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

22nd National Award For Excellence in Energy Management 2021

Team Members:

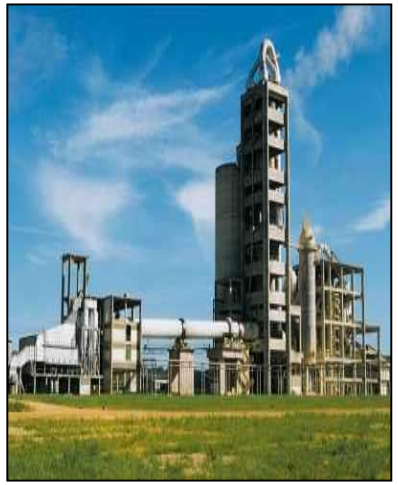
Mr. Shankarappa - Tech Head

Mr. Narsi Reddy - HOD Production

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 30 Million Tons per annum
- 4th largest cement manufacturer in India
- Manufacturing of Special cements like Oil well, Air strips & Railway sleeper grade cement.

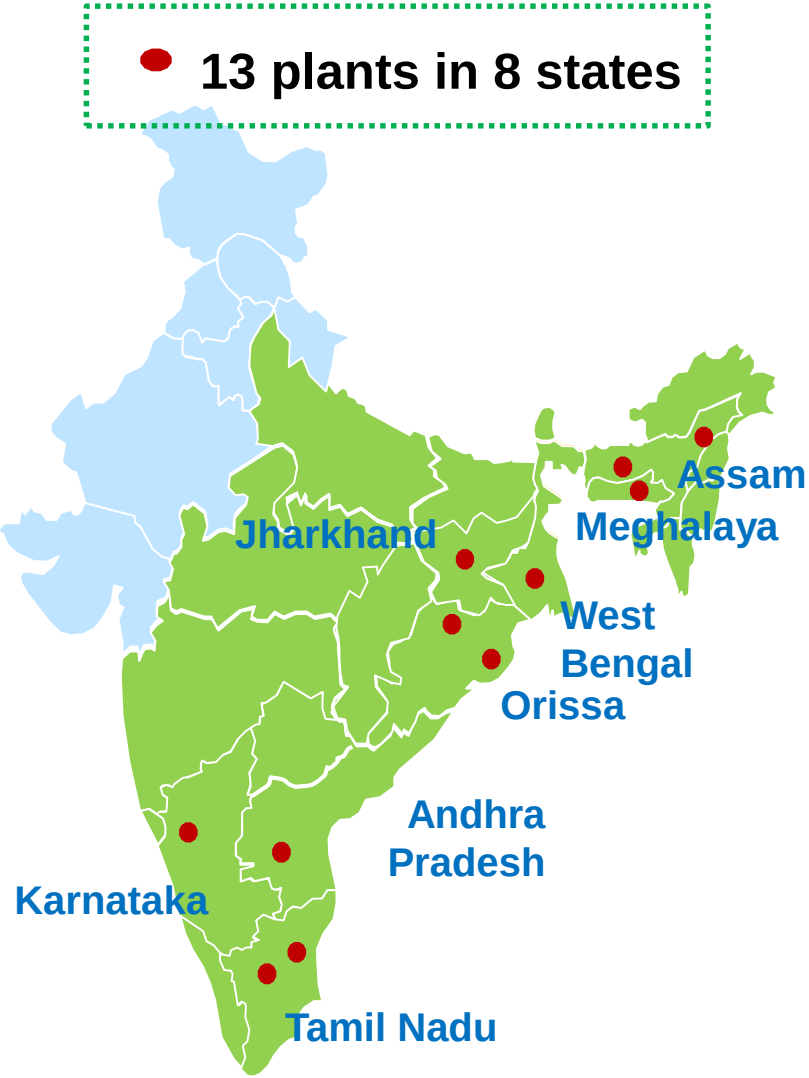


Cement

Power

Sugar

Refractory



Major Process Equipment Specifications

Equipment	Supplier	Rated	Operating	Beyond Capacity
Crusher	MMD	900 TPH	700 TPH	-22%
Raw Mill-VRM	Pfeiffer	400 TPH	450 TPH	12.5%
Pyro-5Stage Preheater	FLsmidth	4500 TPD	6000 TPD	33%
Coal Mill-VRM	Pfeiffer	40TPH-Coal, 25-Pet-coke	24 TPH (Pet-coke)	-4%
Cement mill-VRM	Pfeiffer	300TPH	400 TPH	33%

2. Impact on COVID-19

- 8% drop in annual Cement Production
- Kiln operated with lesser TPD model based on the market demand
- Cost optimization become critical
- Project got delayed
  - AFR Full Fledged Feeding System
  - Cooler Up-gradation

3. Specific Energy Consumption in last 3 years

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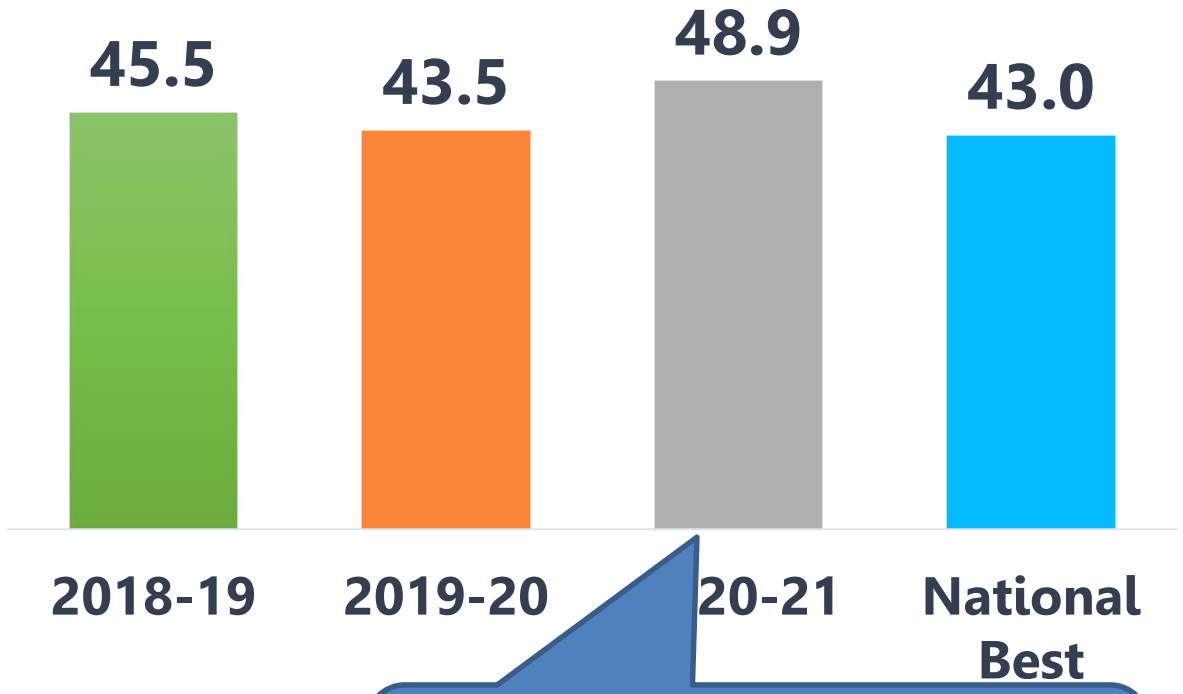
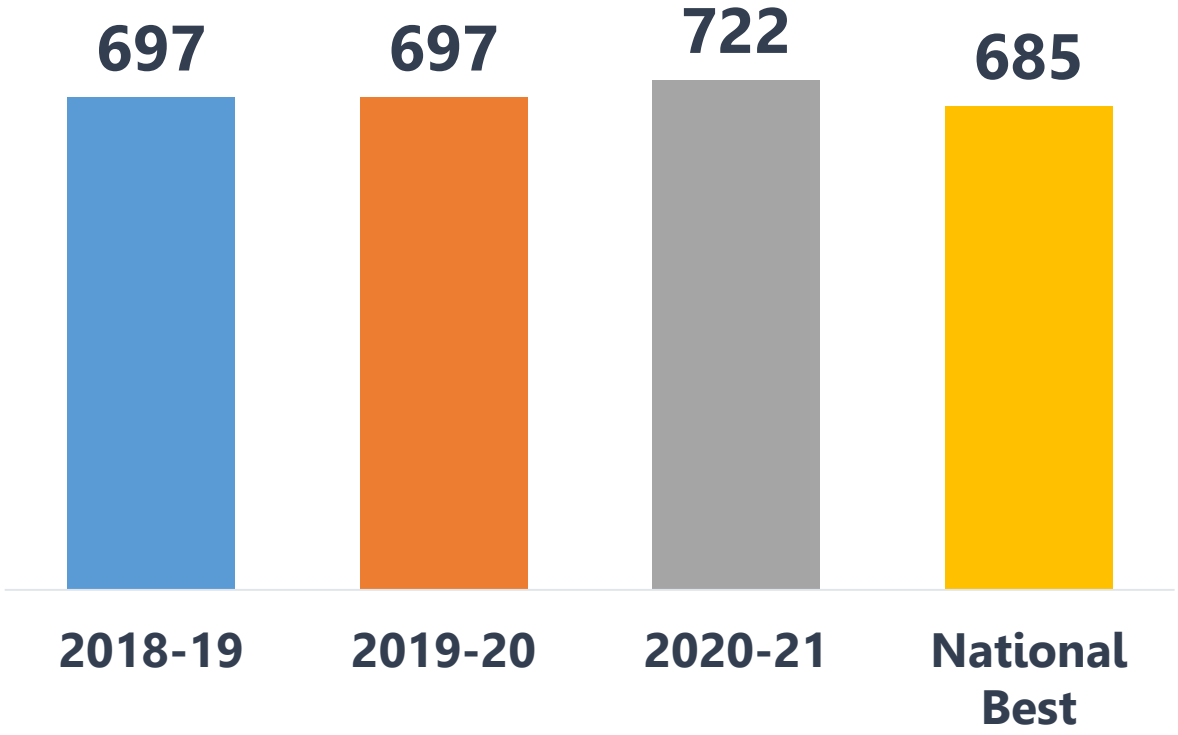
Upto Clinkerization Power - kWh/MT



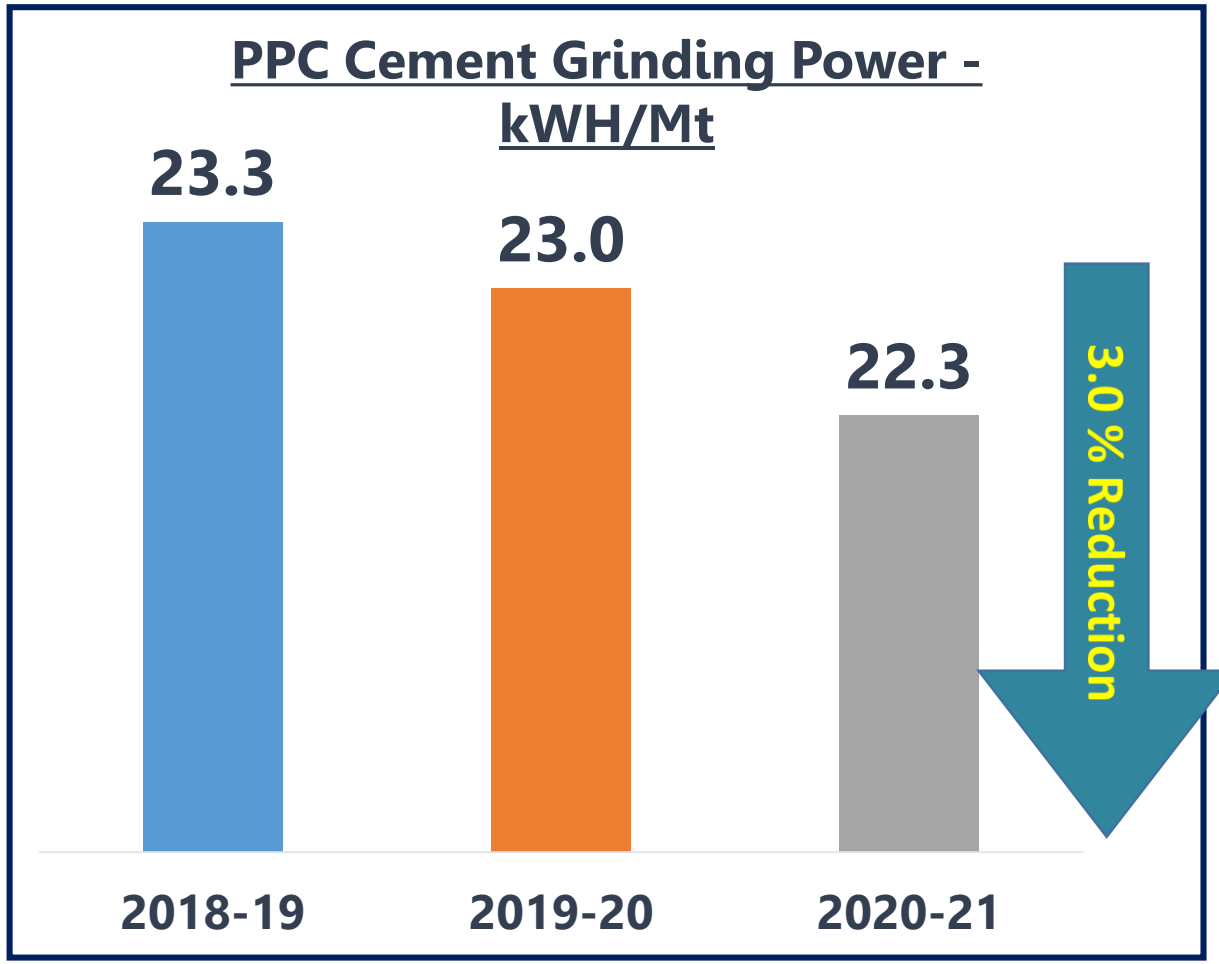
Increased TSR from 6 to 11%
LS moisture increased by 1%
LS Bond Index increased by 1%

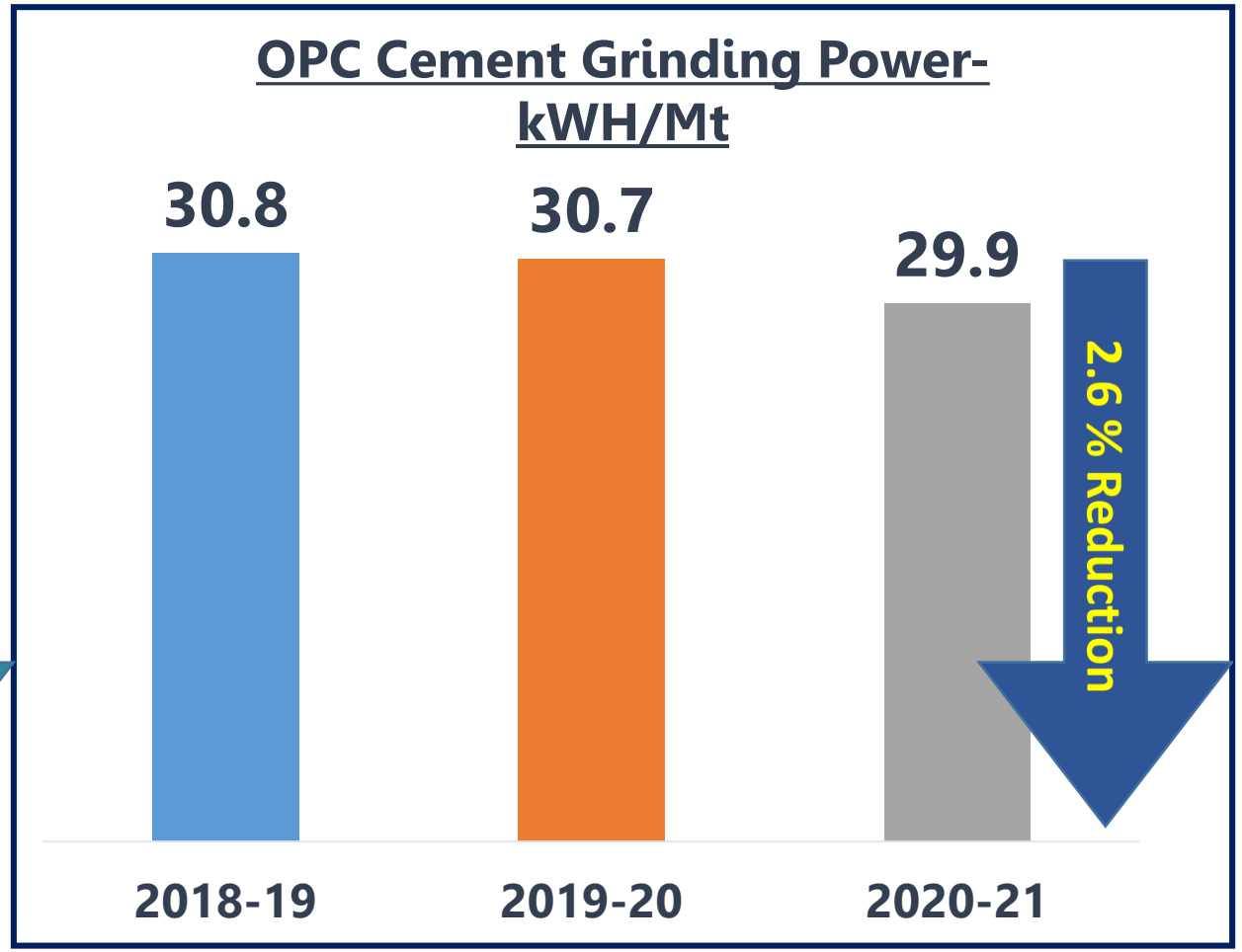
Sp. Heat Consumption - Kcal/kg cl

Due to increase of TSR % and high moisture in AFR



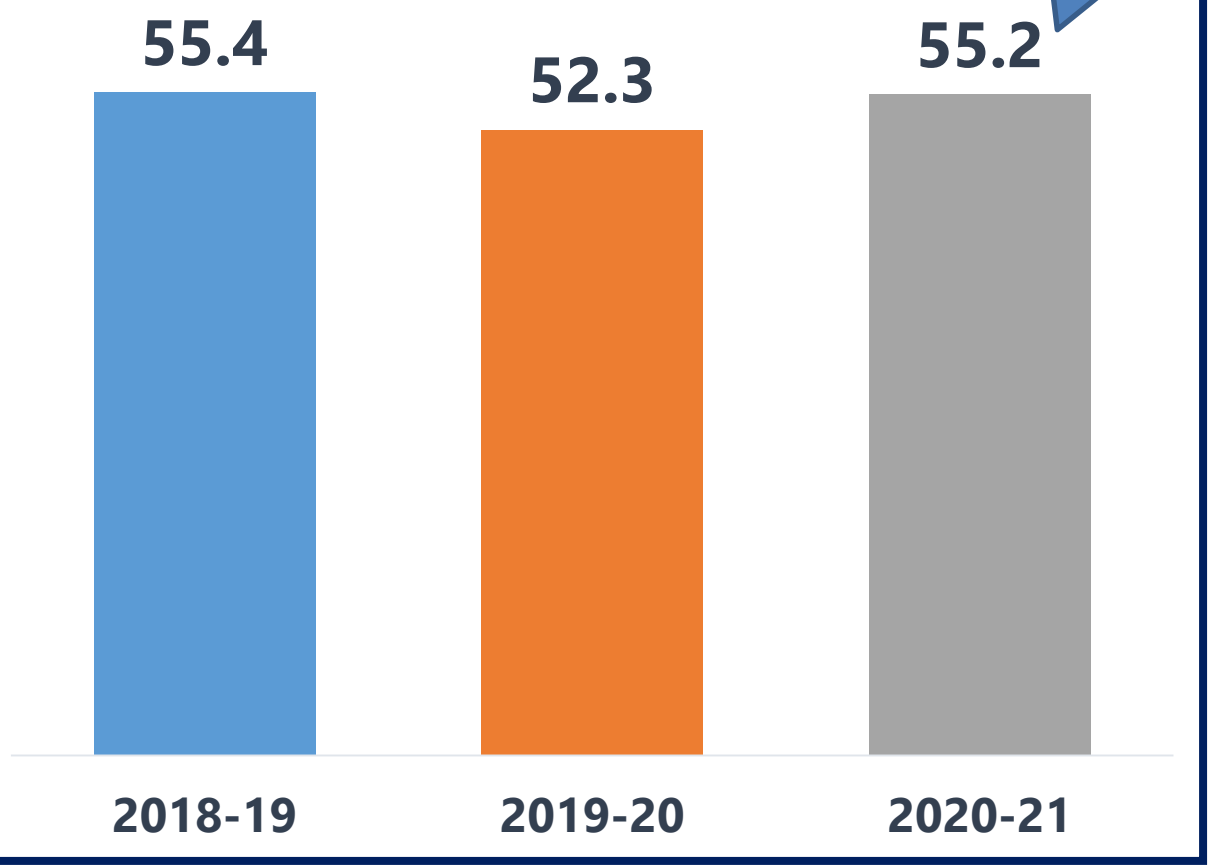
3. Specific Energy Consumption in last 3 years



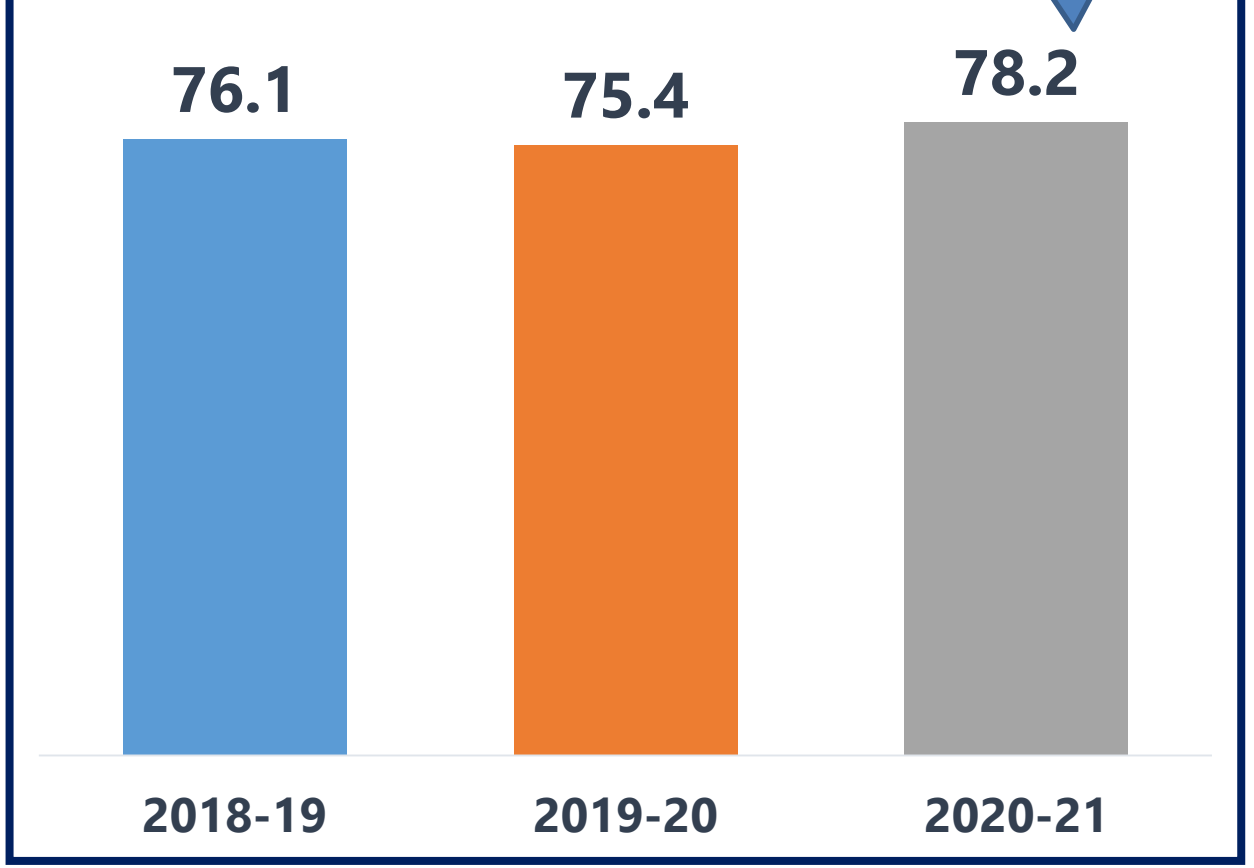


3. Specific Energy Consumption in last 3 years

PPC Overall Sp. Power Consumption - kWH/Mt



OPC Overall Sp. Power Consumption - kWH/Mt



4. Information on Competitors, National & Global benchmark

ENERGYBENCHMARKING		
Parameters	Electrical SEC (kWh / T of Cement)	Thermal SEC (kcal / kg of Clinker)
Comparison of specific energy consumption (SEC)		
SEC : Dalmia Cement –Ariyalur Plant	65.8	722
SEC Values for Competitor - 1 :	66.5	725
SEC Values for Competitor - 2 :	68.2	728
SEC Values for Competitor - 3 :	70.3	734
National Benchmark for SEC :	56.1	676
International Benchmark for SEC :	55.0	670
SEC Target for FY 2021-22 :	62.0	695
Please mention the sources / references for the furnished data (National & International Data)	As per CII Bench marking details (DCBL Ariyalur Plant at 5th place)	

Road Map To Achieve Benchmark/National/Global Best

Reduction of Electrical Energy Consumption

Target – 62 kWh/MT of cement

Up-gradation of Cement Mill Classifier-0.55 units FY-22

Up-gradation of Cement Mill gear box – 0.25 units, FY-22

Up-gradation of Preheater Fan-0.5 units, FY – 22

Up-gradation of Coal mill Classifier – 0.2 units, FY-22

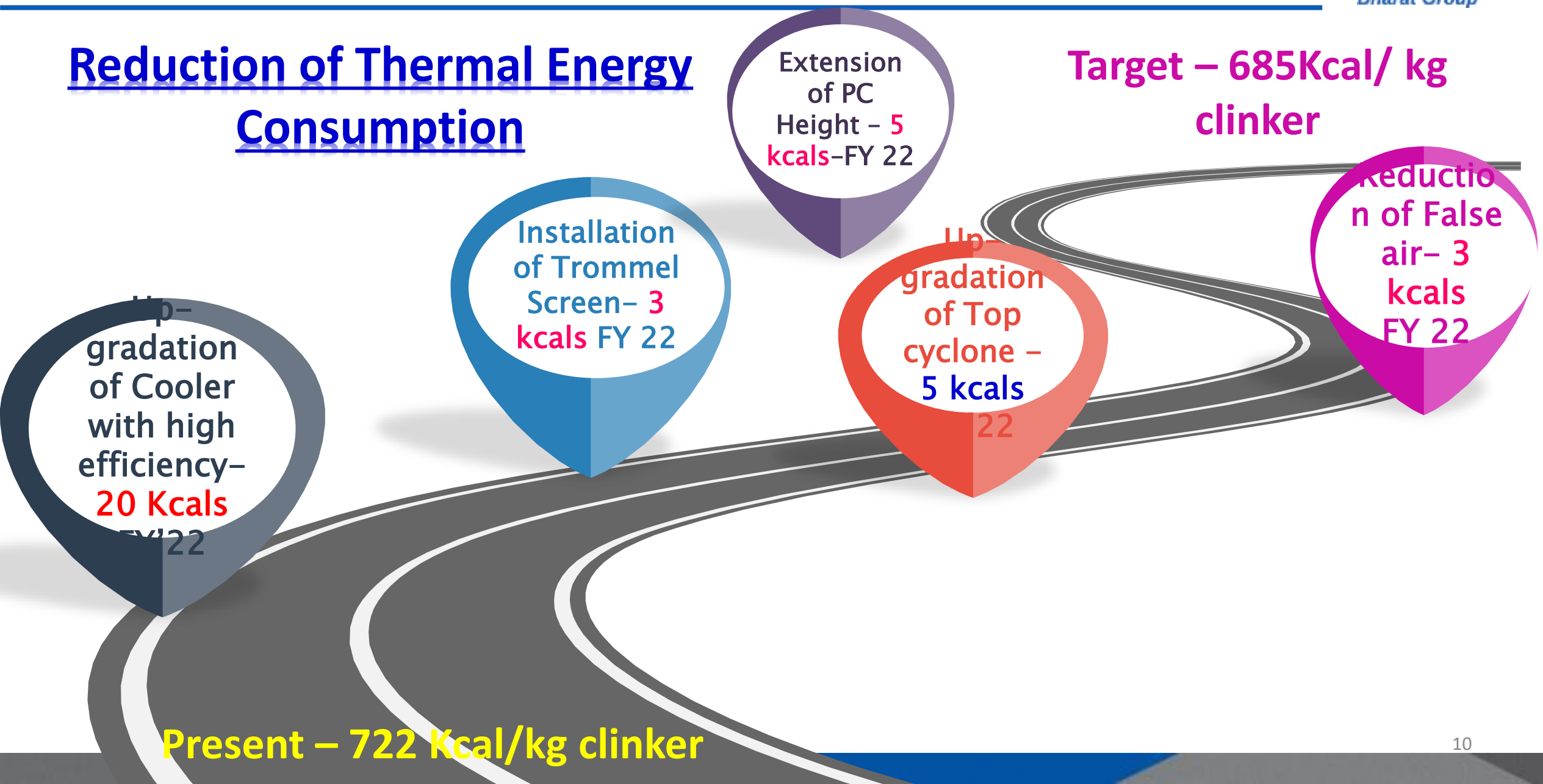
Up-gradation of Cooler with high efficiency-1.5 units, FY-22

Up-gradation of Raw Mill Classifier -0.5 units

Present – 65.8 kWh/MT of cement

Road Map To Achieve Benchmark/National/Global Best

Reduction of Thermal Energy Consumption



List of Major Encon projects planned in FY 2021-22

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Bench Marking Activities

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 Sp. Power consumption by installation of tertiary crusher to reduce the limestone size <40mm	2493560	11.22			11.2	15	16
2	Enhancement of productivity in Raw Mill by up-gradation of Classifier & mill Fan with high efficiency & high volume	748068	3.37			3.4	40	143
3	Reduction of Pressure drop across Raw Mill nozzle ring by modification of nozzle orientation as recommended by M/S MECHWELL	311695	1.40			1.4	3	26
4	Up-gradation of Coal Mill Classifier with high efficiency	331612	1.49			1.5	5	40
5	Up-gradation of Preheater Fan with higher efficiency & higher volume	782210	3.52			3.5	20	68
6	Up-gradation of Baghouse Fan with higher efficiency & higher volume	391105	1.76			1.8	8	55
7	Up-gradation of Clinker Cooler with IKN Cooler	3259210	14.67	6,269	58.7	73.3	237	39
8	Up-gradation of Pre-calciner by extension of height			1,045	9.8	9.8	53	65
9	RDF to Charcoal conversion project			1,254	11.7	11.7	21	21
10	Reduction of PH pressure drop by retro-fitting of Top Cyclone	260737	1.17	313	2.9	4.1	20	58
11	Up-gradation of Cement Mill Classifier with High Efficiency	1046787	4.71			4.7	144	367
12	Enhancement of CVRM mill output by retro-fitting of CVRM gear box	697858	3.14			3.1	83	317
13	Installation of Solar Plant - 9 MW (Considered avg - 1.5 MW for 12 hrs*330days)	6237000	21.83			21.8	460	253
Total Saving		1,65,59,842	68	8,881	83	151	1,109	88

5. 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	Investments in Lakhs	Savings in Lakhs
2018-19	20	114	162	8.4	2	0	7.2
2019-20	12	193	237	9.8	3	0	17
2020-21	12	2447	252	116	2	0	7
Total Cost Savings -Lakhs			651				31.2

5. Energy Saving projects implemented in FY 2018-19

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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	Effective utilization of quick start	66725	0.32			0.3	0	0
2	Secondary Crusher tripping avoided by installation of hardox plate at side comb	111209	0.53			0.5	0.8	18
3	VFD installed in Auxiliary bag filter fan in Raw mill Bag house transport group	119033	0.57			0.6	0.1	2
4	Raw Mill cyclone rotary airlock gap minimized thereby False air reduced by 1%	238066	1.13			1.1	0.3	3
5	Optimization of Nozzle ring & Dam ring in Raw Mill	714199	3.40			3.4	0.5	2
6	Optimization of Coal Mill Dam Ring & Nozzle Ring with immediate effect of fuel changeover	131838	0.63			0.6	0.3	6
7	Reduction of Coal Mill Bag house DP from 100 to 60mmwg by providing the coanda purging nozzles	171389	0.82			0.8	1.2	18
8	Optimization of Pyro-jet Burner			557	4.60	4.60	2	5
9	Reduction of False Air from 5 to <4 %	78207	0.37	70	0.58	0.95	1	13
10	Installation of Turbo Blower for Kiln coal pumping	31283	0.15	111	0.92	1.1	0.9	10
11	Top cyclone entry portion enlarged by 500mm thereby pressure drop got reduced by 10 mmwg	78207	0.37			0.4	0.5	16
12	ESP fan inlet duct splitter plate and swivel plate provided at fan inlet thereby fan static resistance reduced by 10 mmwg	31283	0.15			0.15	0.2	15
13	45 kwh Compressor installed in pyro section for shut down work	7821	0.04			0.04	0.02	6
14	Fresh Air damper provided in OPC grinding	73573	0.35			0.4	0.1	3
15	Cement Mill Fan Cone gap reduced	92878	0.44			0.44	1.0	27
16	VFD installed in Auxiliary bag filter in Cement Mill Section (511 FN1, 591 FN7 & 561 FN2)	65015	0.31			0.31	0.8	29
17	Preheater & cooler building all the HPSV lamps changed to LED	18576	0.09			0.09	0.6	81
18	CCR building all the CFL lamps changed to LED	27864	0.13			0.13	0.6	54
19	High efficiency pump installed in Cement Mill & CCR	37151	0.18			0.18	0.3	17
20	Packing Plant Bag Filter optimization	33436	0.16			0.16	0.30	23
	Total Saving	21,27,754	10.1	738.0	6.1	16.2	11.4	8.4

5. Energy Saving projects implemented in FY 2019-20

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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

5. Energy Saving projects implemented in FY 2020-21

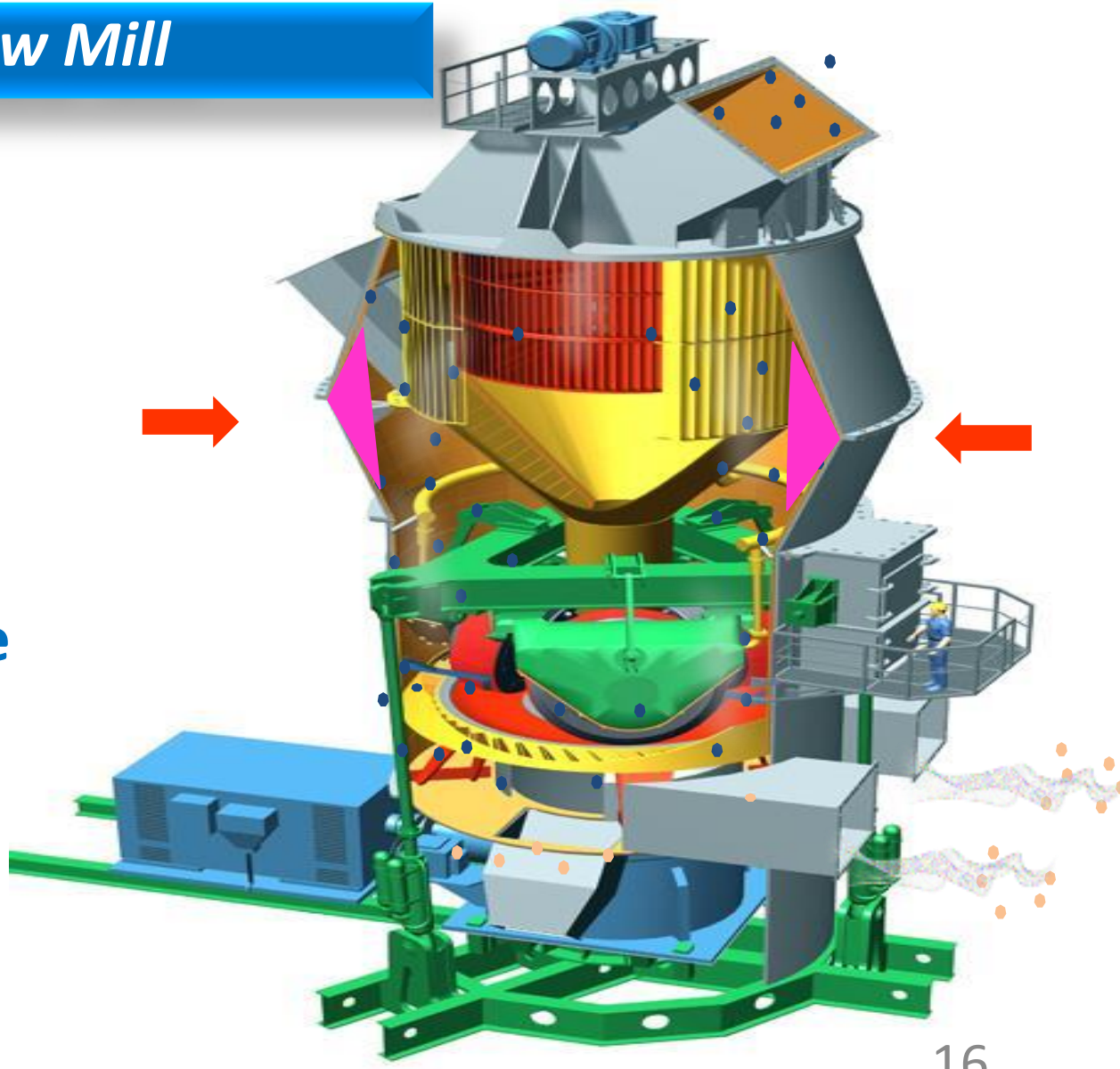
Dalmia Bharat Group

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

5. Energy Saving projects implemented in FY 2020-21

Reduction of Classifier Annular Gap in Raw Mill

- Classifier inlet velocity increased from 12 to 16 m/sec by reduction of annular Gap thereby mill internal recirculation load reduced and mill DP also reduced by 20mmwg which was resulted that mill output was increased by 10-15 TPH
- After this modification, we achieved the mill output more than 450 TPH



Benefits:

- ☑ Sp. Power reduced by 0.12 kWH/MT
- ☑ Investment – 13 Lakhs
- ☑ Cost Saving – 12 Lakhs/annum

5. Energy Saving projects implemented in FY 2020-21

Conversion of DUOFLEX to JETFLEX Burner

- Duoflex burner tip converted into Jetflex Burner successfully and Primary Air consumption reduced by 4% thereby Heat consumption reduced by 4 Kcal/ kg clinker
- Achieved the desired clinker production of 6000 TPD

Benefits:

- ☑ Sp. Heat consumption reduced by 4 Kcal/ kg cl
- ☑ Cost Saving – 5.5 Lakhs/annum

5. Energy Saving projects implemented in FY 2020-21

Optimization of Compressor Air Consumption by inter-connecting

160 Kw Compressor
CFM – 950
Speed – 50-60%
Power -88 kWH

45 Kw Compressor
CFM – 240
Power – 30 kWH

- Pre-heater
- Raw Mill
- Coal Mill
- Kiln Bag House
- Blending Silo
- ROBO Lab

160 Kw Compressor
CFM – 950
Speed – 70%
Power -105 kwh

- Pre-heater
- Raw Mill & BH
- Coal Mill
- Kiln Bag House
- Blending Silo
- ROBO Lab

Benefits:

- ☑ Sp. Power reduced by 300 kWH/Day
- ☑ Cost Saving – 4.5 Lakhs/annum

6. Innovative project implemented in FY 2020-21

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Implementing Coal Mill Recirculation System By innovative idea

Constraints:

- No recirculation system as per design
- Mill overload due to more material accumulation in scrapper chamber and need frequent empty out
- Reduction in mill productivity
- High handling cost

Innovation:

- Introducing recirculating arrangement with in-house design to handle rejects by mechanized system against OEM design

6. Innovative project implemented in FY 2020-21

Project Details:

- In-house design and developed recirculation system with bucket elevator and air tight arrangement to ensure closed loop system
- All the equipment's including bucket elevator made in-house and installed

Replication Potential:

- This project can be implemented in all coal mill which is <25 TPH

Benefits:

- ☑ Mill main drive power hunting was optimized by 10-15 kW
- ☑ Sp. Power reduced by 0.4 kWH/MT
- ☑ Cost Saving – 12 Lakhs/annum

7. Utilization of Renewable Energy Sources

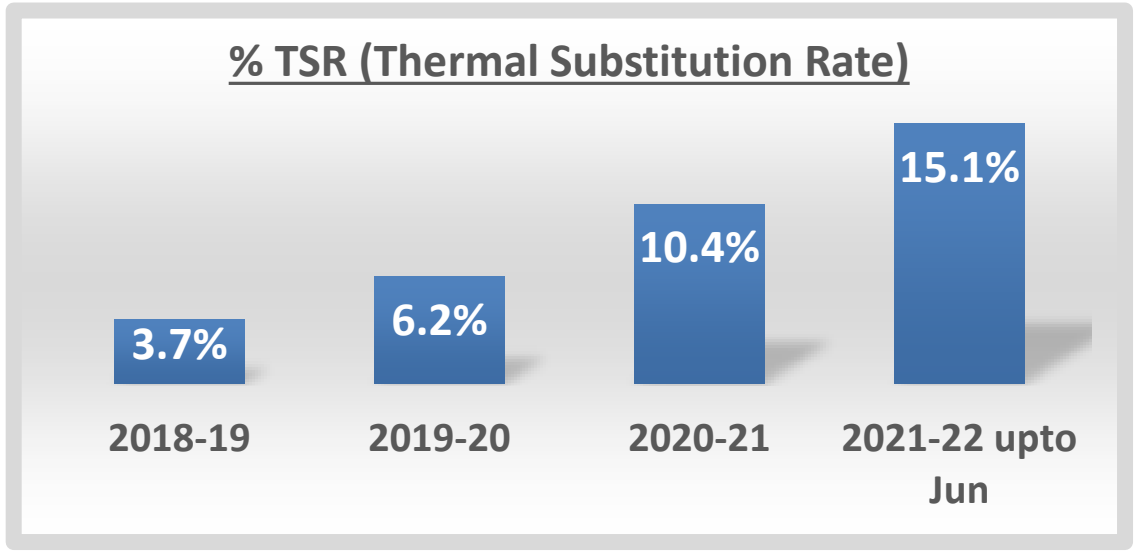
Replacement of Electrical Energy with Renewable Energy	Annual Energy Generated in 2018-19 (million kWh)	% Share	Annual Energy Generated in 2019-20 (million kWh)	% Share	Annual Energy Generated in 2020-21 (million kWh)	% Share
Wind Energy	24.27	19.95	23.28	17.93	21.98	17.51
Replacement of Thermal Energy with Renewable Energy	Equivalent Annual Fuel Savings in 2018-19 (million kcal/year)	% Share	Equivalent Annual Fuel Savings in 2019-20 (million kcal/year)	% Share	Equivalent Annual Fuel Savings in 2020-21 (million kcal/year)	% Share
Solar Thermal Energy	65	0.01	65	0.01	65	0.01
Biomass Plant	12	0	12	0	12	0

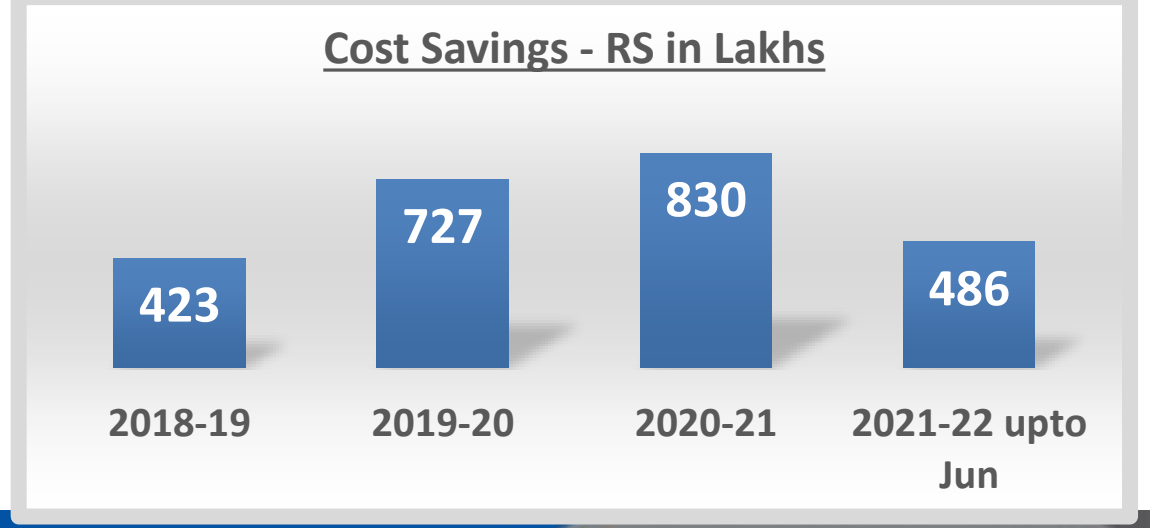
On Site -Solar Power plant (11 MWP) erection in-progress & planned to commission on Jan'22

8. Utilization of waste material as fuel

Clean & Green is Sustainable & Profitable

Green Fuel	2018-19	2019-20	2020-21
Carbon black	2289	813	0
Plastic waste	622	2365	7415
RDF	-	3465	14753
Spent wash/GEPIL Liquid	177	621	516
Solid Waste Mix	1889	2624	924
Tyre chips	1057	1222	290
Resin Waste	522	1650	863
Paint Sludge	707	1964	639
Oil chocked Cotton Waste	769	941	723
SCF	-	269	290
Total Quantity-MT	8032	15934	26413
% TSR	3.7%	6.2%	10.4%
Green Raw Material	2018-19	2019-20	2020-21
Tannery Sludge - MT (Wet)	4469	4862	33
Lime Sludge - MT (Wet)	14076	25702	17489
Total Quantity-MT	18545	30564	17522





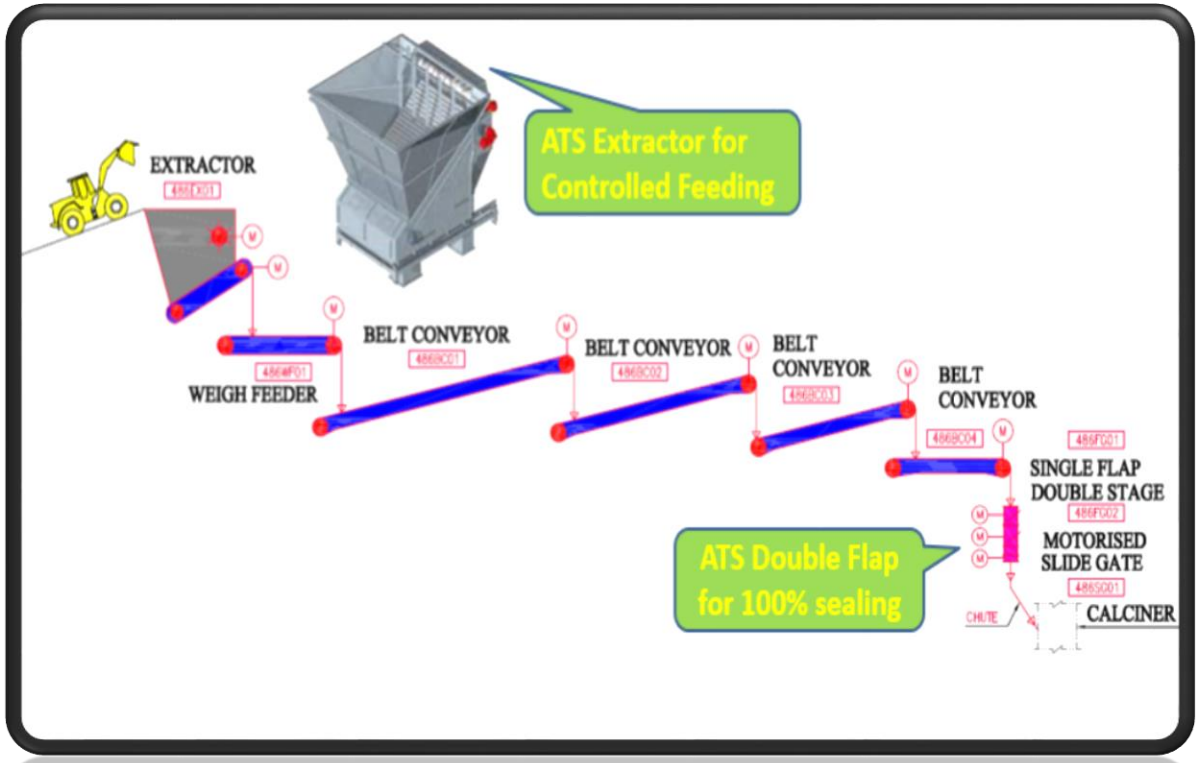
8. Utilization of waste material as fuel

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



9. Learning from CII Energy Award 2020

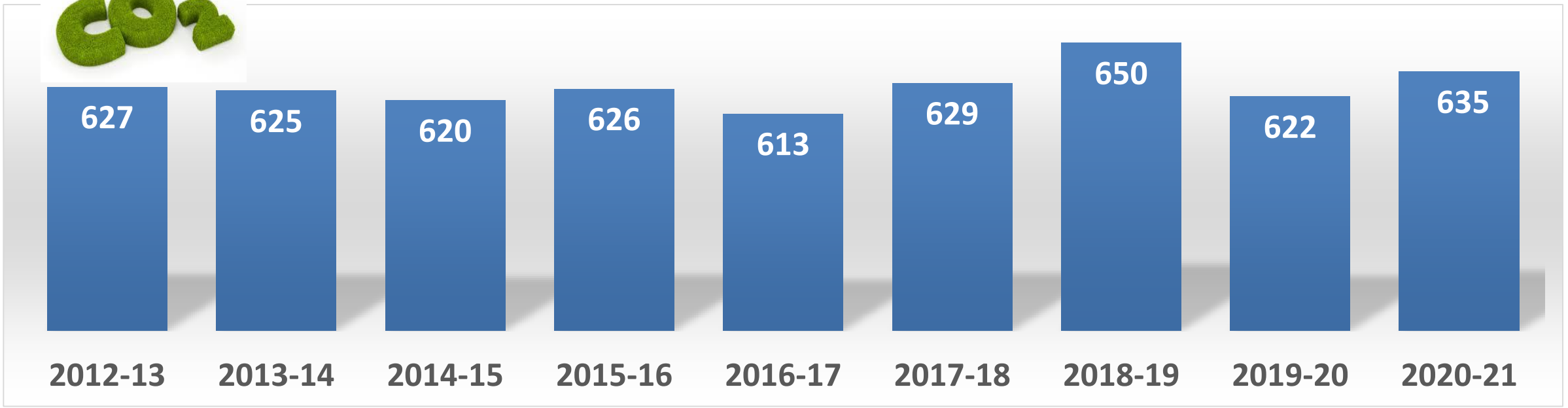
1. Reduction of classifier annular gap in VRM that was learned in CII forum and it was implemented in all the mills – Mill output increased by 15 TPH and reduced sp .power – 0.1 kWH/MT

2. Reduction of Bag house DP by providing the purging nozzle in purging pipe that was learned and it was implemented in Cement mill, coal mill and auxiliary bag filters – Reduced the sp. Power consumption – 0.8 kWH/MT

3. Implementing triple feeding point for Dry-flyash feeding in CVRM – Mill output increased by 5-10 TPH

10. GHG Inventorisation

CO2 emission – Kg/ MT of Cement



Action Plan to achieve <400 kg /MT of cement

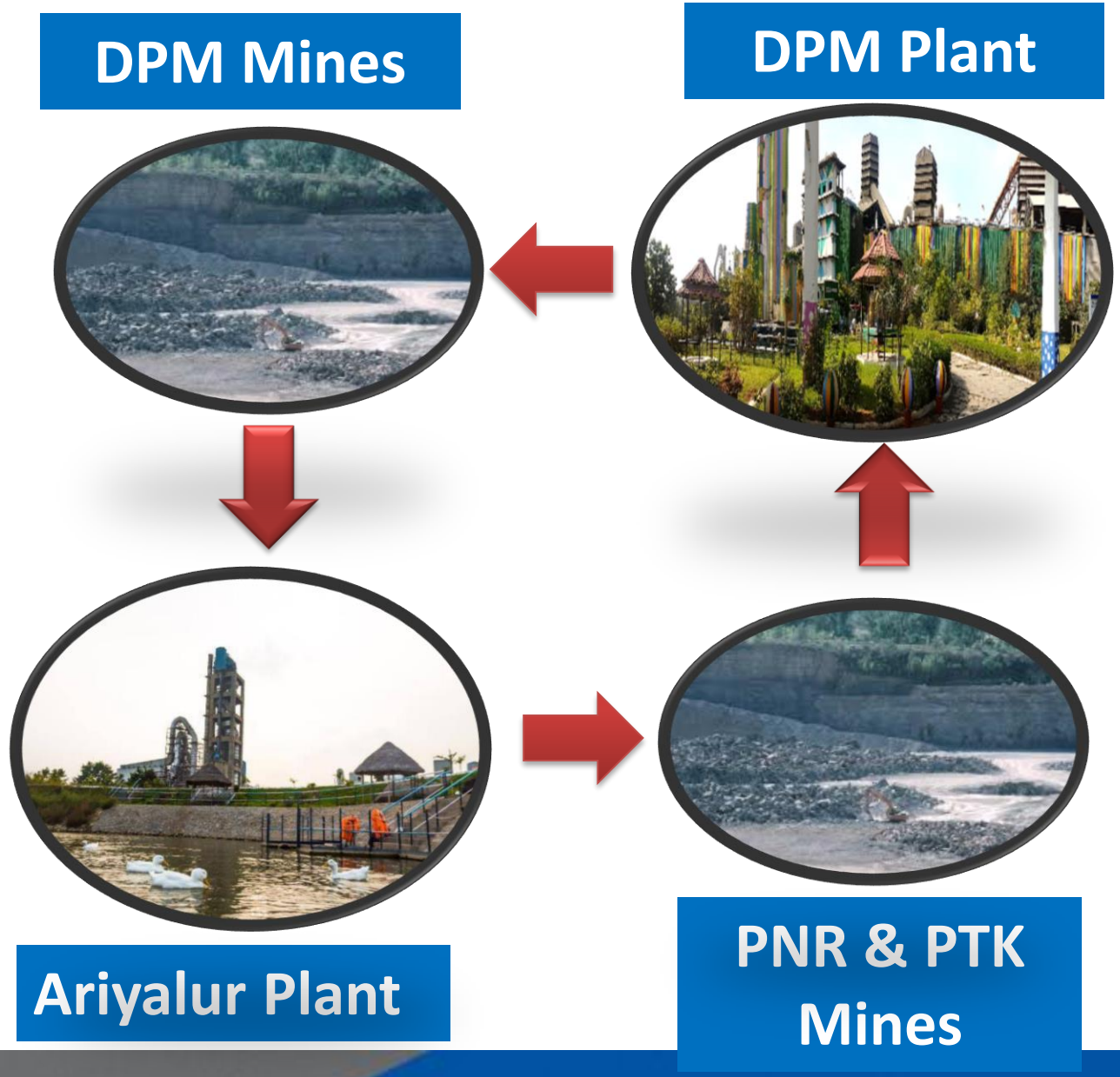
Short Term:

- Increase the AFR utilization from 10 to 35%
- Increase of PPC product ratio from 58 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

11.1 Green Supply Chain – Round Trip



Results:

- Round Trip Qty
- FY 2019-20 = 896732 MT
- FY' 2020-21 = 1040102 MT
- Increased thro' round trip - 143370 MT
- If direct Trip - 1.94 Lits/ Mt
- If Round Trip – 1.25 Lits/ Mt
- Fuel Saved - 98925 Lits of Diesel

☑ **Cost Saving – 84 Lakhs/ Annum**

11.0 Green Supply Chain

11.2 Increased Backhaul Quantity

Results:

- Increased Backhaul Quantity from 8.3 to 8.7%
- Fuel Saved = 19773 Lits of Diesel

☑ Cost Saving = 17 Lakhs/annum

11.3 Increased Higher Size Vehicle

Results:

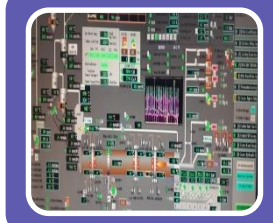
Fuel Savings = 24397 Lits

Cost Saving = 21 Lakhs

12. Team work, Employee Involvement & Monitoring

Daily Monitoring and Reporting System

On line Energy management System (EMS) and Knowledge Manager

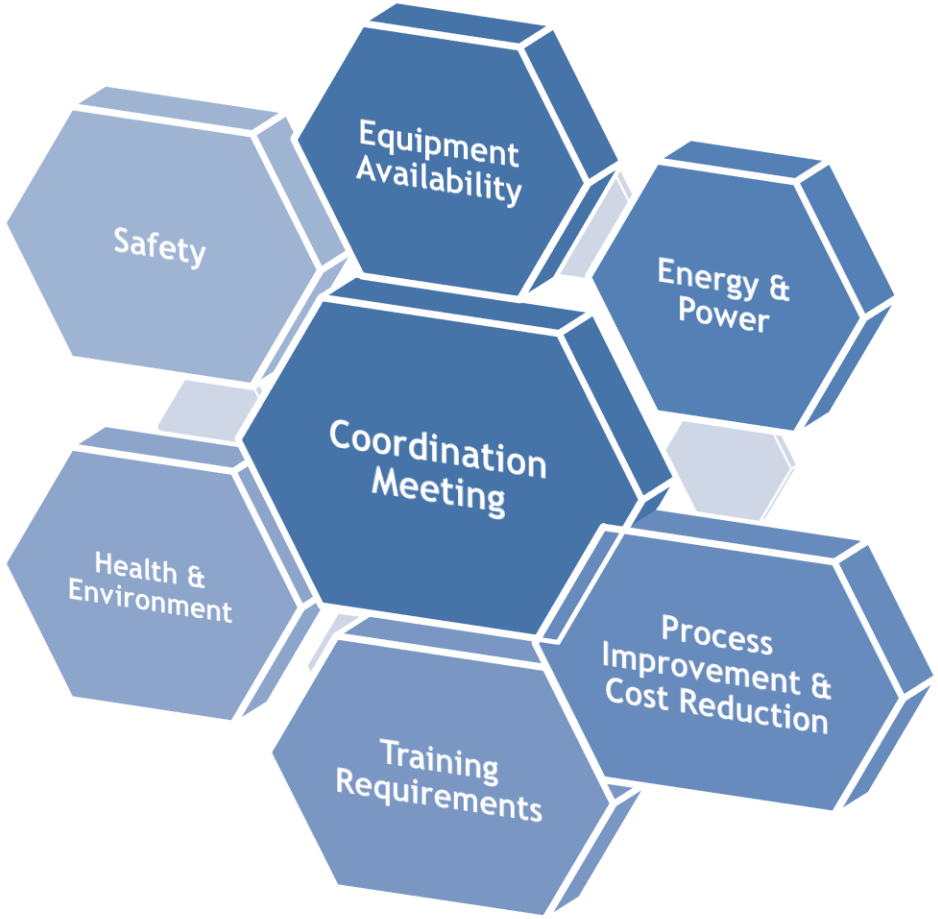


Online Specific power consumption is monitored by CCR Operators

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

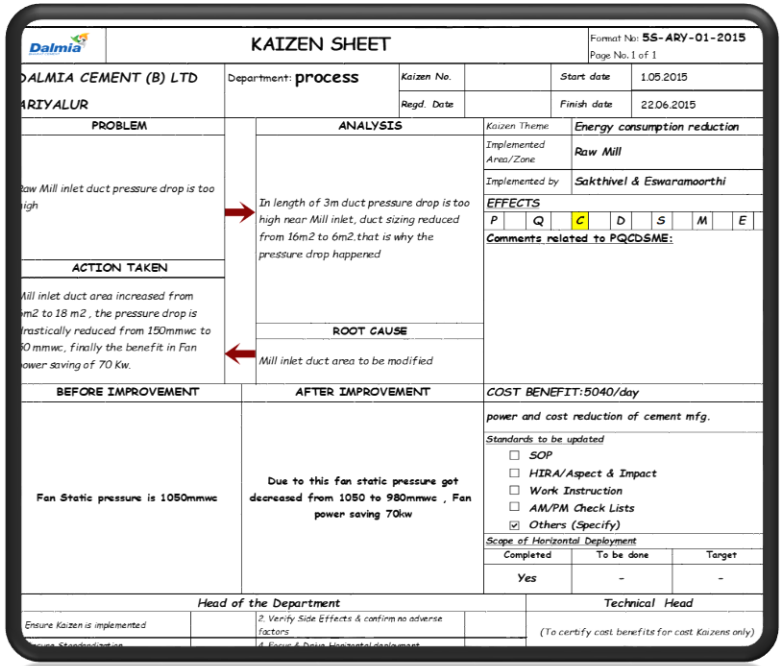
Daily Review Meeting Chaired by Technical Head



12. Team work, Employee Involvement & Monitoring

- Energy Task Force Team, Cross functional team (CFT) & Quality Circle team (QC) – Identifying energy saving potential projects, implementation and monitoring.
- Quick fund allocation by the management based on the pay back period less than 40 months
- Best Energy saving initiatives from Kaizen and Encon projects are awarded every month Gate meeting.
- Visiting Energy Efficient plant & Participating seminars for new technology adoption

Kaizen Format



KAIZEN SHEET

Format No: 5S-ARY-01-2015
Page No. 1 of 1

ALMIA CEMENT (B) LTD	Department: process	Kaizen No.		Start date	1.05.2015
ARIYALUR		Regd. Date		Finish date	22.06.2015

PROBLEM	ANALYSIS	
aw Mill inlet duct pressure drop is too igh	In length of 3m duct pressure drop is too high near Mill inlet, duct sizing reduced from 16m2 to 6m2,that is why the pressure drop happened	Kaizen Theme: Energy consumption reduction Implemented Area/Zone: Raw Mill Implemented by: Sakthivel & Eswaramoorthi
ACTION TAKEN	ROOT CAUSE	EFFECTS: P Q C D S M E Comments related to PQCDSME:
Mill inlet duct area increased from m2 to 18 m2 , the pressure drop is rastically reduced from 150mmwc to 0 mmwc, finally the benefit in Fan ower saving of 70 Kw.	Mill inlet duct area to be modified	

BEFORE IMPROVEMENT	AFTER IMPROVEMENT	COST BENEFIT:5040/day
Fan Static pressure is 1050mmwc	Due to this fan static pressure got decreased from 1050 to 980mmwc , Fan power saving 70kw	power and cost reduction of cement mfg.

Standards to be updated
- ☐ SOP
- ☐ HIRA/Aspect & Impact
- ☐ Work Instruction
- ☐ AM/PM Check Lists
- ☑ Others (Specify)

Scope of Horizontal Deployment

Completed	To be done	Target
Yes	-	-

Head of the Department			Technical Head
Ensure Kaizen is implemented		2. Verify Side Effects & confirm no adverse factors	(To certify cost benefits for cost Kaizens only)

Project implemented through kaizen – 11 no's on FY 20-21

Energy Efficiency training, workshops & seminar's attended – 12 Programs

13. 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

MGMT. SYS. RvA C 024

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

Green-Pro Certification from CII

Almost 2.13 % of Turn over was invested on Energy Conservation Projects

Way Forward

- Reduction of “Heat Rate” from 722 to 685 Kcal/ kg clinker
- Reduction of Electrical Power from 65.8 to 62 kWh/Mt of cement
- Increase the Green Fuel Usage from 10.4 to 35%
- Commissioning of Solar Power plant -11 MWP
- Implementation of Industry 4.0
- Negative Carbon footprint by 2040
- 100% Renewable Energy by 2030

BEE - Energy Awards

National Energy Conservation Award From Ministry Of Power FY 2012

National Energy Conservation award from Ministry of Power FY 2013

National Award in an Two Categories – NCCBM (Energy & Environment) FY 2019

CII - Energy Awards

9 Consecutive Years

2011-12

2012-13

2013-14

2014-15

2015-16

2016-17

2017-18

2018-19

CII

Confederation of Indian Industry

125 Years • Since 1895

21st National Award for

Excellence in Energy Management 2020

This is to certify that

Dalmia Cement (Bharat) Limited, Ariyalur

has been recognized as

"National Energy Leader"

for their consistent and progressive performance in energy management.

This acknowledgment is based on the evaluation by panel of judges at the "National Award for Excellence in Energy Management" held during 25 - 28 August 2020.

K S Venkatagiri
Executive Director
CII - Godrej GBC

Ravichandran Purushothaman
Chairman, Energy Efficiency Council
CII - Godrej GBC

2019-20

Mail ID:

Robert.t@dalmiacement.com

Thank you