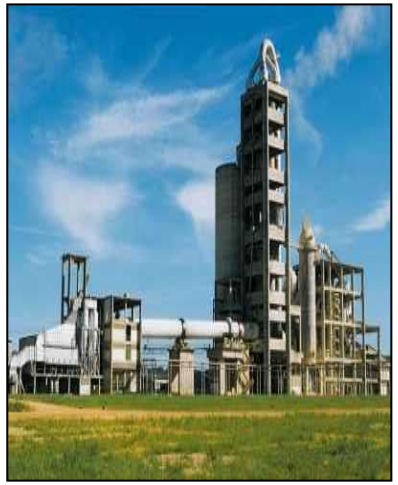
Mr. Shankarappa - Tech Head

Mr. Saravanan – HOD Process

Mr. Sakthivel - SH Process

1. Brief Introduction on Company/Unit

- Founded by Shri Jaidayal Dalmia in 1935
- Pan India presence in Cement business
- Capacity of 35.9 Million Tons per annum
- 4th largest cement manufacturer in India
- Manufacturing of Special cements like Oil well, Air strips & Railway sleeper grade cement.



Cement

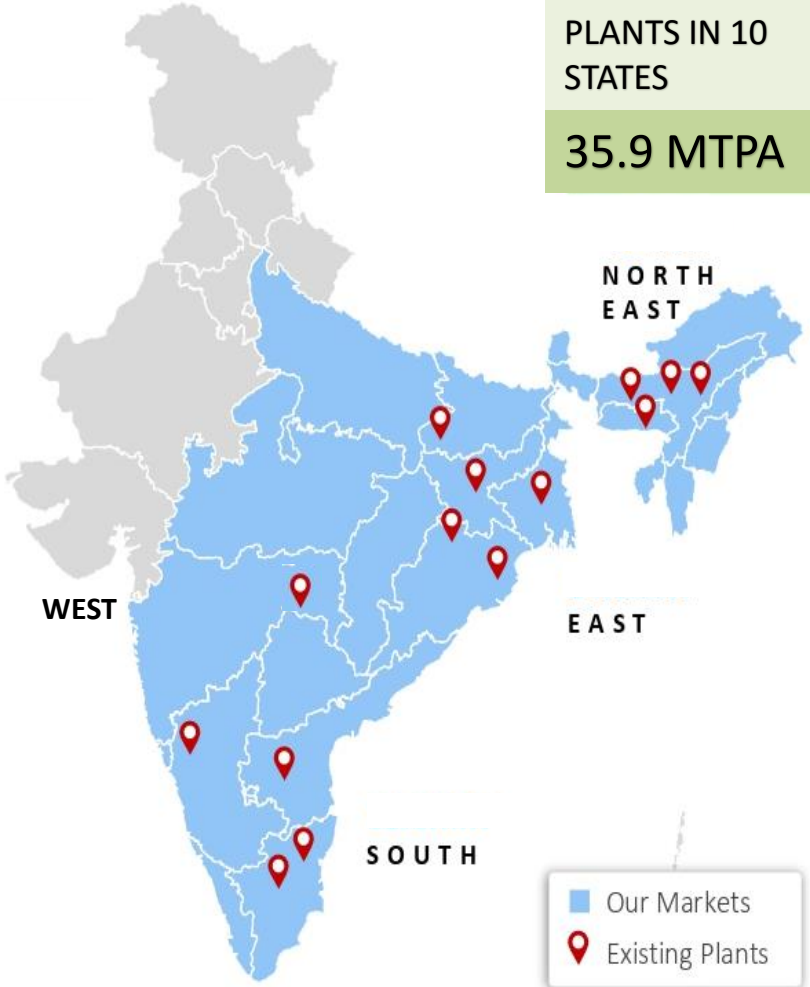
Power

Sugar

Refractory

14
PLANTS IN 10 STATES

35.9 MTPA

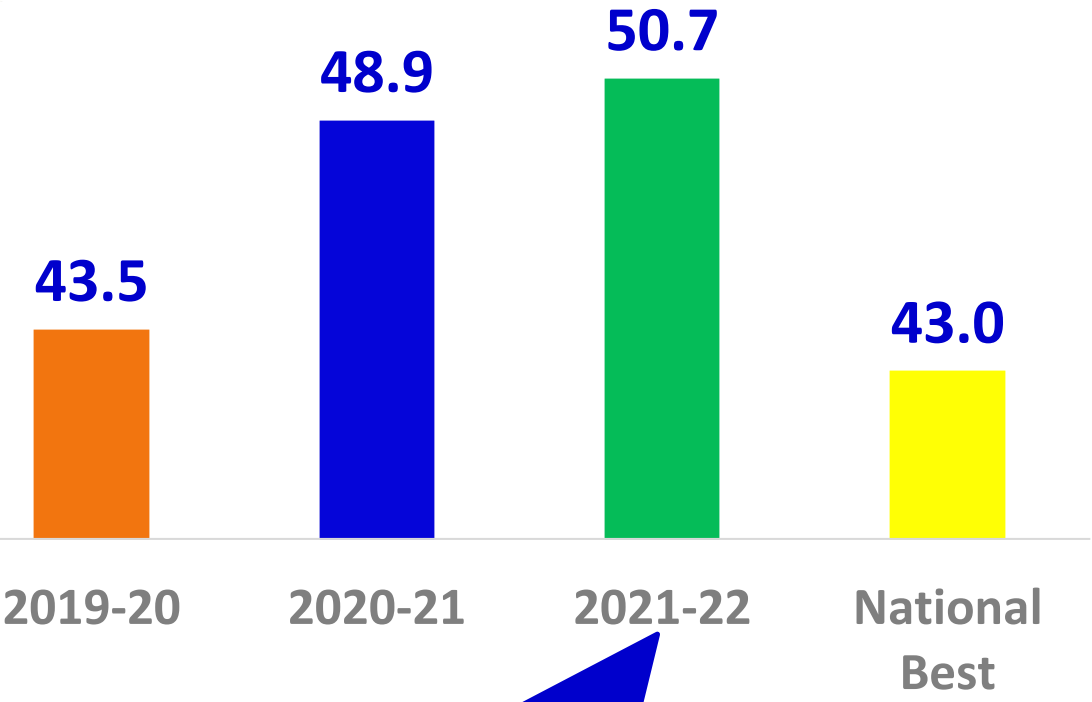


Major Process Equipment Specifications

Equipment	Supplier	Rated	Operating	Beyond Capacity
Crusher	MMD	900 TPH	730 TPH	-18.5%
Raw Mill-VRM	Pfeiffer	400 TPH	418 TPH	4.5%
Pyro-5Stage Preheater	FLsmidth	4500 TPD	6000 TPD	33%
Coal Mill-VRM	Pfeiffer	40TPH-Coal, 25-Pet-coke	28 TPH (Pet-coke)	12.5%
Cement mill-VRM	Pfeiffer	300TPH	400 TPH	33%

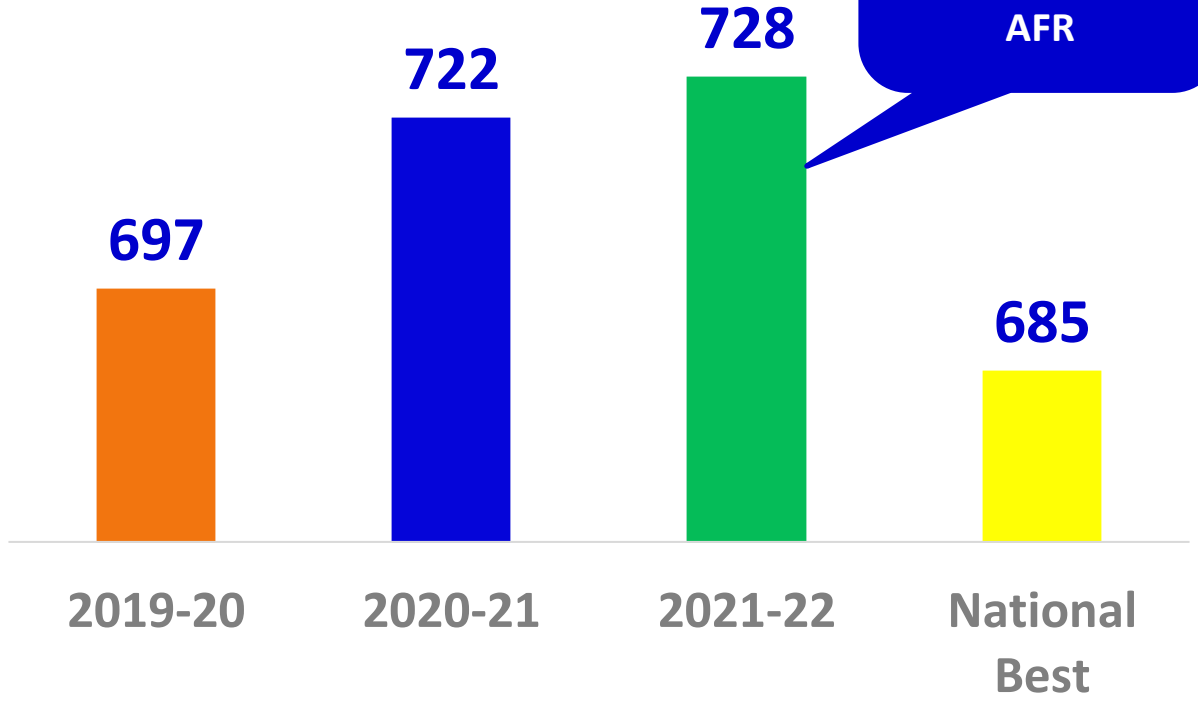
2. Specific Energy Consumption in last 3 years

Upto Clinkerisation Power – Kwh/T



1. Addition of AFR Circuit &
2. Increase of TSR%
3. Kiln operated at 6000 TPD model

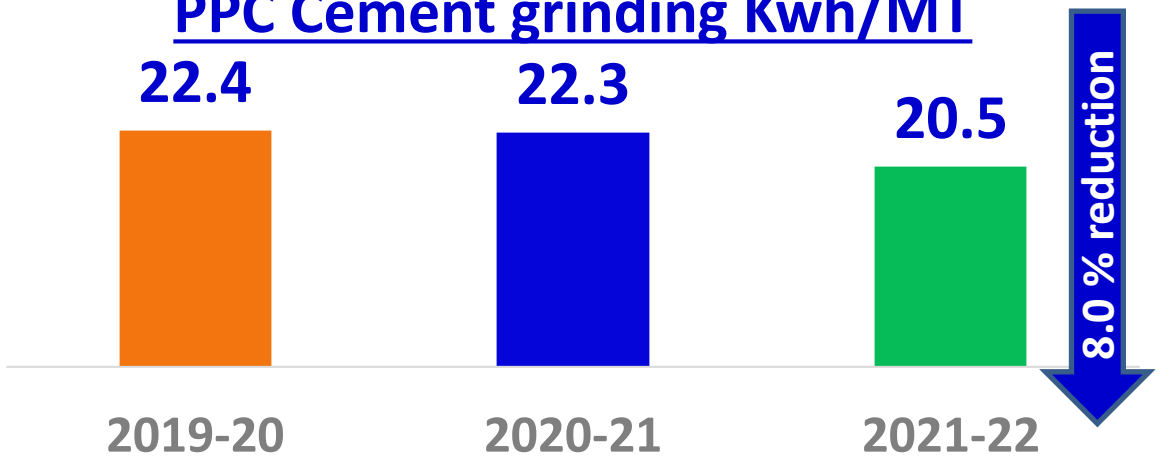
Sp. Heat Consumption - Kcal/kg Cl.



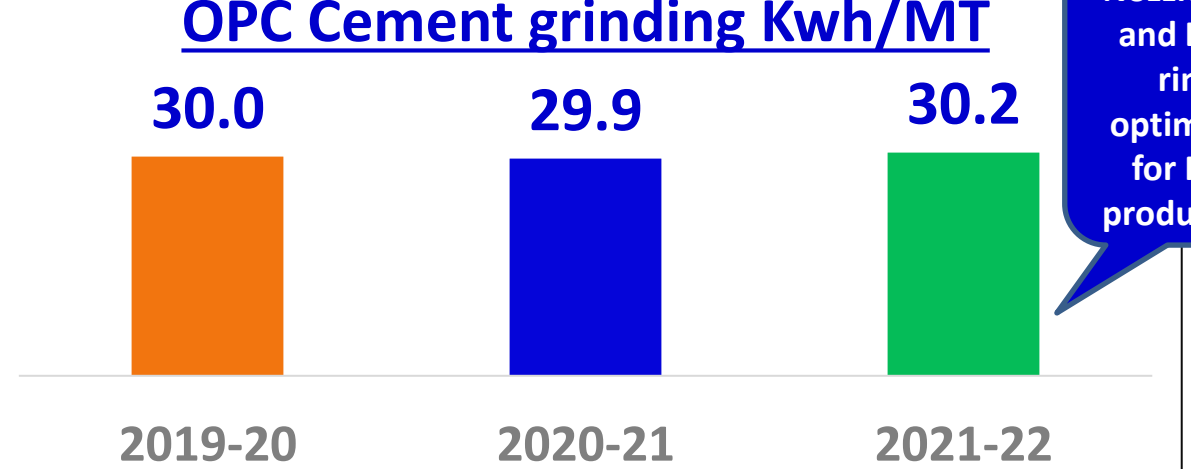
Due to increase of TSR % and high moisture in AFR

2. Specific Energy Consumption in last 3 years

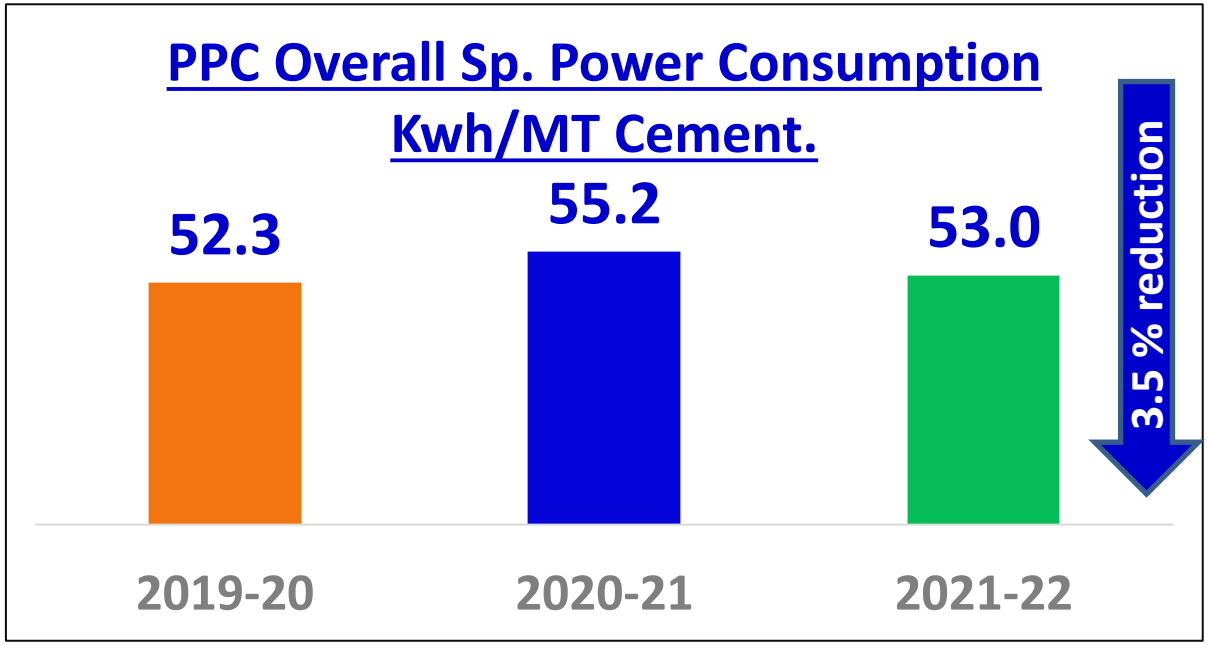
PPC Cement grinding Kwh/MT



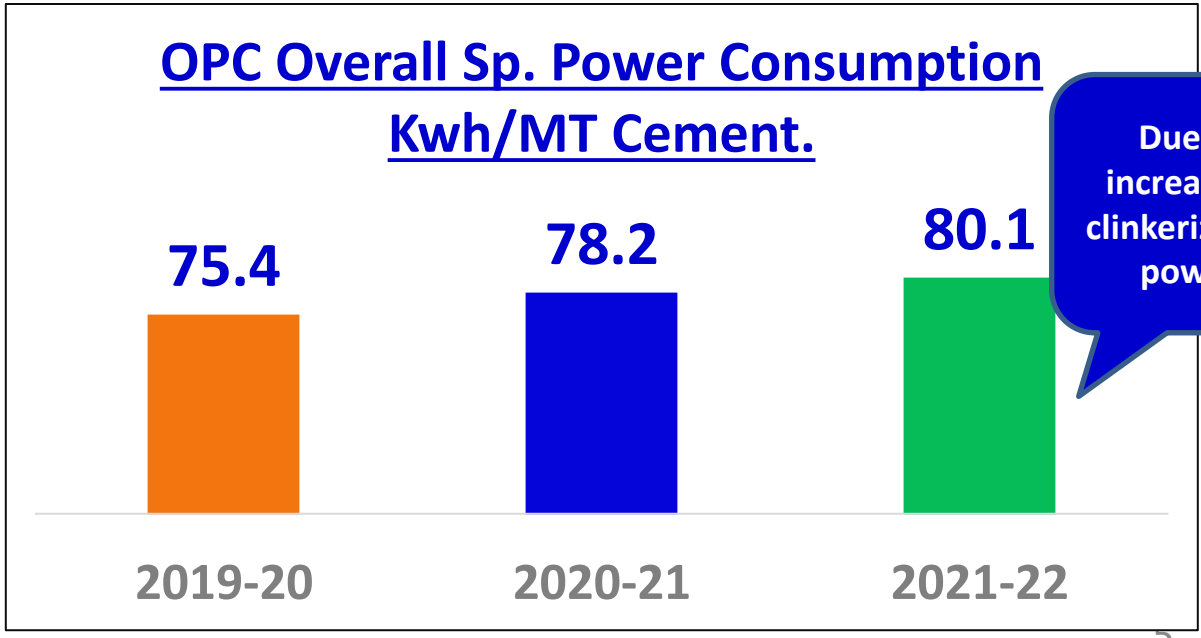
OPC Cement grinding Kwh/MT



PPC Overall Sp. Power Consumption Kwh/MT Cement.



OPC Overall Sp. Power Consumption Kwh/MT Cement.



3. Information on Competitors, National & Global benchmark

ENERGY BENCHMARKING		
Parameters	Electrical SEC (kWh / T of Cement)	Thermal SEC (kcal / kg of Clinker)
Comparison of specific energy consumption (SEC)		
SEC : Dalmia Cement –Ariyalur Plant	68.59	728
SEC Values for Competitor - 1 : (Ramco)	69.30	735
SEC Values for Competitor - 2 : (Ultratech)	71.40	746
SEC Values for Competitor - 3 : (Chettinadu)	71.65	758
National Benchmark for SEC :	56.14	676
International Benchmark for SEC :	55.0	670
SEC Target for FY 2022-23 :	66.0	700
Please mention the sources / references for the furnished data (National & International Data)	As per CII Bench marking details (National & International Data)	

Road Map To Achieve Benchmark/National/Global Best

Reduction of Electrical Energy Consumption

Target < 66 kWh/MT of cement

Up-gradation of Cement Mill Classifier-0.55 units June-23

Up-gradation of Cooler with high efficiency-1.8 units, March-23

Up-gradation of Raw Mill Classifier -0.5 units

Reduction of PH pressure drop by retro-fitting of Top Cyclone -0.15 units, March-23

Up-gradation of Preheater Fan-0.5 units,

Up-gradation of Cement Mill gear box - 0.25 units,

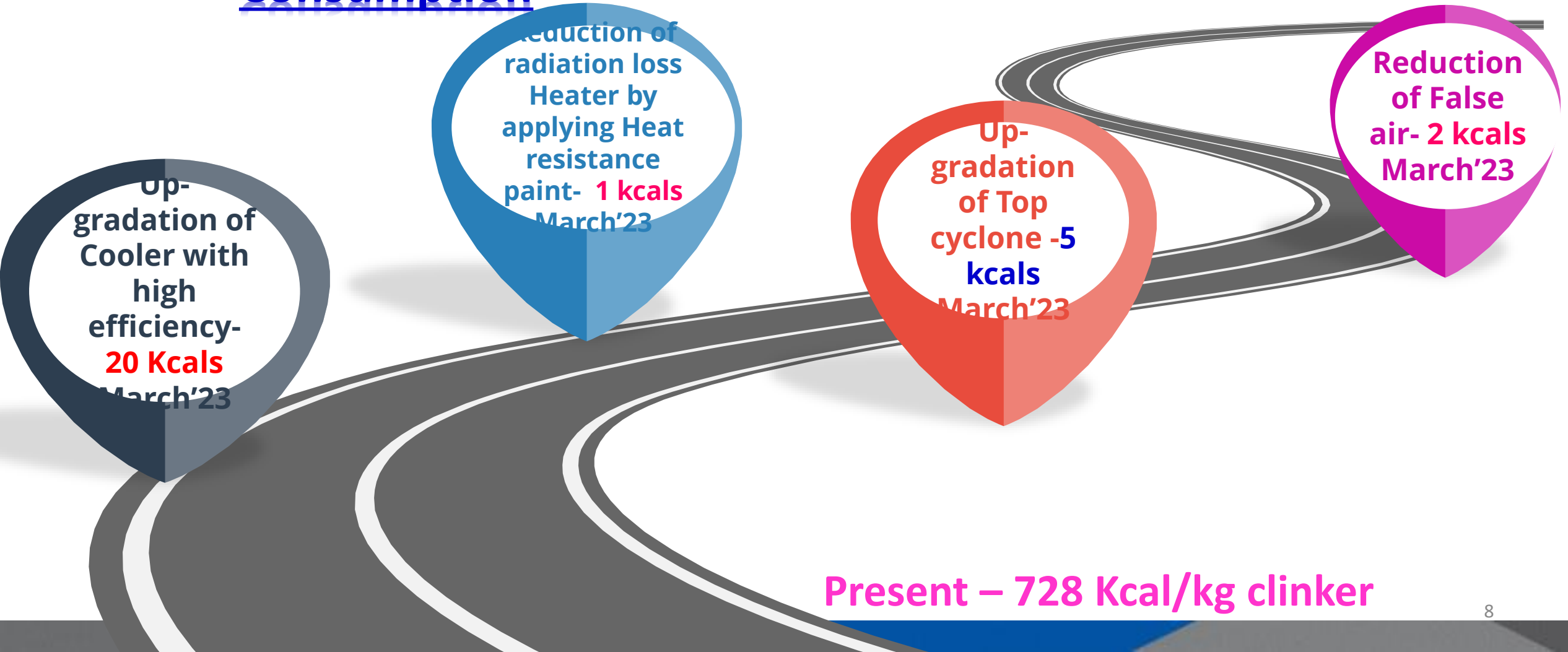
Present – 68.59 kWh/MT of cement

Expected Electrical Energy Reduction - 3.0 Kwh/MT of Cement

Road Map To Achieve Benchmark/National/Global Best

Reduction of Thermal Energy Consumption

Target – 700 Kcal/ kg clinker



Present – 728 Kcal/kg clinker

4. List of Major Encon project planned in FY 2022-23

Sl. No.	Title of Project	Annual Electrical Saving (kWh)	Annual Electrical Cost Saving (Rs million)	Annual Thermal Saving (Ton/year)	Annual Thermal Saving (Rs million)	Total Annual Savings (Rs million)	Investment Made (Rs million)	Payback (Months)
1	Enhancement of productivity in Raw Mill by up-gradation of Classifier	1246780	5.61			5.6	40	86
2	Up-gradation of Preheater Fan with high efficiency impeller	782210	3.52			3.5	20	68
3	Up-gradation of Baghouse Fan with high efficiency impeller	391105	1.76			1.8	8	55
4	Up-gradation of Clinker Cooler with IKN Cooler	3259210	14.67	4,179	39.1	53.8	237	53
5	Up-gradation of Pre-calciner by extension of height			1,045	9.8	9.8	53	65
6	Reduction of radiation loss in Pre Heater by applying Heat Resistance Paint			209	2.0	2.0	10	61
7	Reduction of PH pressure drop by retro-fitting of Top Cyclone	260737	1.17	313	2.9	4.1	20	58
8	Up-gradation of Cement Mill Classifier with High Efficiency	1046787	4.71			4.7	144	367
9	Enhancement of CVRM mill output by retro-fitting of CVRM gear box	697858	3.14			3.1	83	317
Total Saving		76,84,687	35	5,747	54	88	615	84

4. Energy Saving projects implemented in last three years

Year	With Investment				Without Investment	
	No. Of Proposals	Investments in Lakhs	Savings in Lakhs	Payback Months	No. Of Proposals	Savings in Lakhs
2019-20	12	193	237	9.8	3	17
2020-21	12	2447	252	116	2	7
2021-22	10	163	549	3.6	2	277
Total Cost Savings -Lakhs			1038			301

4. Energy Saving projects implemented in FY 2019-20

Dalmia Bharat Group

Sl. No.	Title of Project	Annual Electrical Saving (kWh)	Annual Electrical Cost Saving (Rs million)	Annual Thermal Saving (Ton/year)	Annual Thermal Saving (Rs million)	Total Annual Savings (Rs million)	Investment Made (Rs million)	Payback (Months)
1	Kiln outlet seal was replaced with Swell graphite seal arrangement			313.5	1.94	1.9	2.3	14
2	Applying Heat Resistant Paint in 5th Cyclone			209.0	1.29	1.3	0.8	7
3	Coal Mill main drive speed increased from 75 to 85%	276343	1.30			1.3	0.0	0
4	Standby RAL provided in Coal Mill	82903	0.39			0.4	0.5	15
5	Optimization of Compressor power consumption by installation of Flow meter	456289	2.15			2.2	0.3	2
6	RVRM Bag house all RAL's start & stop given every 10 min to reduce the false air entry	45614	0.22			0.2	0	0
7	Dense phase air slide blower 7.5 kW stopped by interconnection of nearby blower	45503	0.21			0.2	0	0
8	Up-graded Cement Mill Fan with higher efficiency	1004538	4.74			4.7	1.2	3
9	Reduction of Classifier Annular Gap in Cement Mill	814490	3.84			3.8	2.2	7
10	Reduction of CVRM Bag House DP by providing the nozzle in compressor blow pipe	305434	1.44			1.4	3.2	27
11	CVRM Silo Feed Elevator Gear box up-graded with high capacity	169686	0.80			0.80	1	15
12	CVRM Seal air pipe laid outside to avoid frequent damages and installed stand by seal air fan to increase the reliability	271497	1.28			1.3	0.9	8
13	Optimization of Cement Mill Compressor merged with Packing plant operation	305434	1.44			1.4	0	0
14	DSP silo extraction aeration blower motor rating changed from 15 to 7.5 kW	50906	0.24			0.2	0.1	5
15	100% LED light replaced	509057	2.40			2.4	6.8	34
	Total Saving	43,37,693	20.5	522	3.2	23.7	19.3	9.8

4. Energy Saving projects implemented in FY 2020-21

Dalmia Bharat Group

Sl. No.	Title of Project	Annual Electrical Saving (kWh)	Annual Electrical Cost Saving (Rs million)	Annual Thermal Saving (Ton/year)	Annual Thermal Saving (Rs million)	Total Annual Savings (Rs million)	Investment Made (Rs million)	Payback (Months)
1	Reduction of Classifier Annular Gap in Raw Mill	272451	1.20			1.2	1.3	13
2	Reduction of Classifier Annular Gap in Coal Mill	113622	0.50			0.5	0.3	7
3	Coal mill reject handling system installed	85217	0.38			0.4	0.1	3
4	Conversion of Duoflex to Jetflex burner			771.4	5.46	5.5	3.6	8
5	Enhancing AFR usage by installation of winch system			192.9	1.37	1.4	1.2	11
6	Enhancing AFR usage by installation of full fledged mechanized feeding system			1928.6	13.66	13.7	230	202
7	Optimization of ROBO lab Compressor power consumption	295600	1.30			0.0	0.5	0
8	Avoided starting delay in CVRM by providing additional Hydraulic pump	75718	0.33			0.3	0.5	18
9	Cement Mill silo feed elevator up-graded from 350 to 410 TPH by drive up-gradation	82028	0.36			0.4	0.5	17
10	Reduction of CVRM stoppages by installation of additional magnetic separator in the feeding belt	100957	0.45			0.4	1.2	32
11	Up-gradation of Cooler water spray pump	94647	0.42			0.4	2.9	83
12	Reduction of reject handling in CVRM by installation of weigh feeder in reject circuit	189294	0.83			0.8	2.2	32
13	Optimized 3 no's Aux. Bag filters DP by providing nozzle in purging pipe	37859	0.17			0.0	0.2	0
14	All 3 packers, feeding elevators are interconnected and operating the single elevator for 2 packers	63360	0.28			0.3	0.2	9
	Total Saving	14,10,753	6.2	2,893	20.5	25.2	244.7	116.3

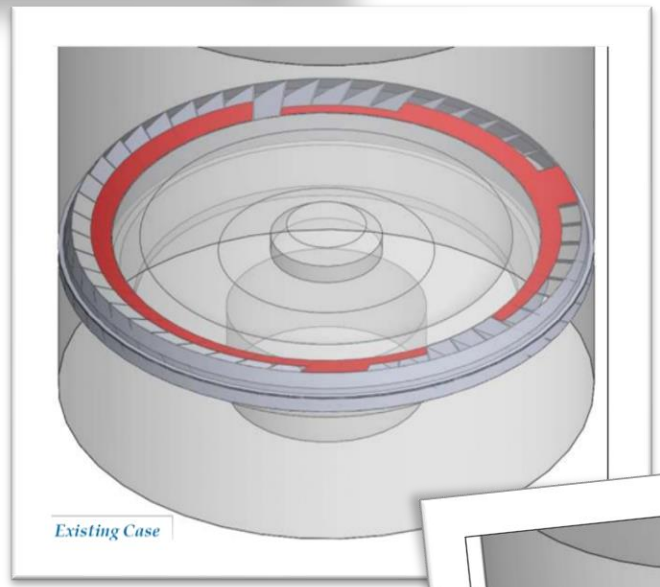
4. Energy Saving projects implemented in FY 2021-22

Sl. No.	Title of Project	Annual Electrical Saving (kWh)	Annual Electrical Cost Saving (Rs million)	Annual Thermal Saving (Ton/year)	Annual Thermal Saving (Rs million)	Total Annual Savings (Rs million)	Investment Made (Rs million)	Payback (Months)
1	Reduction of Pressure drop across Raw Mill nozzle ring by modification of nozzle pattern	384411	2.65			2.7	1	5
2	Up-gradation of Coal Classifier with high efficiency	460420	3.18			3.2	4.99	19
3	Reduction of Radiation losses by appyling heat resistant paint in kiln shell			252	3.46	3.5	0.8	3
4	Increase in Clinker Liquid content by increasing KF alumina from 3.2 to 3.5%			1051	14.41	14.4	0.0	0
5	Cyclone -3 Dip tube replaced with new thereby PH exit reduced by 20 Deg C			1051	14.41	14.4	3.8	3
6	TAD temperatere increased by replacing damaged duct portion with new duct around 20m			1261	17.29	17.3	3.3	2
7	PC Outlet temperature fluctuations optimized by implementation of Puzzy logic in EO System			840	11.52	11.5	0.8	1
8	In AFR discharge chute jamming was completely avoided by providing Air Blaster & SS plate	26673	0.18			0.2	0.4	26
9	Enhanced shredder productivity by installation of ARCO plate instead of MS plate	80018	0.55			0.6	0.5	11
10	Enhanced OPC productivity from 260 to 290 TPH and reduction of Sp. Power consumption	1922339	13.26			13.3	0	0
11	Cement Bag house False air reduced by 1% by replacement of anval rotary air lock type	240292	1.66			1.7	0.7	5
	Total Saving	31,14,154	21.5	4,454	61.1	82.6	16.3	2.4

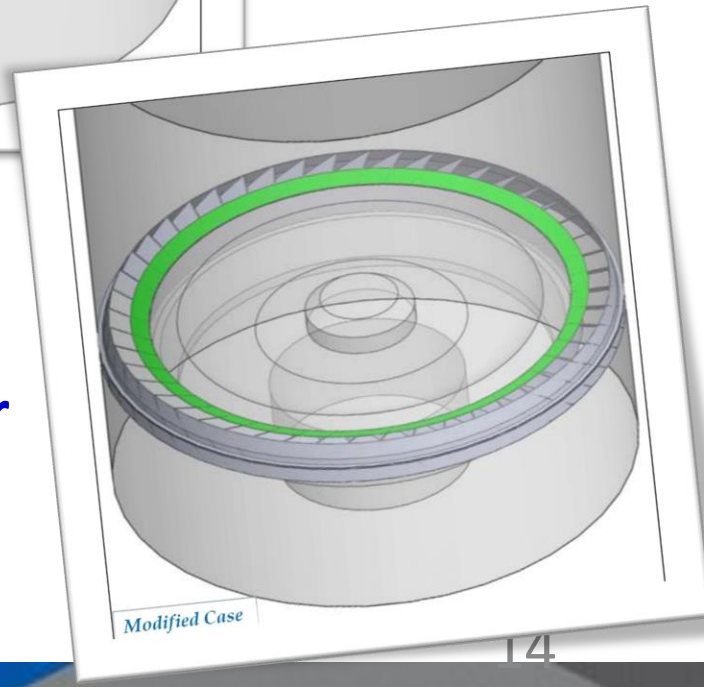
4. Energy Saving projects implemented in FY 2021-22

Reduction of Pressure drop across Raw Mill nozzle ring

- There was a huge pressure drop across the nozzle ring.
- Through M/S Mechwell CFD study carried out and suggested to modify the nozzle Ring Blockage Pattern and reduced pressure drop by 20 mmWG thereby Specific power consumption reduced by 0.16KWH/T



Before



After

Benefits:

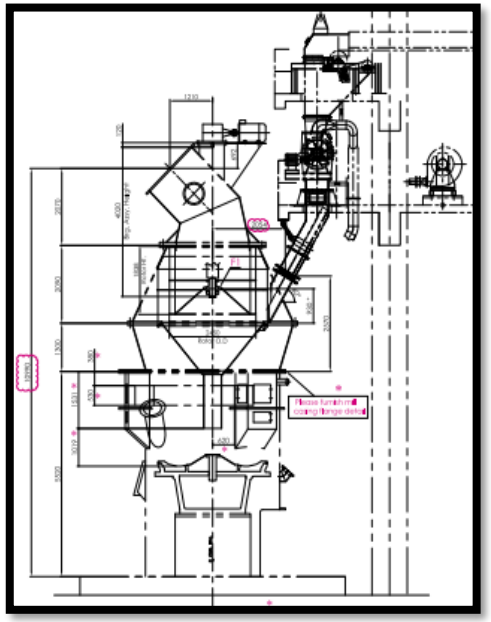
- ☑ Sp. power consumption reduced by 0.16 Kwh/t
- ☑ Cost Saving – 26.5 Lakhs/annum

4. Energy Saving projects implemented in FY 2021-22

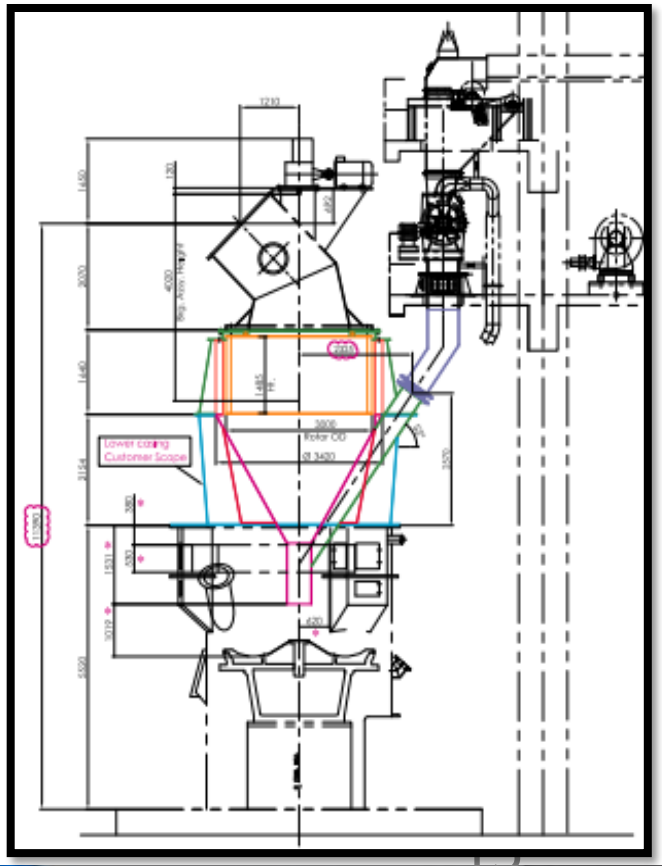
Up-gradation of Coal Classifier with high efficiency

- To increase coal mill output Existing classifier assembly replaced with latest design of high Efficiency classifier by retaining existing drive assembly
- Thereby improved Rotor Velocity and static velocity in latest classifier.
- Increased mill output by 3 TPH and Sp. Power Consumption reduced by 1.6 Kwh/t

Before



After



Benefits:

- ☑ Sp. power consumption reduced by 1.6 Kwh/t
- ☑ Cost Saving – 31.8 Lakhs/annum

5. Innovative project implemented in FY 2021-22

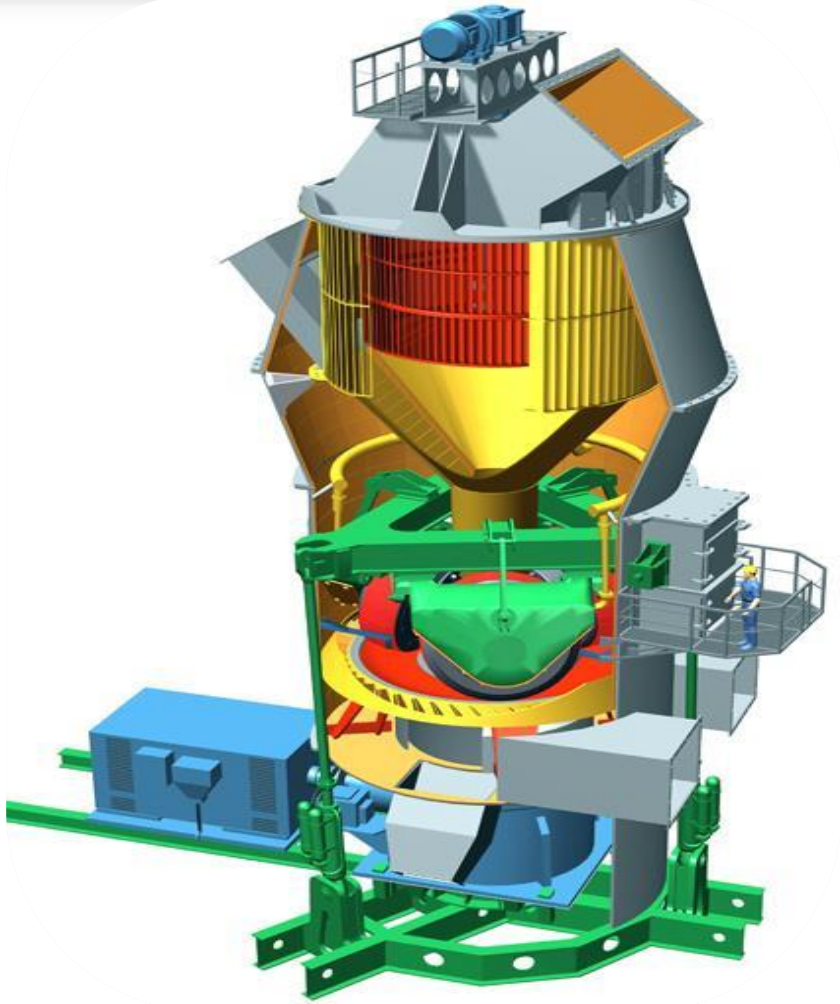
5.1 Enhanced OPC productivity from 260 to 290 TPH & reduction of SPC

Constrain:

- Not able to increase the OPC output more than 260 TPH

Innovation:

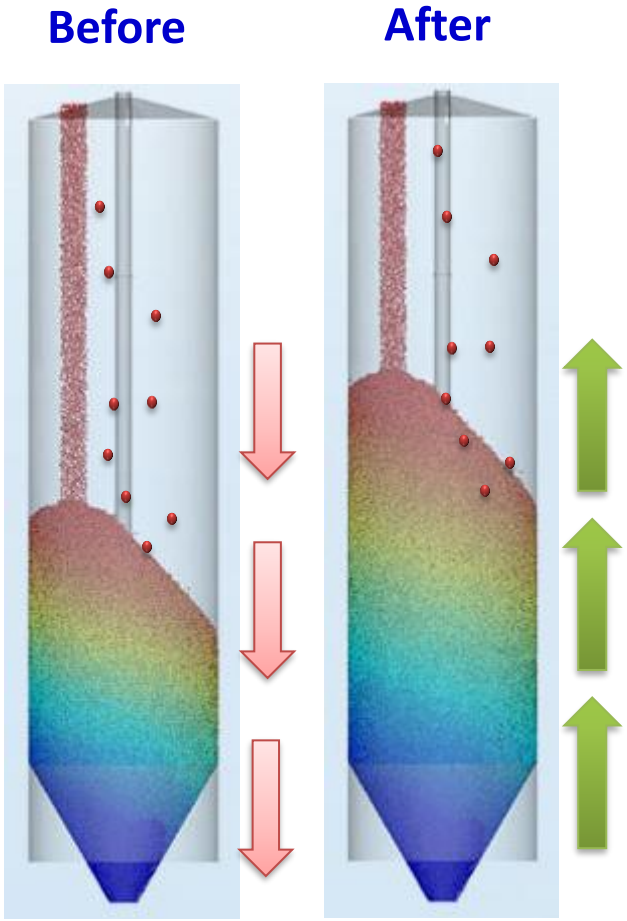
- Analyzed and identified there is a scope for increase the fan air volume which will helpful to improve the mill output.
- Trail has been conducted at different speed with SPRS and GRR mode to maximize the air volume.



5. Innovative project implemented in FY 2021-22

Project Details:

- Trail has been conducted at different speed with SPRS and GRR mode to maximize the air volume.
- The Mill output got increased from 260 to 290 TPH while operating fan in GRR mode at maximum speed of 980 RPM thereby air volume increased by 80000 m3/hr and Sp. Power consumption reduced from 30.8 to 30.0 kWH/Mt.



Replication Potential:

- This project can be implemented in all Cement VRM mill which is having Fan in GRR/SPRS.

Benefits:

- ☑ Increased the OPC production by 30 TPH
- ☑ Reduced the Sp. Power consumption -0.8 kWh/Mt

5. Innovative project implemented in FY 2021-22

5.2 Avoiding of AFR discharge chute jamming

Constrain:

- Frequent jamming in double flap chute
- High worn-out of refractory and material accumulation due to high ash material

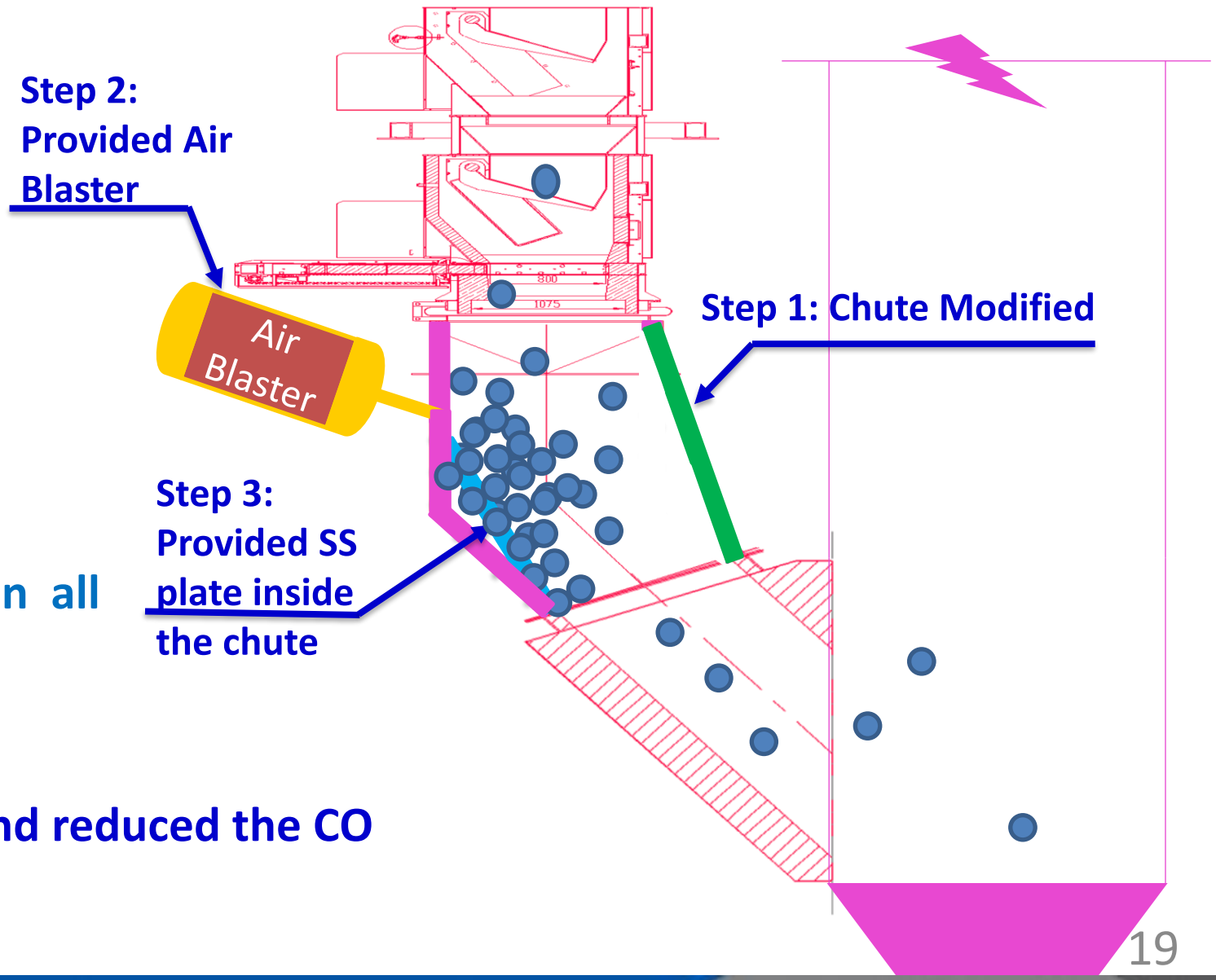
Innovation:

- To resolve this issue, our CFT came up with innovative idea by providing air blaster and modifying chute with SS plate and all the modification was carried out by in-house.

5. Innovative project implemented in FY 2021-22

Project Details:

- All the modification was carried out by In House (Modified chute with SS plate and providing air blaster).
- After the modification there is no jamming issue



Replication Potential:

- This project can be implemented in all AFR feeding circuits

Benefits:

- ☑ Maintain the consistent flow rate and reduced the CO formation at kiln inlet
- ☑ AFR TSR increased by 2%

5. Innovative project implemented in FY 2021-22

5.3 Enhanced shredder productivity by installation of ARCO plate

Constrain:

- Frequent worn out of blades.
- Insufficient quantity of shredded material.

Innovation:

- Our team came up with innovative idea to use ARCO plate instead of MS plate.
- Blade hard-facing was done with ARCO plate and resulted good improvement on blade thickness

Benefits:

- ☑ AFR TSR increased from 16 to 20%
- ☑ Shredder output increased by 4 TPH

BEFORE

AFTER

6. Utilization of Renewable Energy Sources

Replacement of Electrical Energy with Renewable Energy	Annual Energy Generated in 2019-20 (million kWh)	% Share	Annual Energy Generated in 2020-21 (million kWh)	% Share	Annual Energy Generated in 2021-22 (million kWh)	% Share
Wind Energy	23.28	17.93	21.98	17.51	21.49	15.28
Replacement of Thermal Energy with Renewable Energy	Equivalent Annual Fuel Savings in 2019-20 (million kcal/year)	% Share	Equivalent Annual Fuel Savings in 2020-21 (million kcal/year)	% Share	Equivalent Annual Fuel Savings in 2021-22 (million kcal/year)	% Share
Solar Thermal Energy	65	0.01	65	0.01	65	0.01
Biomass Plant	12	0	12	0	12	0

On Site -Solar Power plant (11 MWP) Commissioned on June 2022.

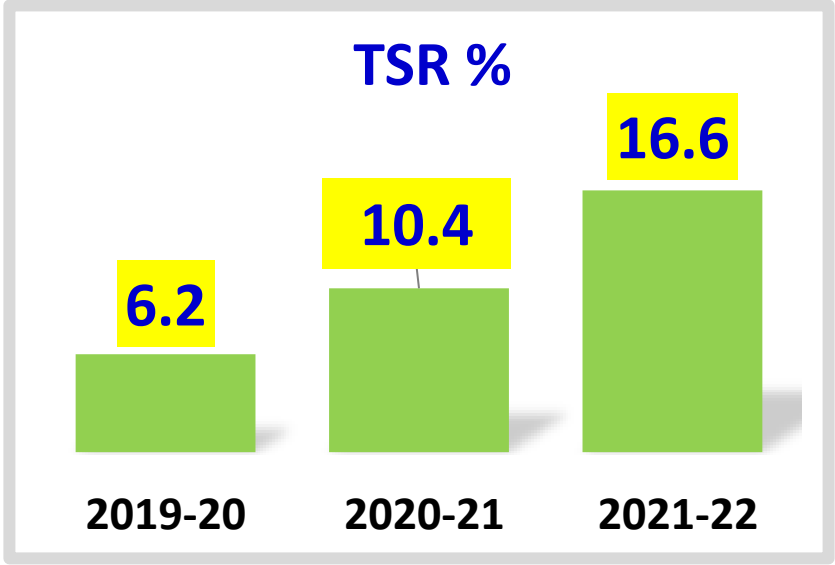
Invested – 46 Crores

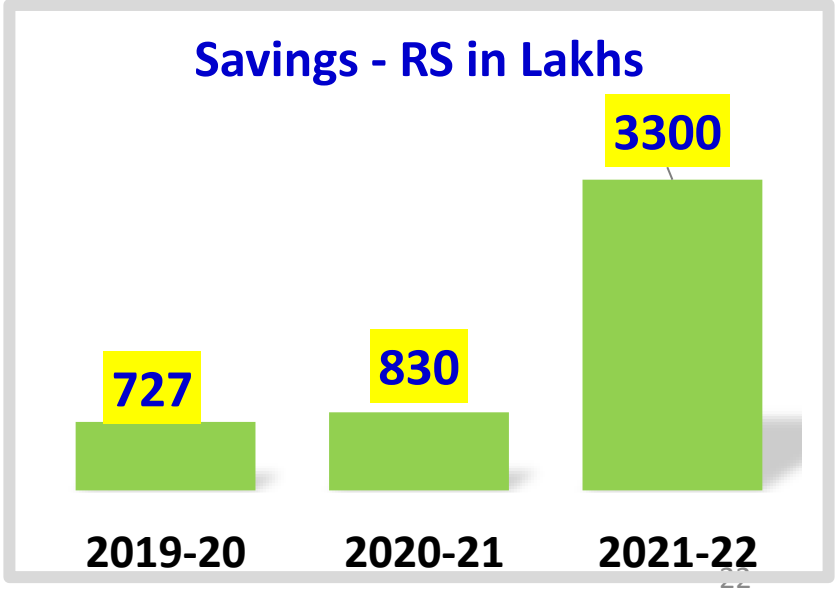
7. Waste utilization and management

Clean & Green is Sustainable & Profitable

FY	2019-20		2020-21		2021-22	
MATERIAL	Qty, (MT)	% TSR	Qty, (MT)	% TSR	Qty, (MT)	% TSR
RDF	3465	1.1%	14753	5.1%	33495	7.9%
Plastic waste	2365	1.1%	7415	3.8%	14502	5.9%
Carbon black	813	0.5%	0	0.0%	3192	1.6%
Cotton Waste	941	0.3%	723	0.3%	1064	0.3%
SCF	0	0.0%	264	0.1%	703	0.3%
Paint Sludge	1964	0.6%	639	0.3%	655	0.2%
Resin Waste	1650	0.9%	863	0.4%	526	0.2%
Tyre Chips	1222	0.7%	236	0.1%	294	0.1%
Solid Waste Mix	2624	0.9%	924	0.3%	129	0.0%
Other AFR's	890	0.3%	596	0.2%	437	0.1%
Total	**15934**	**6.2%**	**26412**	**10.4%**	**54996**	**16.6%**

Green Raw Material	2019-20	2020-21	2021-22
Tannery Sludge - MT (Wet)	4862	33	0
Lime Sludge - MT (Wet)	25702	17489	8662
Total Quantity-MT	**30564**	**17522**	**8662**





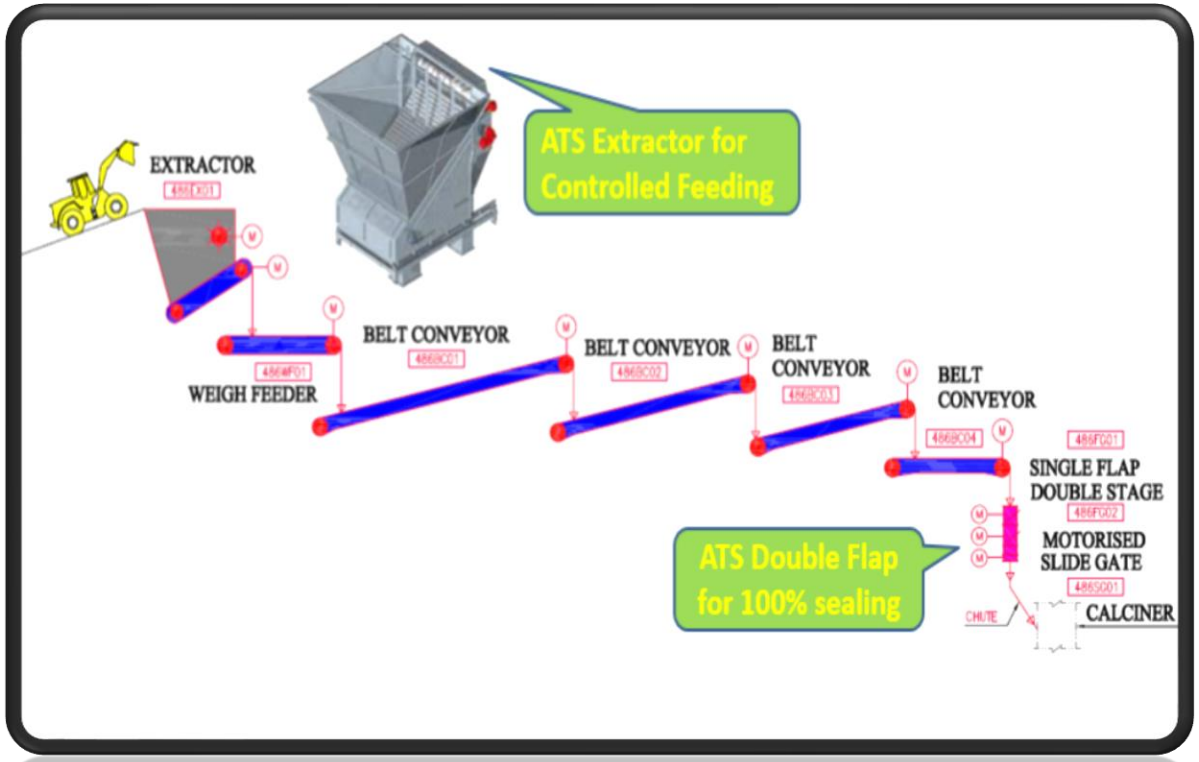
7. Infrastructure for AFR co-processing & pre-processing

Green Fuel Feeding System

- **Full Fledged Feeding System was commissioned successfully thereby TSR has been increased from 6 to 20% with investment of 23 Crores**

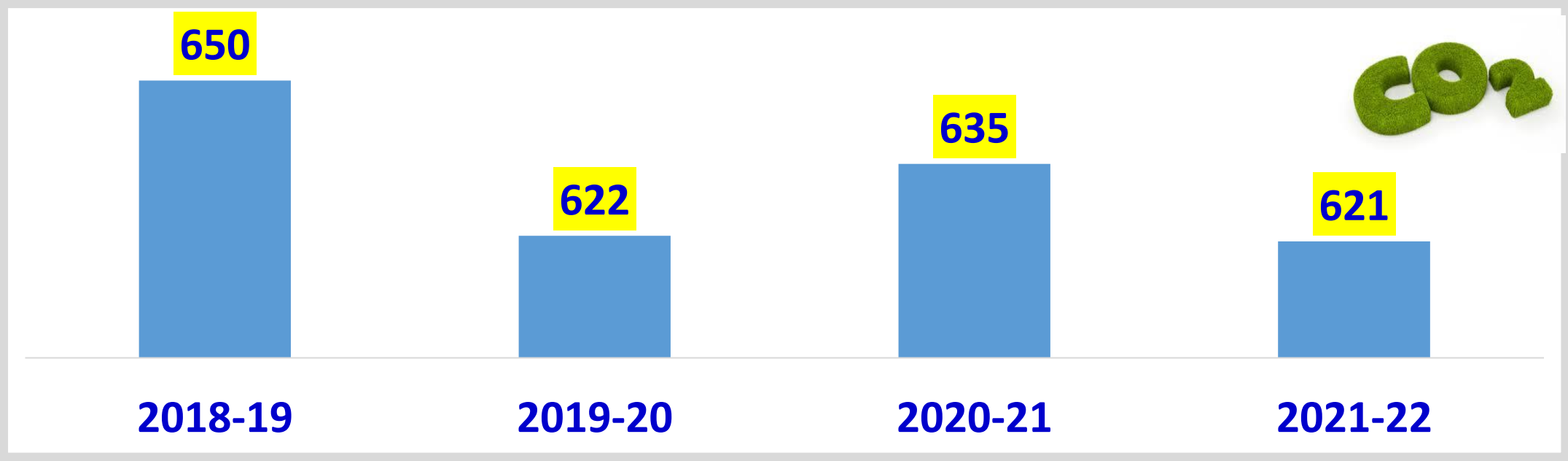
Pre-Processing

Co-Processing



8. GHG Inventorisation

CO2 emission (Scope-1) – Kg/ MT of Cement



Action Plan to achieve <400 kg /MT of cement

Short Term:

- Increase the AFR utilization from 16 to 35%
- Increase of PPC product ratio from 40 to 75%
- Increase of Fly ash usage from 32 to 35%

Long Term:

- Negative carbon footprint on 2040
- Carbon Capturing & Utilization
- By introducing of Composite cement
- 100% AFR utilization in PC

9. Green Supply Chain – Round Trip

DPM Mines

DPM Plant

Ariyalur Plant

PNR & PTK Mines

Results:

- Round Trip Qty
- FY' 2020-21 = 1040102 MT
- FY' 2021-22 = 1081706 MT
- Increased thro' round trip - 41604 MT
- If direct Trip - 1.94 Litres/ Mt
- If Round Trip – 1.25 Litres/ Mt
- Fuel Saved - =28706.8 Litres of Diesel

☑ Cost Saving – 27.3 Lakhs/ Annum

9. Green Supply Chain

Increased Bulker Dispatch Quantity

Results:

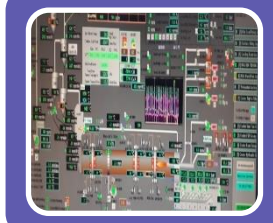
- Bulker Quantity
- FY 20-21 – 517513 MT
- FY 21-22 – 643079 MT
- Increased Bulker Quantity – 125566 MT (4%)
- Diesel Consumption – 1.45 Litres/MT
- Fuel Saved = 86597.1 Litres of Diesel

☑ **Cost Saving = 82.27 Lakhs/annum**

10. Team work, Employee Involvement & Monitoring

Daily Monitoring and Reporting System

On line Energy management System (EMS) and Knowledge Manager



Online Specific power consumption is monitored by CCR Operators

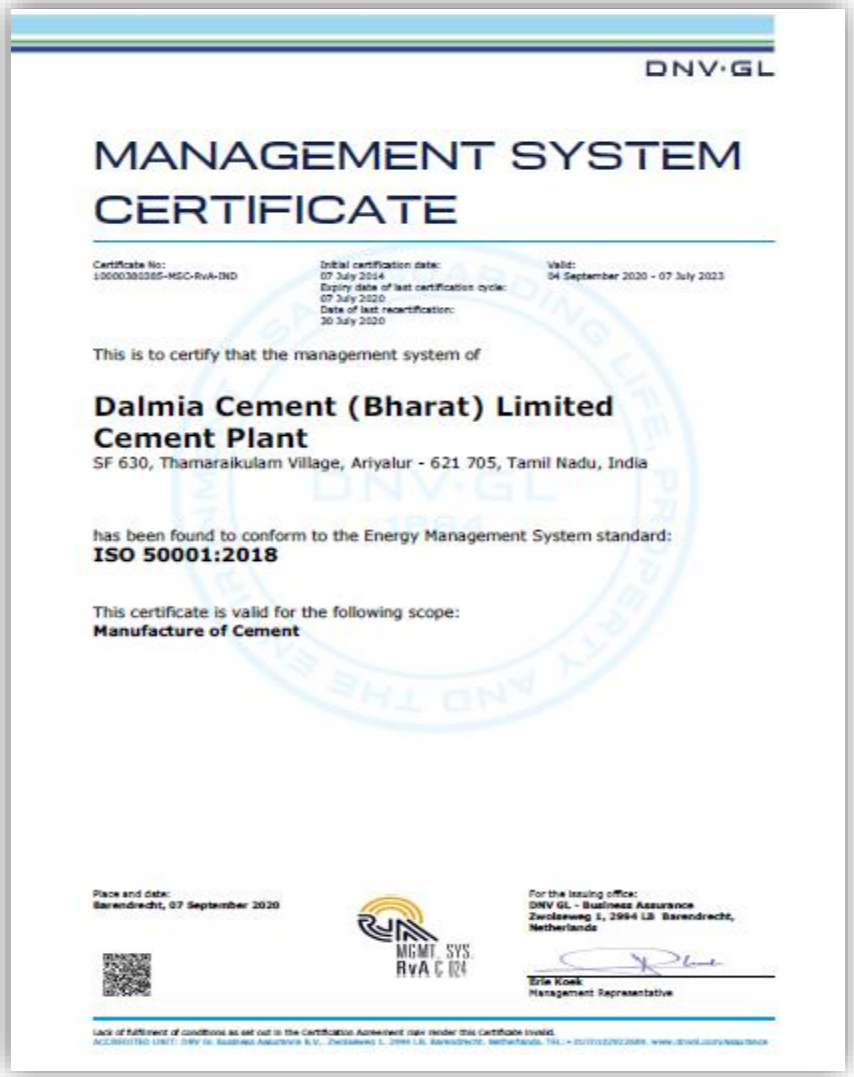
Software for identification of Compressors run hrs, Idle running hours of Major Equipment & Raw water Consumption

Production Software (PHP) for making Daily Production & Power Report & Circulating to all Executives by using IOTs & Clouds

Daily Review Meeting Chaired by Technical Head

11. Implementation of ISO 50001/Green Co/IGBC rating

ISO -50001:2018



DNV·GL

MANAGEMENT SYSTEM CERTIFICATE

Certificate No: 10000380385-MSC-RvA-IND

Initial certification date: 07 July 2014
Expiry date of last certification cycle: 07 July 2020
Date of last recertification: 30 July 2020

Valid: 04 September 2020 - 07 July 2023

This is to certify that the management system of

Dalmia Cement (Bharat) Limited
Cement Plant
SF 630, Thamaraikulam Village, Ariyalur - 621 705, Tamil Nadu, India

has been found to conform to the Energy Management System standard:
ISO 50001:2018

This certificate is valid for the following scope:
Manufacture of Cement

Place and date:
Barendrecht, 07 September 2020

For the issuing office:
DNV GL - Business Assurance
Zwolseweg 1, 2994 LB Barendrecht, Netherlands

Erik Koek
Management Representative

Lack of fulfilment of conditions as set out in the Certification Agreement may render this Certificate invalid.

Green-Pro Certification from CII

Almost 1.3 % of Turn over was invested on Energy Conservation Projects

12. Learning from CII Energy Award 2020

1. Reduction of Pressure drop across nozzle ring by modification of nozzle pattern (M/S Mechwell Design) that was learned and it was implemented in Raw Mill– Reduced the sp. Power consumption – 0.16 kWH/MT

2. Reduction of Radiation losses by applying heat resistant paint (ES 70HT silicon paint) in kiln shell and it was implemented in Kiln shell– Reduced the SHC– 1.2 kCal/Kg Clinker

CII - Energy Awards

10 Consecutive Years

2011-12

2012-13

2013-14

2014-15

2015-16

2016-17

2017-18

2018-19

2019-20

2020-21

Mail ID:

Robert.t@dalmiacement.com

Thank you