Ultratech – Dhar Cement Works

ADITYA BIRLA GROUP

22nd National Award for Excellence in Energy Management

A Presentation by –

UltraTech CEMENT

Dhar Cement Works

24th to 26th August 2021

Presenters:

1. _____
2. _____
3. _____

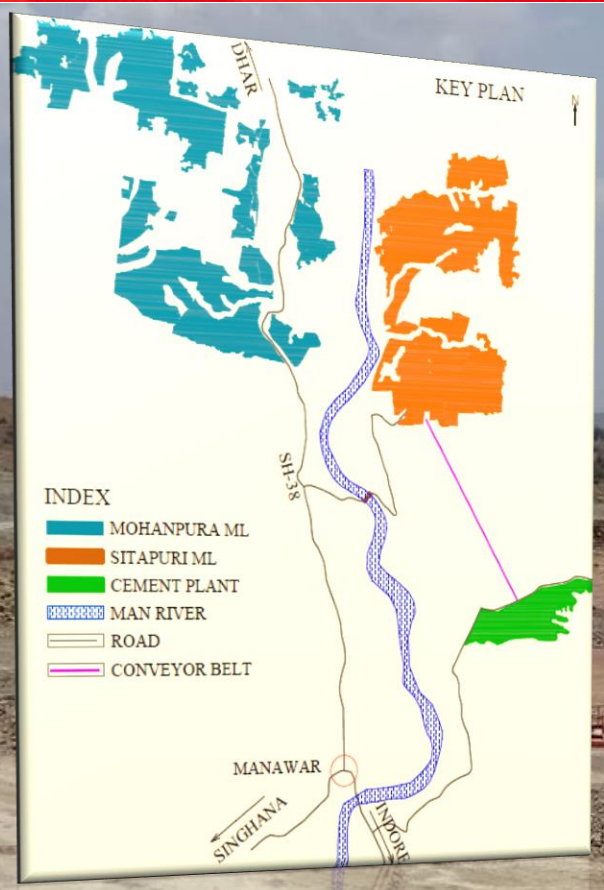
Plant Introduction – Dhar Cement Works

- Clinker Capacity - 2.4 MTPA (7200 TPD)
- Cement Capacity - 3.5 MTPA (10500 TPD)
- Grades - OPC 43, OPC 53, PPC, PPC-WR

Location - Village Tonki, about 120 kms away from Indore, MP.

- Project commissioned in a record time of 363 days, One of the fastest in Cement Industry; at par with global benchmarks
- Compact Footprint, Energy Efficient, Eco-friendly with Latest Technology

Mohanpura and Sitapuri Limestone Mines



Over Land Belt Conveyor (OLBC), 8.0 km long, for transportation of Limestone from Mines to Plant. One of the longest Straight Line and most energy efficient belts among Ultratech Units

Mohanpura (ML -1026 Ha) 0.80 MTPA

Sitapuri (ML - 965 Ha) 3.66 MTPA

Best Practices Followed at Dhar Plant (DHCW)

- ✓ Commissioned in March 2018, DHCW, is a Young Plant with basic Infrastructure and industry best practices in Place
- ✓ Plant is water positive, with natural water reservoirs developed at Plant and Mines Site for rain water harvesting
- ✓ Green Belt development since plant commissioning, with annual plantation of 25 to 30K saplings (cumulative > 1.2 Lac)
- ✓ WHRS System with generation capacity of 13 MW installed during FY 2018-19
- ✓ AFR Feeding System and Solar Power Plant of 15 MWp/ 12.75 MW capacity installed in FY 2019 -20
- ✓ Capacity enhancement plan started in FY 20 -21, for setting up new line of equal capacity.

Process Flow

- Compact and Lean Layout
- Not sidetracking of material
- U shaped material flow
- Single material entry point
- Single material exit points.

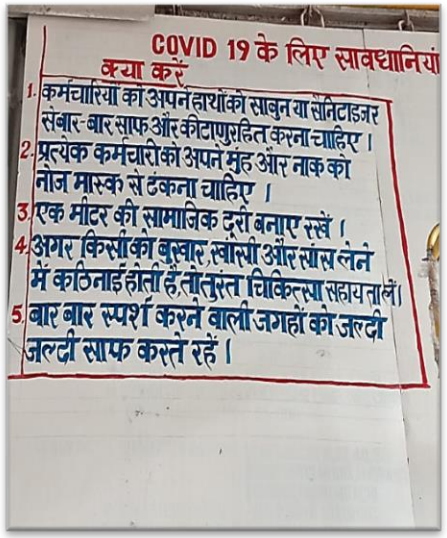
Key Equipment and Capacities

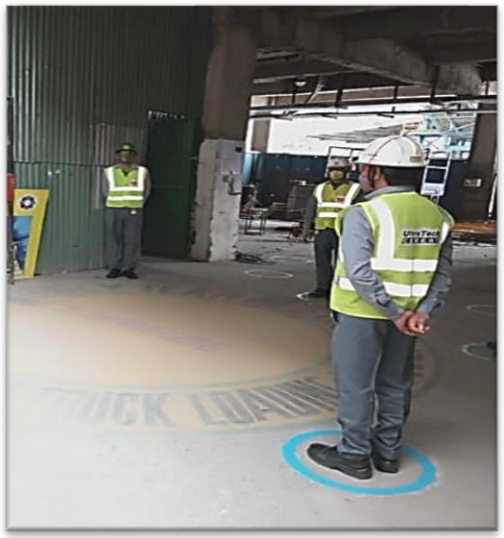
Description	Type	Make	Installed capacity	Operating Capacity
Lime Stone Crusher	Roller Hammer Crusher	L&T	1200 TPH	1370 TPH
Raw Mill	Vertical Roller Mill	Loesche	530 TPH	575 TPH
Kiln & Preheater	Rotary Kiln	ThyssenKrupp	7200 TPD	8000 TPD
Clinker Cooler	Linear Pendulum type with Roller Crusher	IKN	9000 TPD	8000 TPD
Coal Mill	Vertical Roller Mill	Loesche	32 TPH (Petcoke) 60 TPH (Coal)	33 TPH (Petcoke) 55 TPH (Coal)
Cement Mill (2X Mills)	Vertical Roller Mill	Loesche	2 X 240 TPH	232 TPH
Packing Plant (4X Packers)	Cement Bag - Rotary Packer	FLSmidth-Ventomatic	1 X 120 TPH 3 X 240 TPH	1 X 120 TPH 3 X 240 TPH

Impact of Covid 19 and Risk Mitigation

- ❑ Impact on annual production performance: Reduced between 10%-20%
- ❑ Impact on Specific energy consumption (SEC): SEC increased by <5%
- ❑ Initiatives undertaken to improve capacity utilization: Production planning rescheduled to improve the productivity

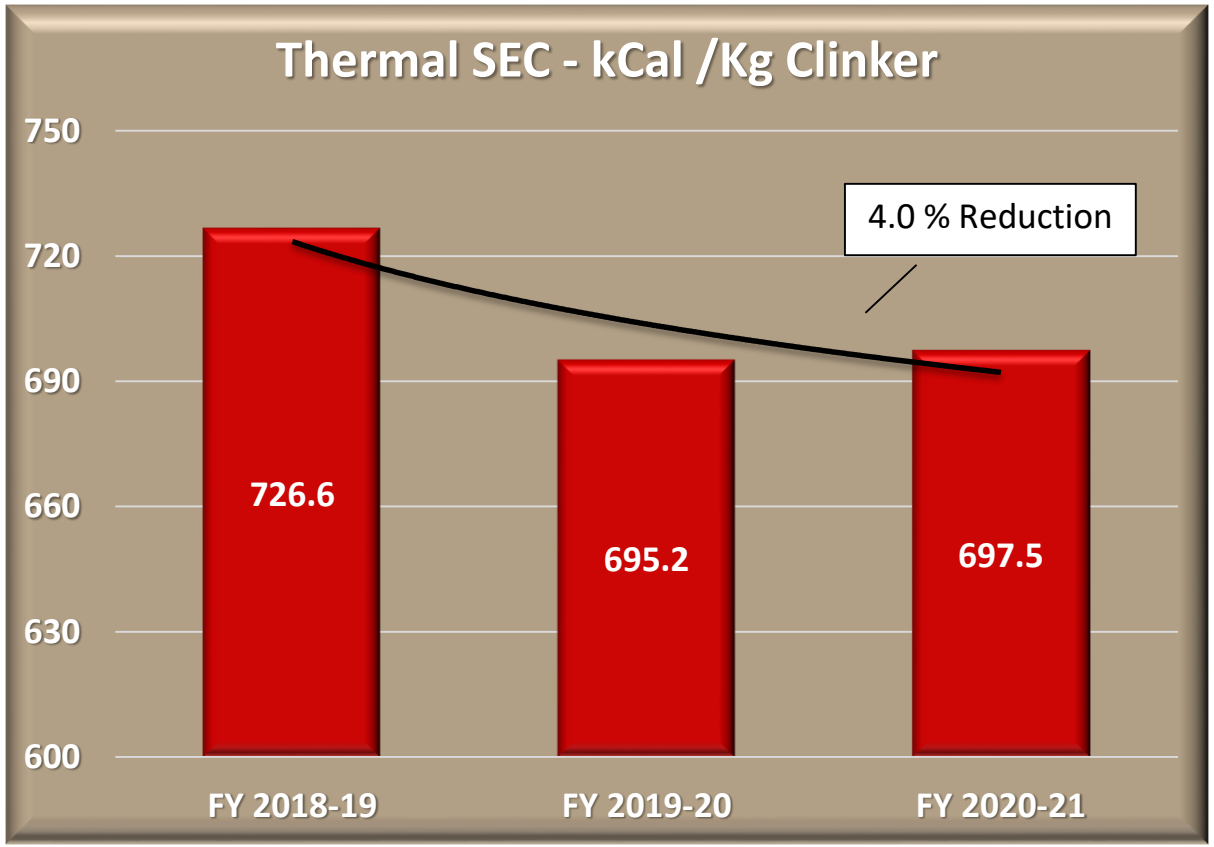
- ➢ Many Initiatives taken to mitigate Covid risks and ensure Business continuity
- ➢ Oyster and Pearl Structure for smooth running, WFH for non technical staff
- ➢ Touchless Sanitization, Attendance through Face reading, Social distancing
- ➢ Awareness sessions and training for Covid appropriate behavior
- ➢ Mass Vaccination for Employees, Contractors, Families
- ➢ Covid Testing and Screening Camps in plant
- ➢ Infrastructure development at nearby medical centers
- ➢ Oxygen generation plant at district level



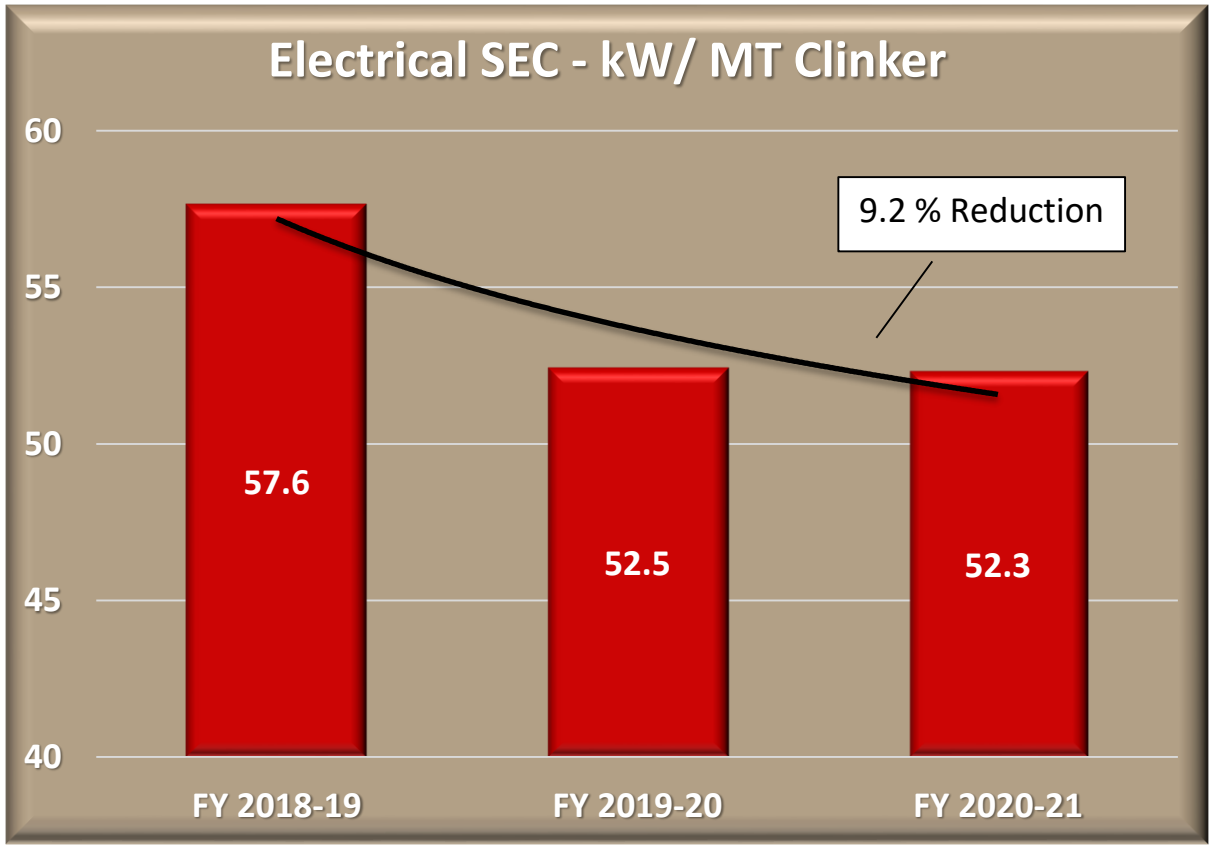


Specific Energy Consumption of Clinker- Thermal & Electrical

2021 Benchmark* – 676 kCal/kg Clinker



2021 Benchmark* – 42.59 kWh/MT Clinker

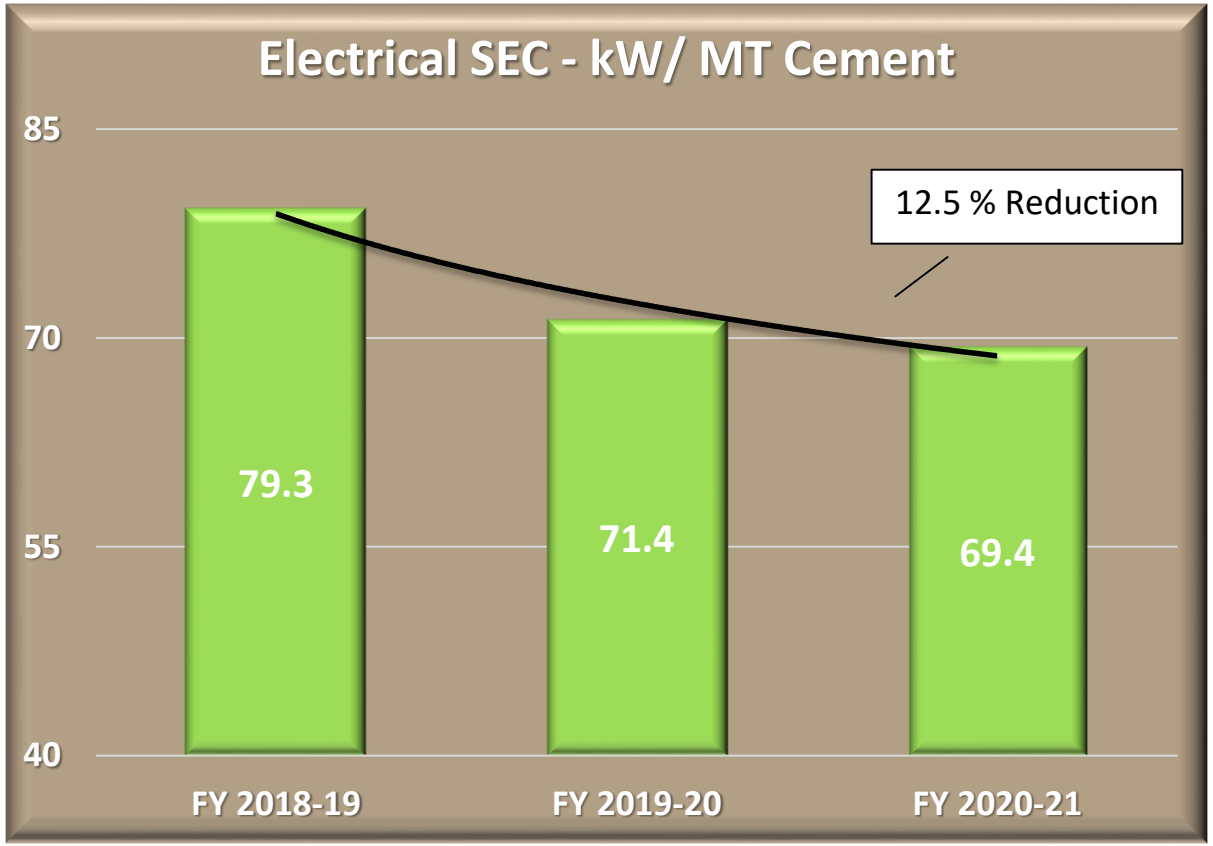


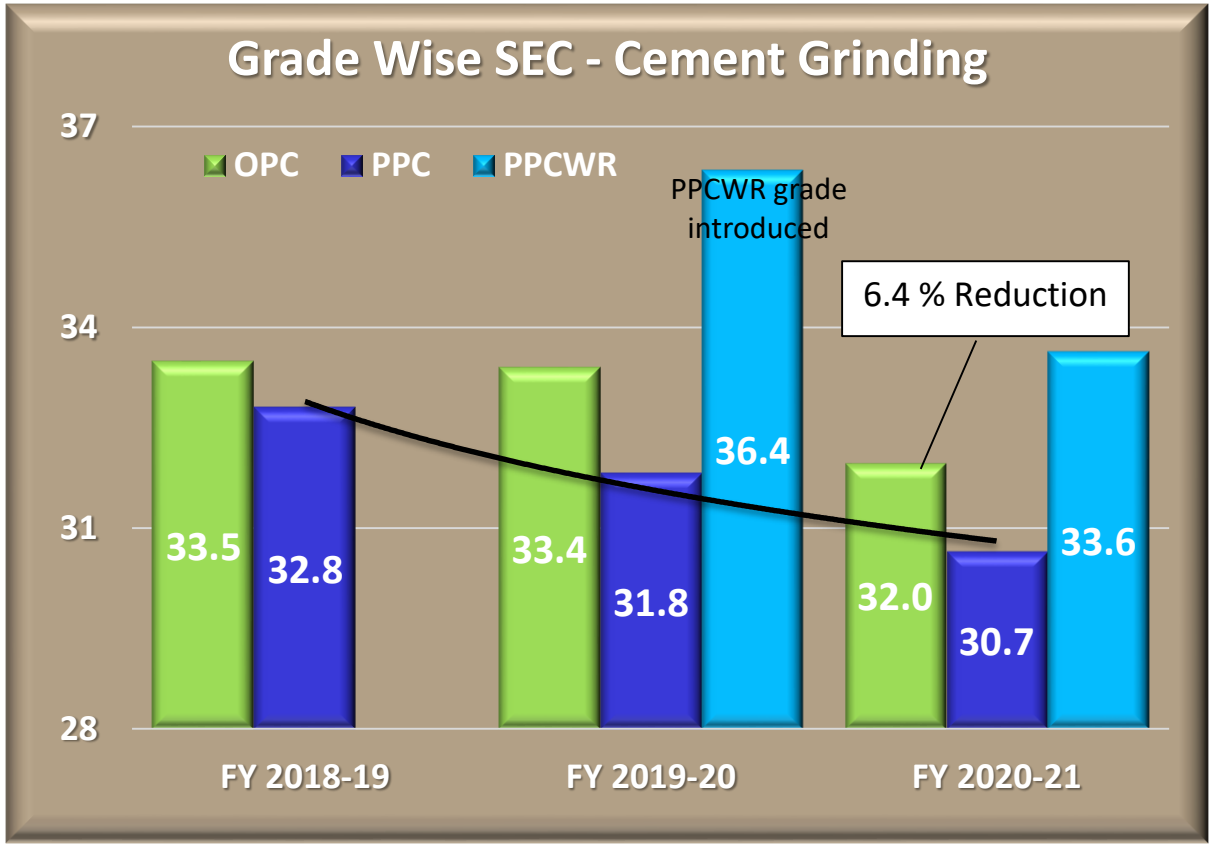
*Source – CII ENERGY BENCHMARKING for the Indian Cement Industry, May 2021

Specific Energy Consumption – Overall Cement

2021 Benchmark* – 56.1 kWh/ MT Cement

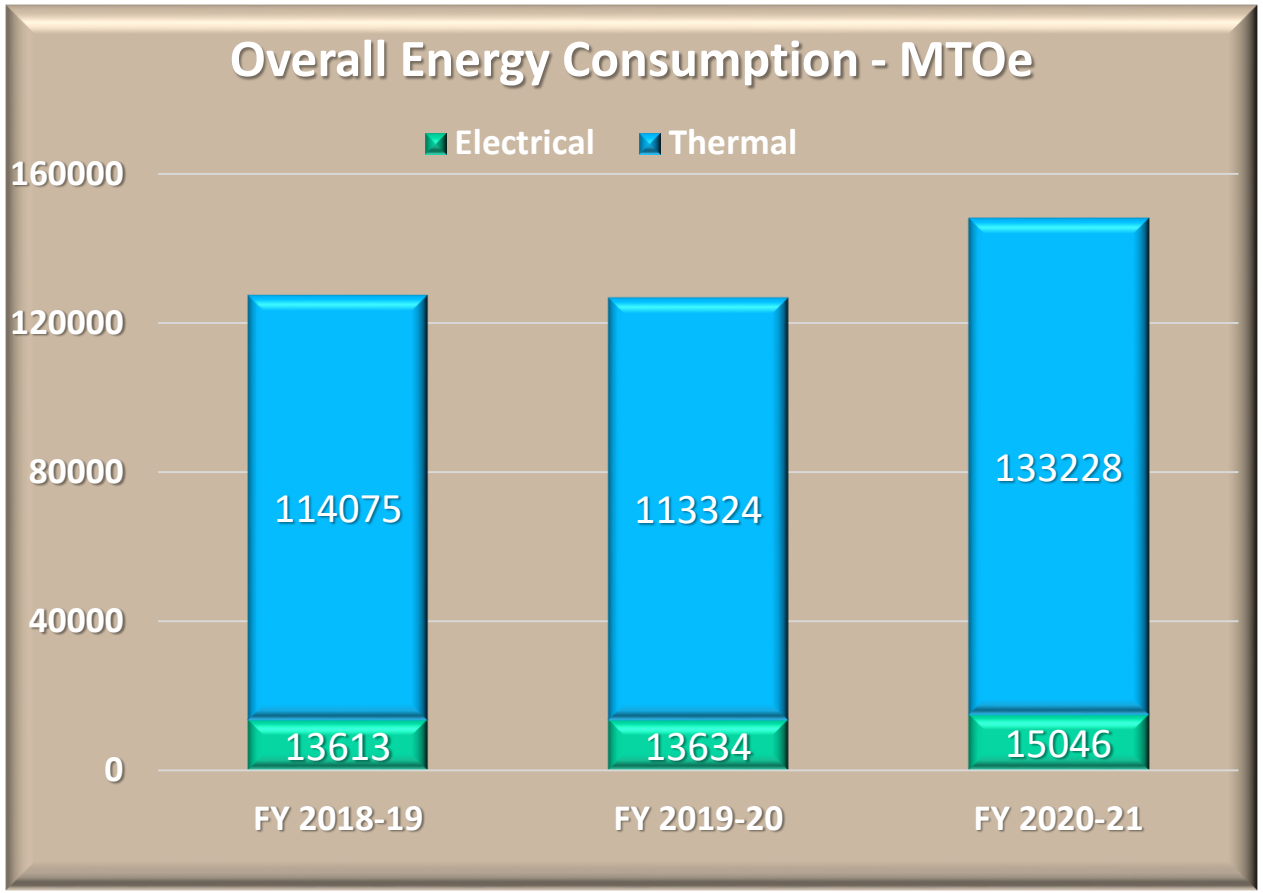
2021 Benchmark* - OPC 24.0 kWh/MT Cement
PPC 18.8 kWh/MT Cement

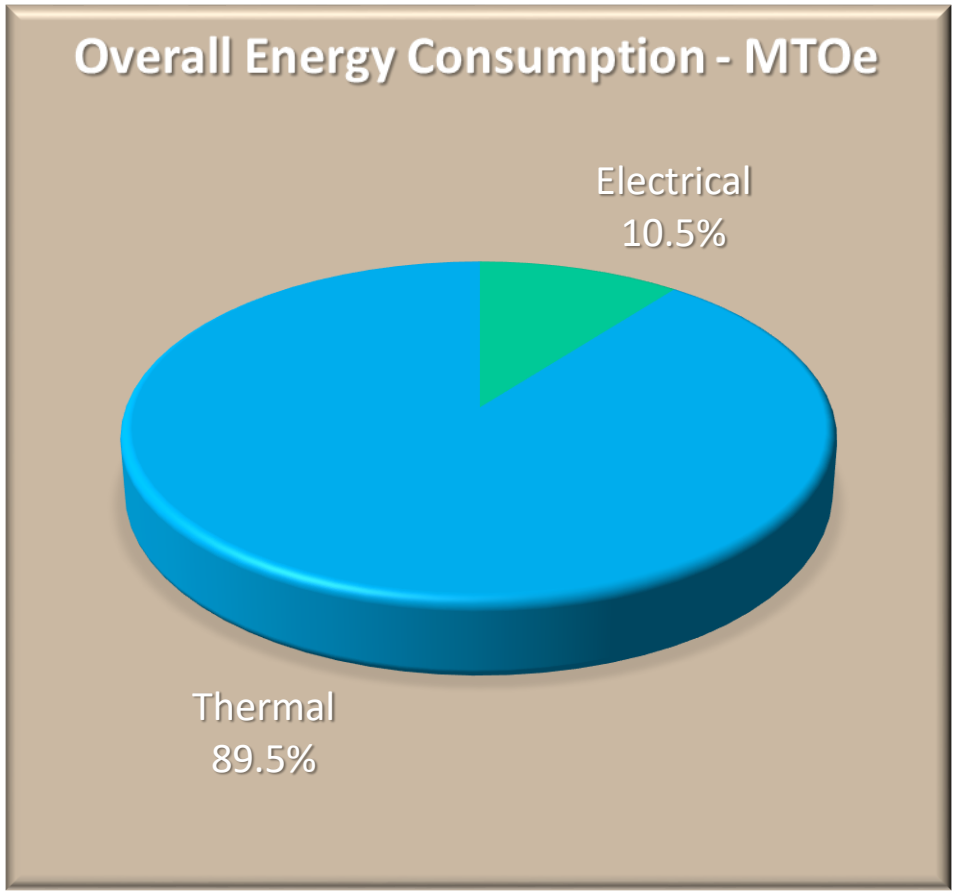




*Source – CII ENERGY BENCHMARKING for the Indian Cement Industry, May 2021

Overall Energy Consumption (MTOe) – FY 18-19 to 20-21





Dhar Unit Standing w.r.t National Benchmarks* (2021)

Electrical SEC Benchmarking Parameters

*Source – CII ENERGY BENCHMARKING for the Indian Cement Industry, May 2021

Section	Unit	Plant1	Plant 2	Plant 3	Plant 4	Plant 5	Plant 6	Plant7	Plant 8	Plant 9	Plant 10	Dhar
Overall SEC	kWh/MT cement	56.14	61.4	61.65	64.56	65.85	67.96	72.85	73.02	73.04	76.09	69.39
Crusher	kWh/MT limestone	1.8	0.65	1.51	0.74	0.74	0.84	1.63	0.75	0.76	0.86	1.41
Raw mill	kWh/MT raw meal	15.8	12.41	12.99	12.23	14.11	11.19	14.03	14.5	18.84	10.8	14.26
WHRS	MW	16	NA	NA	NA	NA	NA	-	7.5	9.5	9	7.40
Kiln	kWh/MT Clinker	19.1	20.06	15.45	18.39	20.06	23.07	19.04	22	21.77	21	19.60
Coal mill	kWh/MT Coal	29.85	38.27	33.45	15.63	39.63	55.53	40.18	48.5	50.84	34.5	54.50
Auxiliaries	kWh/ton clinker	1.3	-	3.91	-	2.39	-	-	1	-	-	
Total SEC up to Clinkerization	kWh/ton clinker	49.93	43.18	45.6	43.96	48.92	49.47	45.78	50.62	57.67	42.59	52.19
Cement Mill (OPC)	kWh/MT	-	28.56	24.5	-	29.85	27.36	-	27	24.47	31.1	31.9
Cement (PPC)	KWh/MT	20.39	22.55	20.45	-	22.33	24.39	-	25	18.79	29	30.65
Cement (PSC)	kWh/MT	-	35.48	-	-	-	-	-	32.68	-		
Cement (others)	KWh/MT Cement	28.5	29.38	29.52	25.12	39.34	29.61	-	-	30.18	48	33.61
	Clinker Factor	0.63	0.71	0.78	-	-	0.81	-	0.85	0.8	0.86	0.86

PPCWR

Benchmarks and Energy Efficiency Targets

Thermal SEC Benchmarking

Dhar*- 697.5

*Compared with plants having similar output rates

Section	Unit	Plant 1	Plant 2	Plant 3	Plant 4	Plant 5	Plant 6	Plant 7	Plant 8	Plant 9	Plant 10
Thermal SEC	kcal/kg Clinker	676	682	682	683	683	685	690	696	698	702
Clinker O/P	TPD	9,500	7,215	7,200	4,500	5,000	5,000	4,622	5,175	4,900	3,150

Efficiency Targets for 3 years Horizon

Objective / Key Performance Indicators	UOM	FY 20-21	Target Y1	Target Y2	Target Y3
Power up to Clinkerization	kwh/Ton	52.19	51.5	50.8	50
Sp. Heat Consumption	Kcal/kg	697.5	692	690	688
Alternative Fuel - TSR %	%	12.6%	16%	18%	20%
WHRS Power Generation	MW	7.4	9.3	10.2	11.0

Key EnCon Projects Planned for FY 21-22

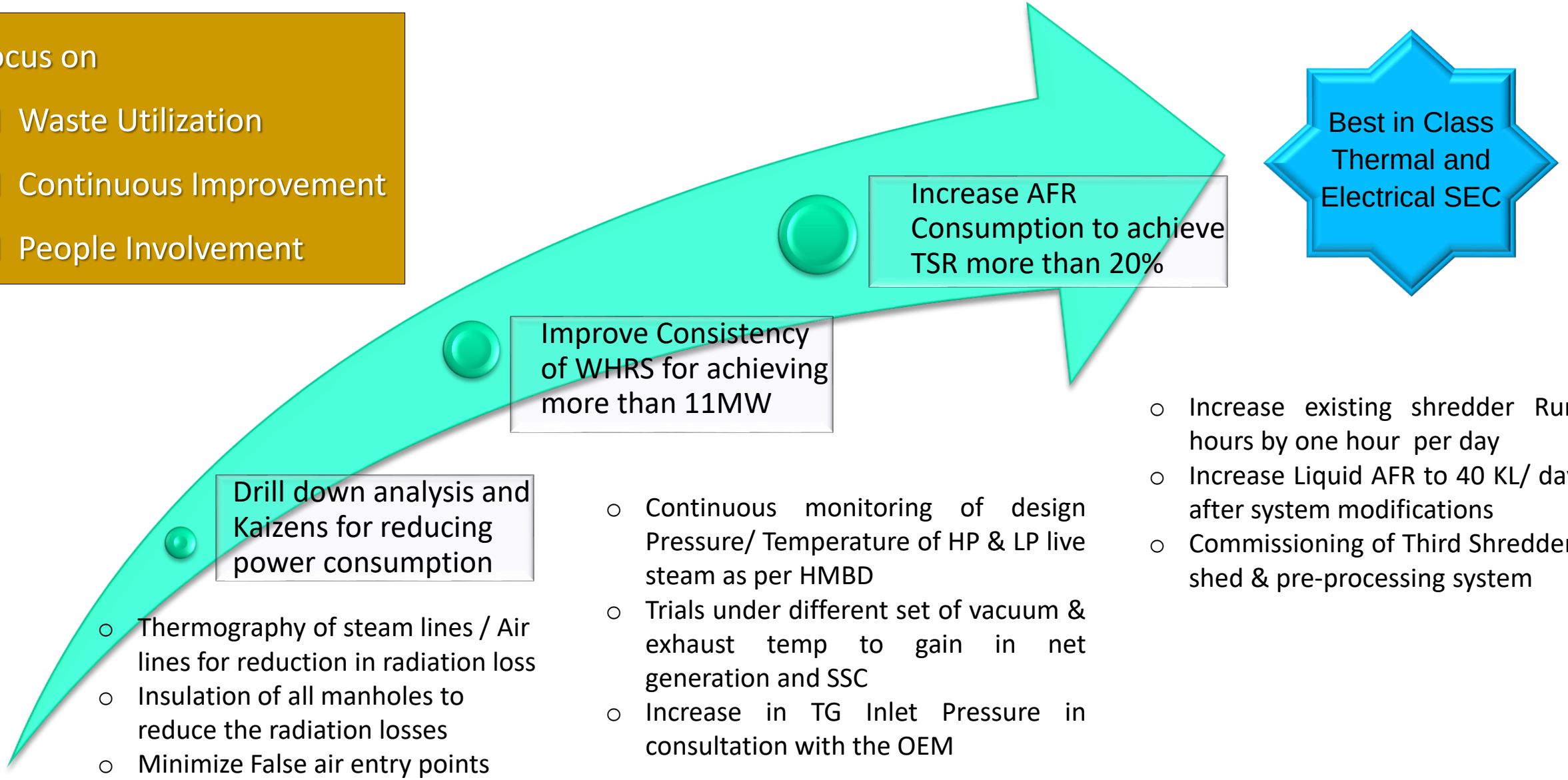
Cement Mill Productivity Enhancement
Cement Mill Roller Modifications
Annual Electrical Saving 1.61 Million kWh

Energy Optimization Through Digitalization
Real time PSI Monitoring of Pyro Parameters
Reduction in specific heat consumption by 5kCal

Road Map to Achieve Targets

Focus on

- ❑ Waste Utilization
- ❑ Continuous Improvement
- ❑ People Involvement



- Thermography of steam lines / Air lines for reduction in radiation loss
- Insulation of all manholes to reduce the radiation losses
- Minimize False air entry points

- Continuous monitoring of design Pressure/ Temperature of HP & LP live steam as per HMBD
- Trials under different set of vacuum & exhaust temp to gain in net generation and SSC
- Increase in TG Inlet Pressure in consultation with the OEM

- Increase existing shredder Run hours by one hour per day
- Increase Liquid AFR to 40 KL/ day after system modifications
- Commissioning of Third Shredder, shed & pre-processing system

Energy Saving Projects Implemented

Summary of EnCon Projects implemented in last 3 years (FY 18-19 to 20-21)

Year	No of EnCon Projects	Electrical Savings (Million kWh)	Savings (INR Million)	Impact on SEC
FY 2018-19	7	1.094 Million kWh	23.9	0.608 kWh/t Cem.
FY 2019-20	6	9.524 Million kWh	275.4	0.441 kWh/t Cem.
FY 2020-21	4	6.667 Million kWh	184.1	0.286 kWh/t Cem.

Renewable Energy Projects / Waste Utilization Projects not Considered.

Emphasis areas -

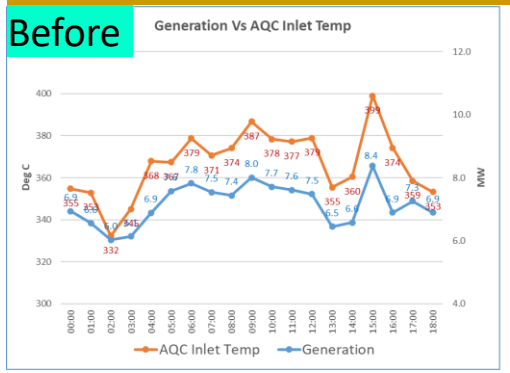
- ❑ Adoption of new Technology Tools based on Digitalization
- ❑ Use of Expert optimizer for process optimization
- ❑ Control Loop tuning and maximization of operation in auto mode
- ❑ Kaizens and Small Improvements

Energy Saving Projects Implemented

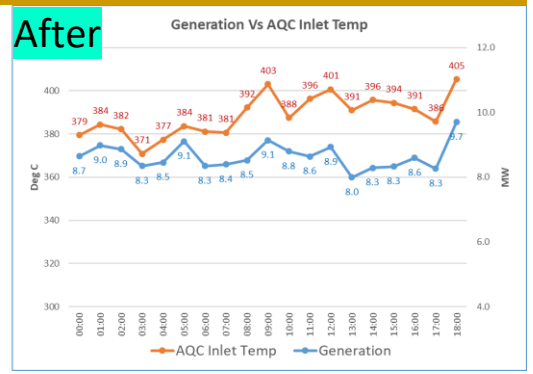
Mix of Kaizen and Process Optimization for Energy Saving

WHRS -Reduction in Variation of AQC inlet temperature

Before



After

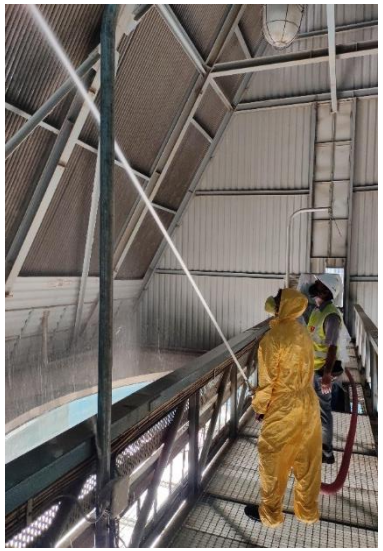


Small Ideas Creating Big Impact

WHRS – Improved Heat transfer of ACC tube fins Coating removal through Water Jet Cleaning

Before

After



EXPERT OPTMIZER PERFORMANCE GURANTEE TEST FOR RAW MILL- UTCL DHAR

	MANUAL OPERATION	EO OPERATION	EXPECTED OUTPUT	GAIN ACTUAL	EXPECTED (%)	ACHIEVED (%)
PRODUCTION (TPH)	603.92	606.82	619.02	2.90	2.50%	0.48
Main Drive Load (KW)	3173.89	3198.7				
Main Fan KW(KW)	3885.63	3892.65				
Separator Load (KW)	97.37	96.84				
SPECIFIC POWER CONSUMPTION(KWH/T) WITHOUT AUXILIARY	11.851	11.846	11.590	-0.01	2.40%	-0.04
BLAINE	343.75	339.96	340.00			
RESIDUE	15.24	15.16	15.00			
Total No of Hours	16	16				

NOTE: ALL DATAS ARE TAKEN FROM ABB KNOWLEDGE MANAGER

EXPERT OPTMIZER PERFORMANCE GURANTEE TEST FOR CEMENT MILL2- UTCL DHAR

	MANUAL OPERATION	EO OPERATION	EXPECTED OUTPUT	GAIN ACTUAL	EXPECTED (%)	ACHIEVED (%)
PRODUCTION (TPH)						1.34
Main Drive Load (KW)						
Main Fan KW(KW)						
Separator Load (KW)						
SPECIFIC POWER CONSUMPTION(KWH/T) WITHOUT AUXILIARY				0.60	2.20%	-2.14
BLAINE						
RESIDUE						
Total No of Hours						

NOTE: ALL DATAS ARE TAKEN FROM ABB KNOWLEDGE MANAGER

Optimization through EO for Output improvement and Energy Reduction – Raw Mill & Cement Mills

EXPERT OPTMIZER PERFORMANCE GURANTEE TEST FOR CEMENT MILL1- UTCL DHAR

	MANUAL OPERATION	EO OPERATION	EXPECTED OUTPUT	GAIN ACTUAL	EXPECTED (%)	ACHIEVED (%)
PRODUCTION (TPH)	247.32	245.32	247.79	2.39	2.00%	0.98
Main Drive Load (KW)	4140.00	4062.70				
Main Fan KW(KW)	1971.92	1928.12				
Separator Load (KW)	147.00	145.51				
SPECIFIC POWER CONSUMPTION(KWH/T) WITHOUT AUXILIARY	25.77	25.01	25.20	-0.75	2.20%	-2.93
BLAINE	341.50	343.87				
RESIDUE	15.23	15.19	15.00			
Total No of Hours	16.00	13.00				

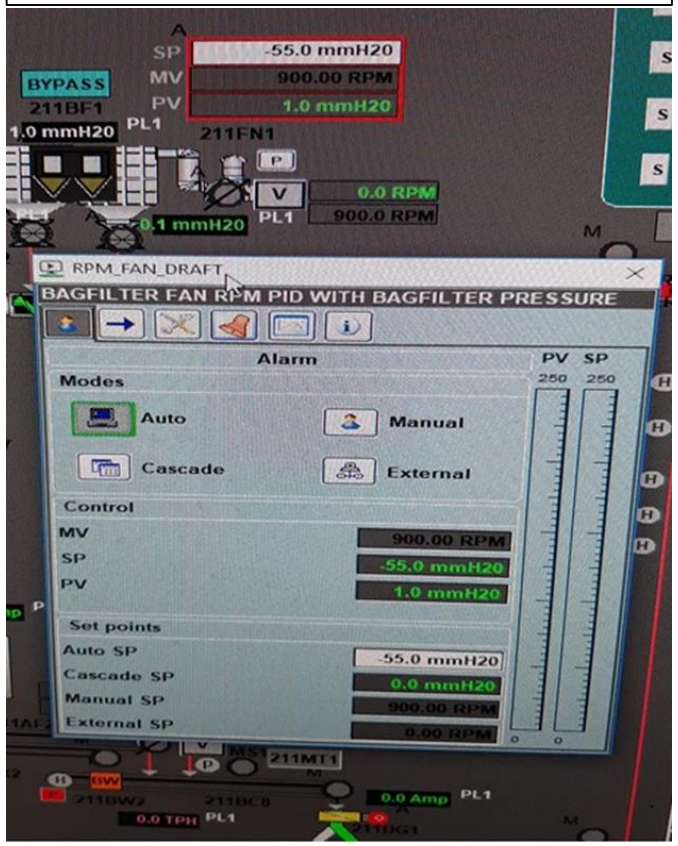
NOTE: ALL DATAS ARE TAKEN FROM ABB KNOWLEDGE MANAGER

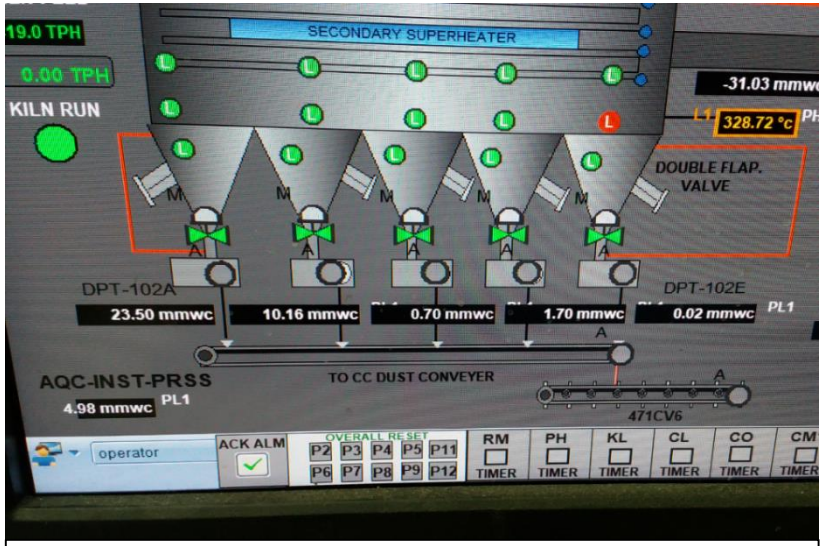
Energy Saving Projects Implemented

Hot air recirculation system from ESP outlet to Cooler inlet for improved WHRS performance

Increase in Boiler Inlet temperature and DP
Increase in WHRS generation by 0.5 to 0.6 MWH

Implementation of PID in Bag Filters (I/L Pressure v/s Fan RPM)





Timer based operation of AQC Boiler RAV & Chain Conveyors

Innovative Projects Implemented – FY 2021

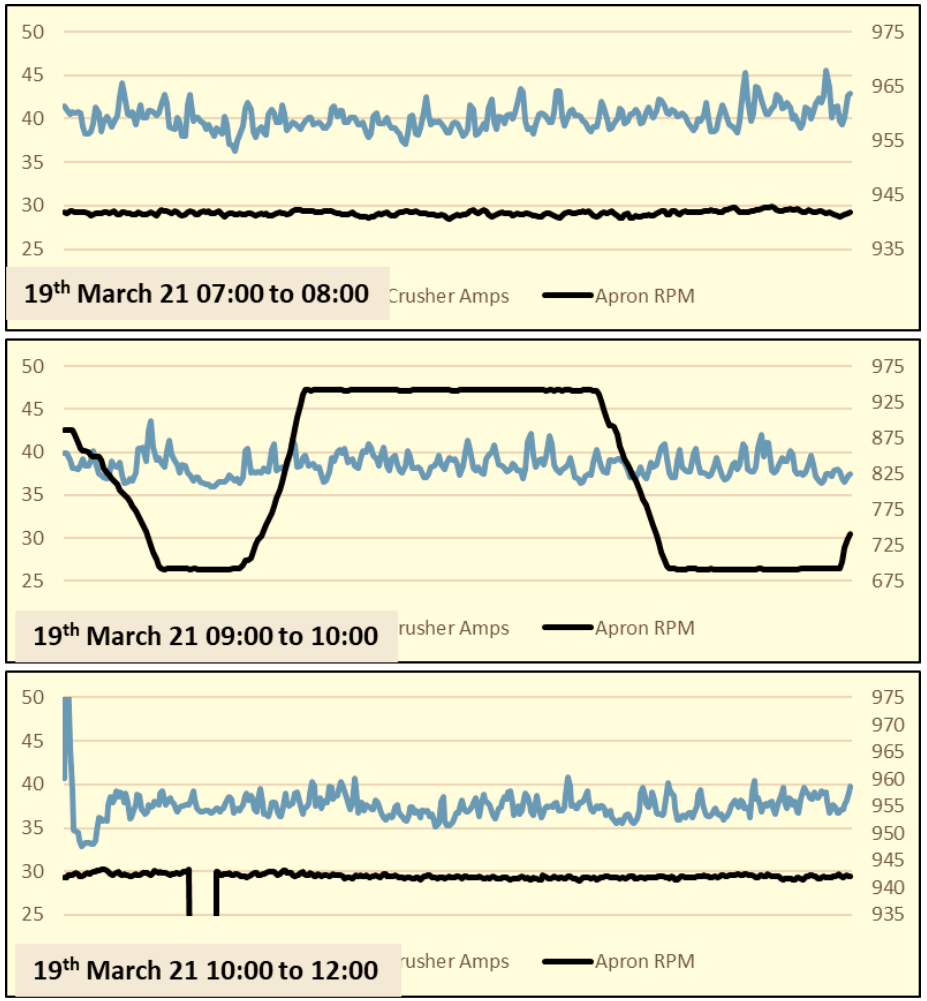
Reduction in Limestone Transport Circuit Specific Power Consumption through Implementation of PID Logic

Problem Definition

- An apron Conveyor installed with VFD drive to feed Crushed Lime Stone to 8 Km long Over Land Belt Conveyor(OLBC).
- Operator control required to monitor and adjust speed according to OLBC feed requirements.
- Variation of feed rate to OLBC resulted in filling of surge hopper leading to frequent Crusher Stoppages / reduced output rate

- Problem was analysed by the plant cross functional team.
- Constraints identified in effectiveness of manual control
- Key factors- Manual input & response time due to conveyor length

Team decided to work on optimization with in-house skills available.



Before Optimization

Innovative Project – Benefits and Replication Potential

- PID logic developed to operate Apron conveyor with input from OLBC belt weigher,
- Selecting the right control parameters to ensure that a constant speed and feed rate is achieved at the OLBC

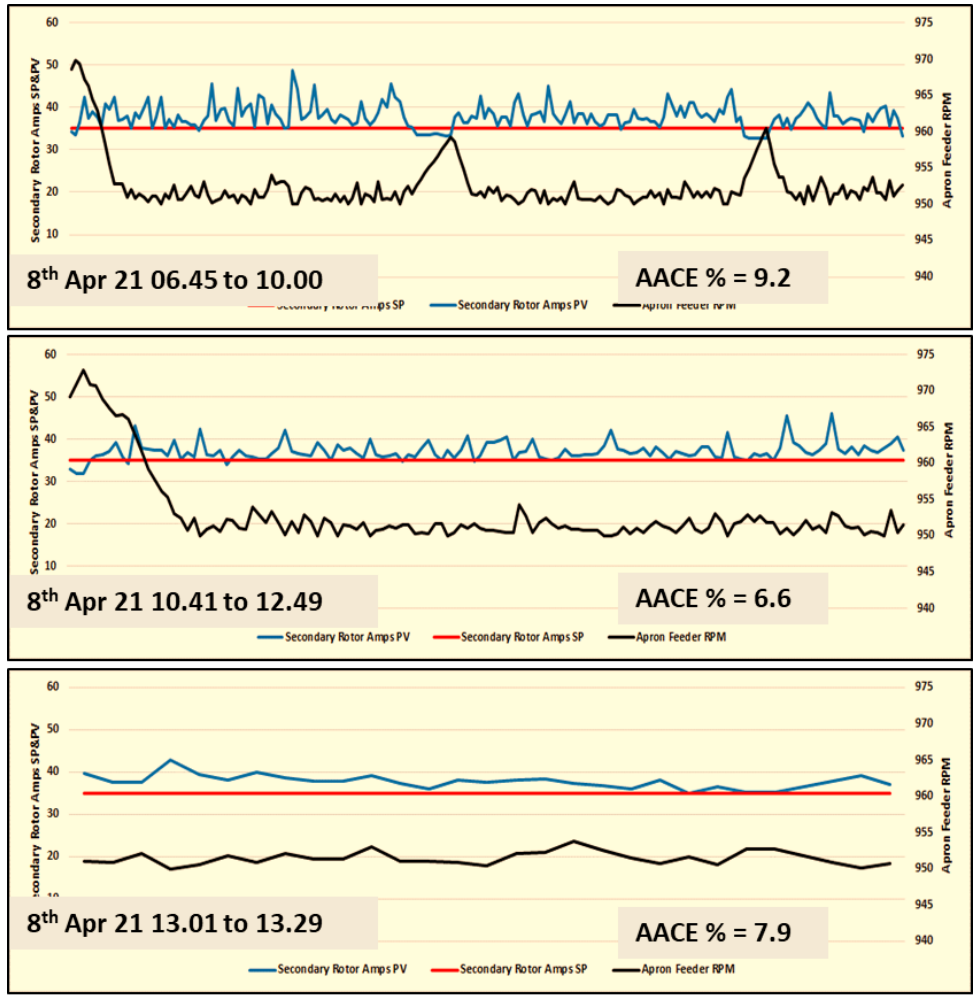
✓ Crusher Output increased from 1260 to 1320 TPH

✓ LS Transport circuit SPC reduced from 1.52 to 1.41 Kwh/MT

✓ Saving - 17.70 Lakhs / Annum, without any Investment

Huge replication potential in material transportation circuits which are generally neglected due to relatively less power consumption.

Through optimization approach, idle running time of material feeding circuits can be minimized, resulting in power cost saving



After Optimization

Utilization of Renewable Energy Sources

Electrical Energy – Solar Power

Year	2018-19	2019-20	2020-21
Onsite / Offsite	-	Onsite	Onsite
Installed Capacity (MWH)	-	12.75	12.75
Generation (Million kWh)	-	13.06	19.82
% of overall Electrical energy	-	8.24	11.37

Thermal Energy – WHRS

Year	2018-19	2019-20	2020-21
Installed Capacity (Million kCal)	11.18 Million kCal /Hr	11.18 Million kCal /Hr	11.18 Million kCal /Hr
Usage (Million kCal)	14361 Million kCal	29349 Million kCal	37648 Million kCal
% of overall Thermal energy	1.26	2.59	2.83

Capacity enhancement of Solar power Plant Planned with commissioning of New Line

Waste Utilization and Management

Waste as Fuel during FY 18-19 to 20-21

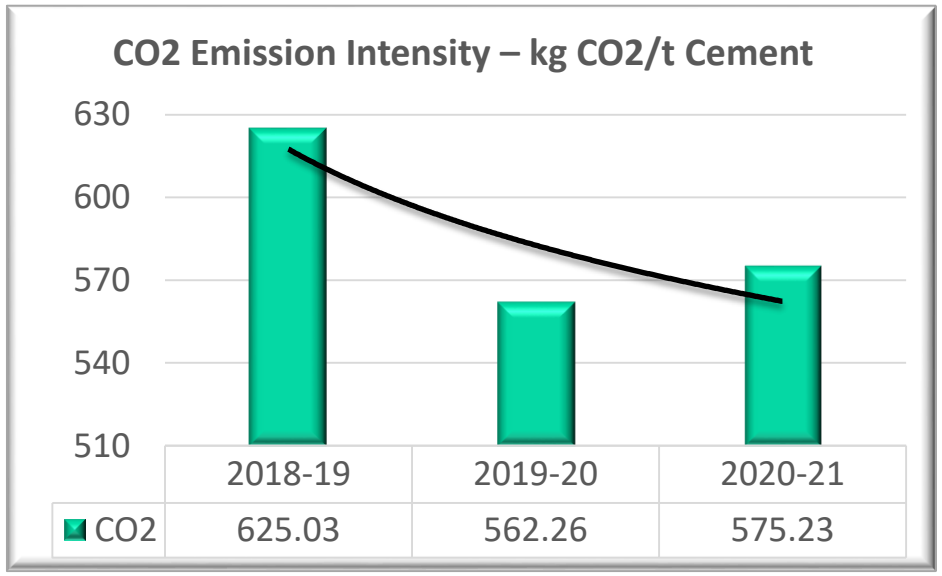
Alternate Fuel Type	Qty (MT)	NCV (kCal/kg)	% of total Fuel
Plastic Waste	39811	3735	7.93%
MSW Derived Fuel	29186	3783	5.81%
Cinder	7001	3527	1.39%
ETP Sludge	2467	2228	0.49%
Liquid Waste	2456	3403	0.49%
Boiler Ash	2043	708	0.41%
PH Waste Solid	1334	3432	0.27%
PH Waste Liquid	992	1963	0.20%
FMCG Waste	815	5367	0.16%
Fibre Waste	725	4380	0.14%
Polymer Waste	441	4470	0.09%
Spent Carbon	413	5023	0.08%
Solid Waste	295	4533	0.06%
Paint Sludge	246	2973	0.05%
Footwear Scrap	148	4048	0.03%
PU Scrap Rexene	45	4222	0.01%
Mix Agro Waste	10	3329	0.00%

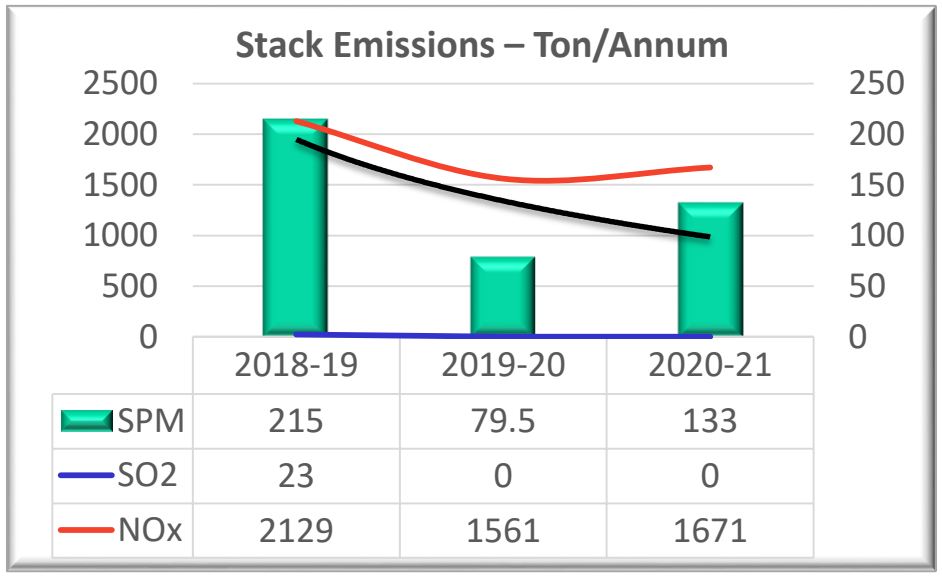
Waste as Raw Material during FY 18-19 to 20-21

Year	Waste	Quantity (MT)	Replaced Material	Waste as % of Raw Material
FY 2018-19	Copper Slag	8413	Laterite	0.34 %
FY 2019-20	Copper Slag	26988	Laterite	1.08 %
FY 2020-21	Copper Slag	37060	Laterite	1.26 %

- Explore Positive cost high CV AFR above 4000 @ 40 % quantity out of total consumption.
- Use of other materials like Groundnut Husk, MSW (plastic waste), Embroidery Waste etc. in addition to present AFR
- Calcium Sulphate instead of Marine Gypsum

GHG Inventorisation - Absolute Emissions & Intensity





- ✓ Real time Monitoring of Emissions, and Display at prominent locations inside and outside the plant

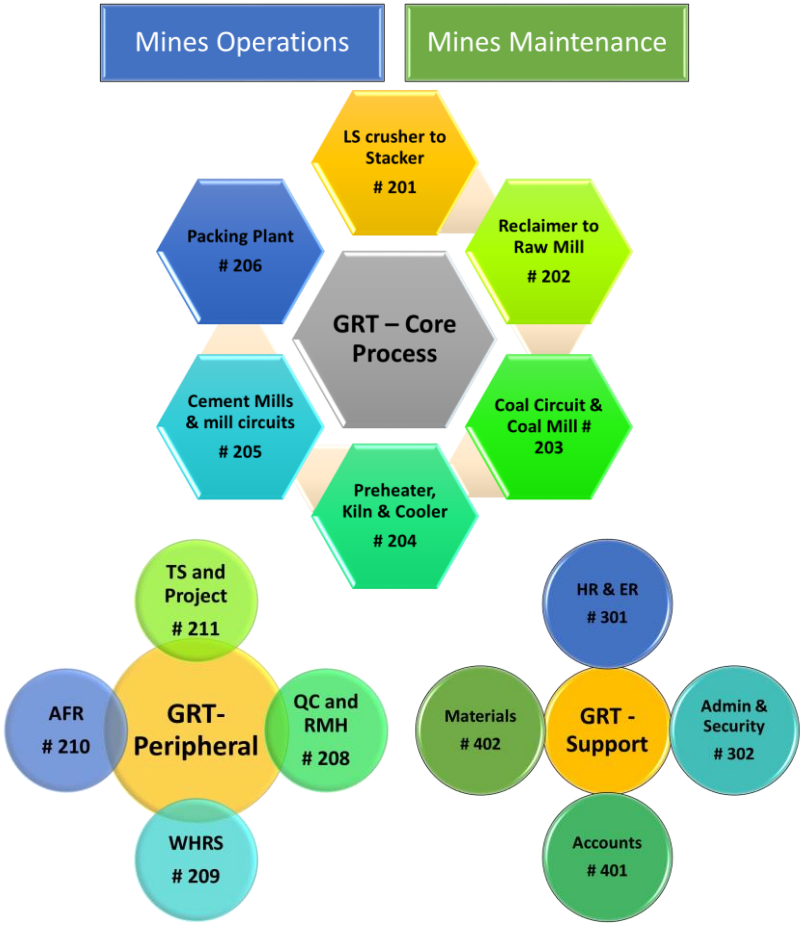
SNCR System Installed at Plant

Teamwork, Employee Involvement and Monitoring

- Grass Root Teams for each area defined to look after basic condition and process improvements
- Each team is Mentored by Senior Management representative to encourage participation, and channelize continuous improvement efforts through cross functional approach
- Kaizens are reviewed and shared at regular intervals at plant level and at group level through forums like I Love My Ultratech,

I love my UltraTech
My mike my idea

Implemented more than 300 best practices shared through I Love My Ultratech

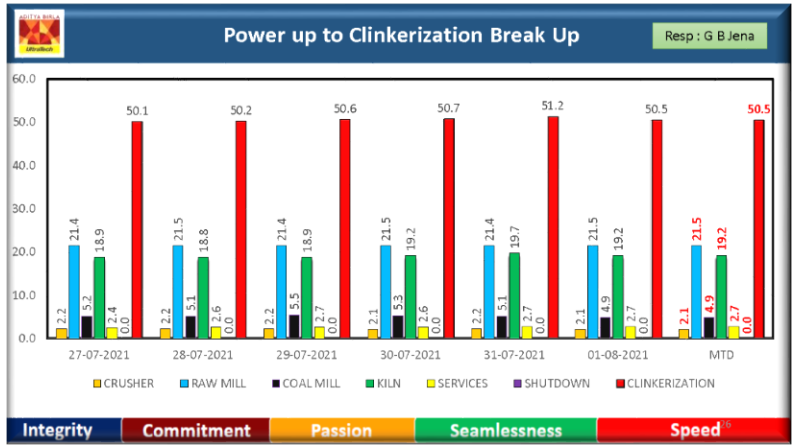


GRT Structure at DHCW

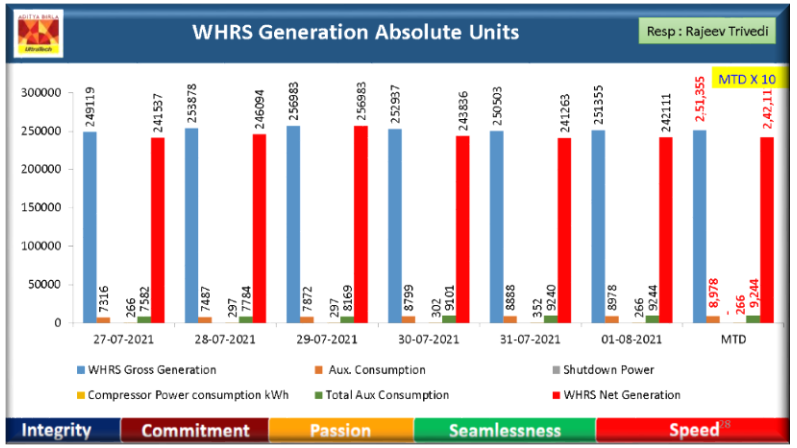
Kaizen Projects Presentations to Top Management

Daily Monitoring – Key Energy Parameters

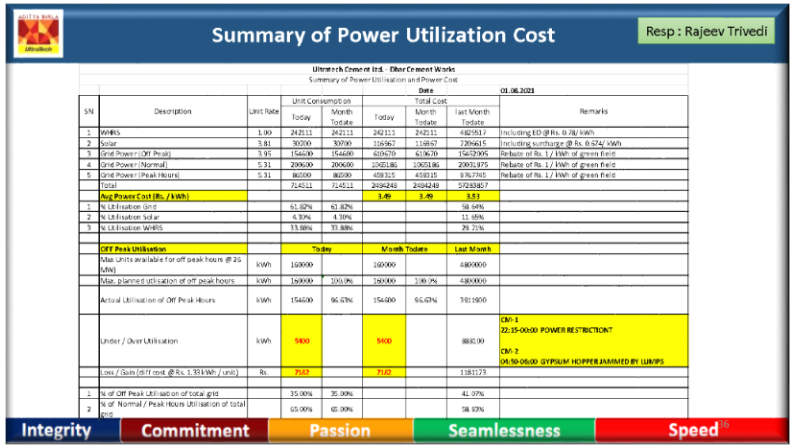
✓ Daily Review Chaired by Unit Head – Trends of Energy Parameters are discussed with gap analysis and improvement actions



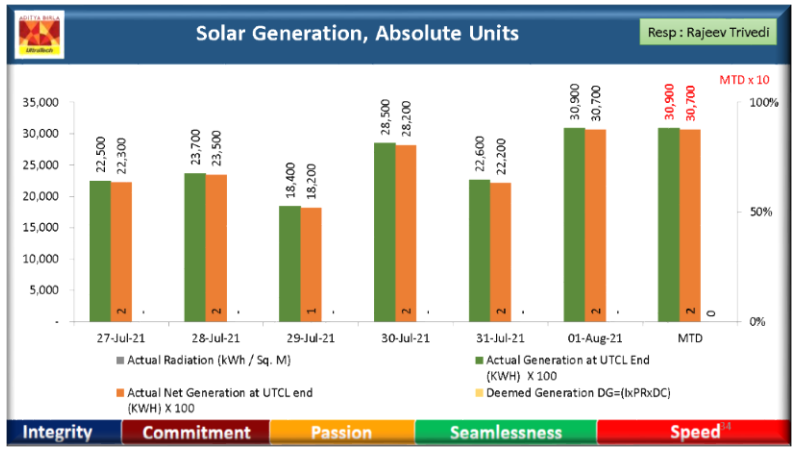
Power up to Clinkerization



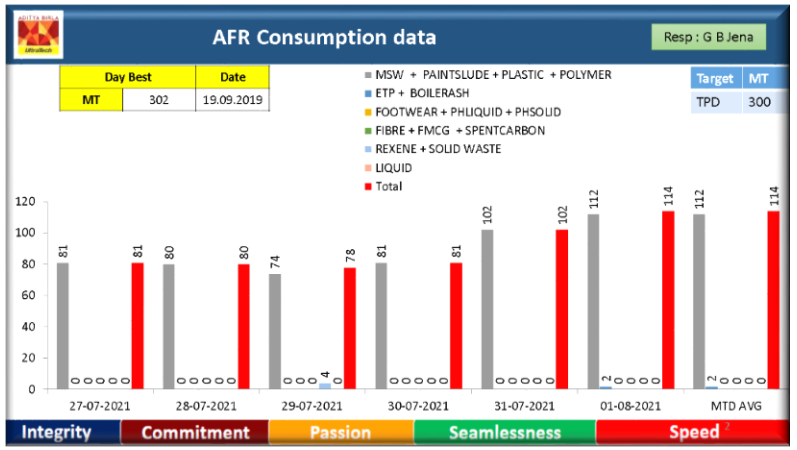
WHRS Generation



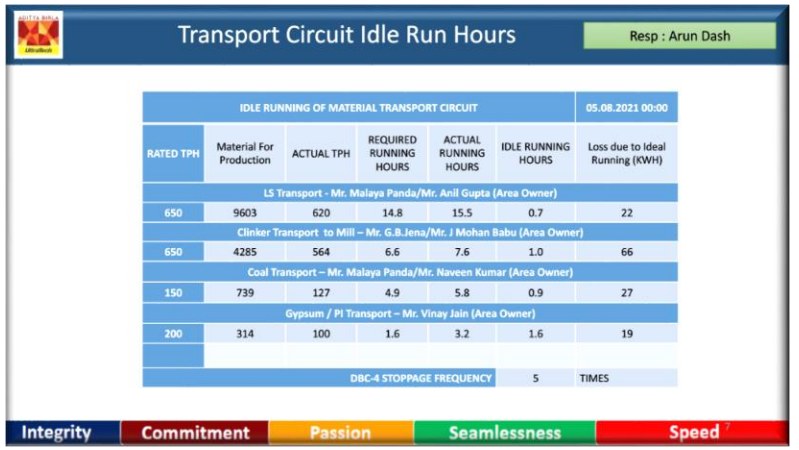
Power Utilization- Peak/ off-peak



Solar Power Utilization



AFR Consumption and TSR %



Idle Run Hours Monitoring

Green Supply Chain Management

Green Driving Habits for Green Supply Chain

- India's diesel consumption has doubled in the past decade; with HDVs accounting for largest share of transportation petroleum end-use.
- Transportation of bulk material forms backbone of Supply chain activities in Cement Industry. Effective N3 Category Vehicle Driving is very significant towards better fuel efficiency & safety.
- With a perspective of long term sustainability, Unit took initiatives for cultivating better driving habits among young Heavy Duty Vehicle drivers.
- 30 Days workshops arranged in collaboration with Ashok Leyland driving School, for local youth and transporters.
- Classroom Training, Hands on Learning, Simulation based evaluation followed by Competency Certification to impart effective driving skills to participants

Change agents for sustainable future, with better employment opportunities.
Reduced operating and maintenance costs for fleet owners
Reduced GHG emissions & reduced fuel consumption of 1.5 -2 liter per 100 km

Implementation of ISO 50001 / Green Co / IGBC Rating

Integrated Management System – ISO 9001, ISO 14001, ISO 45001 Certification in FY 2018-19

DNV·GL

MANAGEMENT SYSTEM CERTIFICATE

This is to certify that the management system of

UltraTech Cement Limited
(Dhar Cement Works)
Village: Tonki, Manawar, Dist: Dhar - 454 446, Madhya Pradesh, India

has been found to conform to the Quality Management System standard:
ISO 9001:2015

This certificate is valid for the following scope:
Manufacturing and supply of cement

DNV·GL

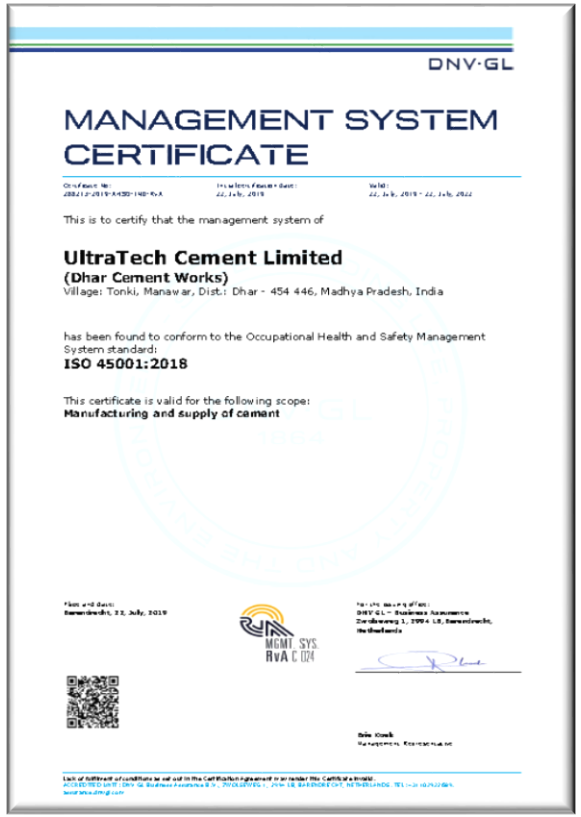
MANAGEMENT SYSTEM CERTIFICATE

This is to certify that the management system of

UltraTech Cement Limited
(Dhar Cement Works)
Village: Tonki, Manawar, Dist: Dhar - 454 446, Madhya Pradesh, India

has been found to conform to the Environmental Management System standard:
ISO 14001:2015

This certificate is valid for the following scope:
Manufacturing and supply of cement



DNV·GL

MANAGEMENT SYSTEM CERTIFICATE

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UltraTech Cement Limited
(Dhar Cement Works)
Village: Tonki, Manawar, Dist.: Dhar - 454 446, Madhya Pradesh, India

has been found to conform to the Occupational Health and Safety Management System standard:
ISO 45001:2018

This certificate is valid for the following scope:
Manufacturing and supply of cement

Energy Management System ISO 50001 – Planned for implementation: FY 2022-23

Awards / Acknowledgement / Achievements

Mines Environment & Mineral Conservation (MEMC)

1) **Afforestation – First Prize**
2) **Waste Dump Management – Second Prize**
3) **Mineral Conservation – Second Prize**
4) **Mineral Beneficiation – Second Prize**
5) **OVERALL PERFORMANCE – THIRD PRIZE**

✓ Recognition in multiple categories of CSR Activities for developmental efforts & sustainability in nearby region

✓ Recognized as one of the Lowest Cost Units of Ultratech Cement

UltraTech CEMENT

Dhar Cement Works
Village - Tonki, Tahsil - Manawar,
District - Dhar, Madhya Pradesh
PIN – 454446

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