UltraTech Cement Limited

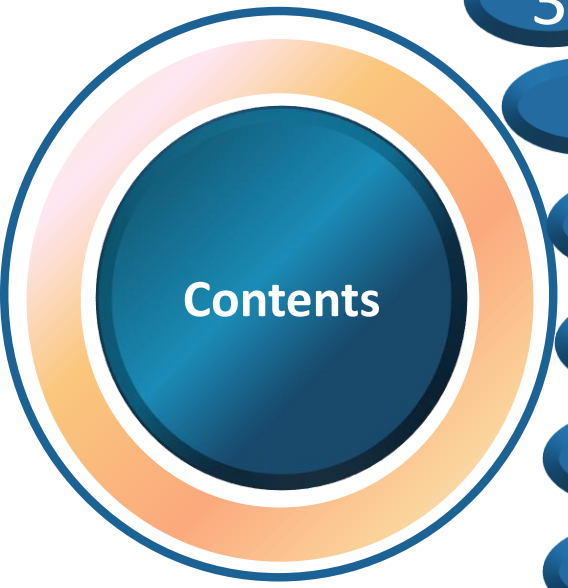
(Unit: Kotputli Cement Works-Power Plant)

TEAM MEMBER

❖ Hari. K. Chaturvedi	Assistant Vice president
❖ Ajay Dhama	Sr. Manager
❖ Manoj Kumar	Sr. Manager
❖ Pintu Dodiya	Manager

Welcome to CII
19th National Award for Excellence in Energy Management (FY-2022)

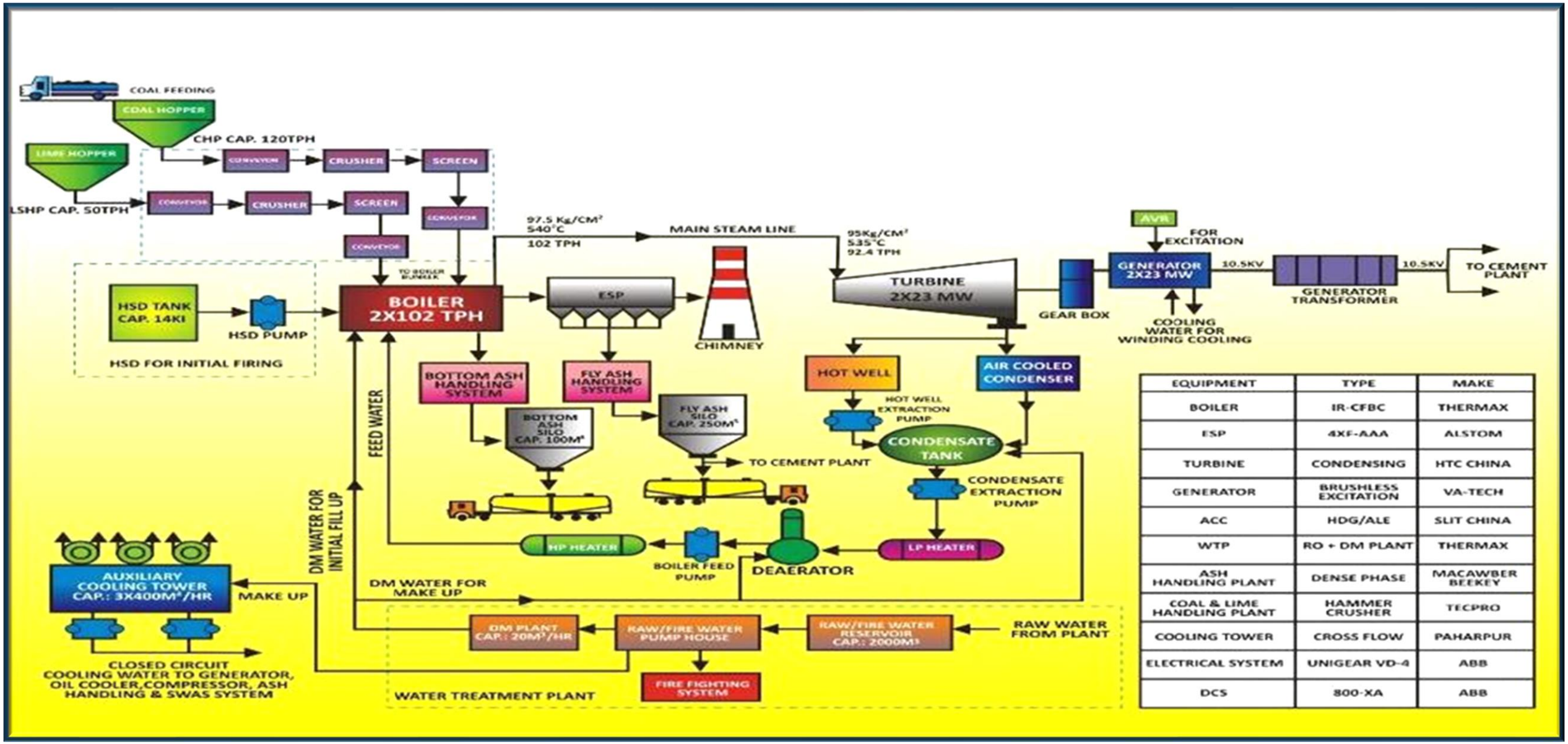
Contents



Profile

- UltraTech Cement……
- Kotputli Cement Work
- An Aditya Birla Group Company.
- 2X23 MW Captive Power Plant
- 3.3 MTPA capacity Green field Cement plant.
- Certified with ISO 9001, 14001, 45001 , ISO 27001, ISO 50001 & ISO 17025.
- UltraTech-Kotputli TPP won First prize in “National Energy Conservation Award- 2017” by Ministry of Power Awarded by honourable President of India.
- The continual Energy improvements by KCW TPP have been recognized by awarding “CII – Excellence Energy Efficient Unit award” for last consecutive four years at CII – Hyderabad
- Adopted World Class Manufacturing Excellence Model

Thermal Power Plant

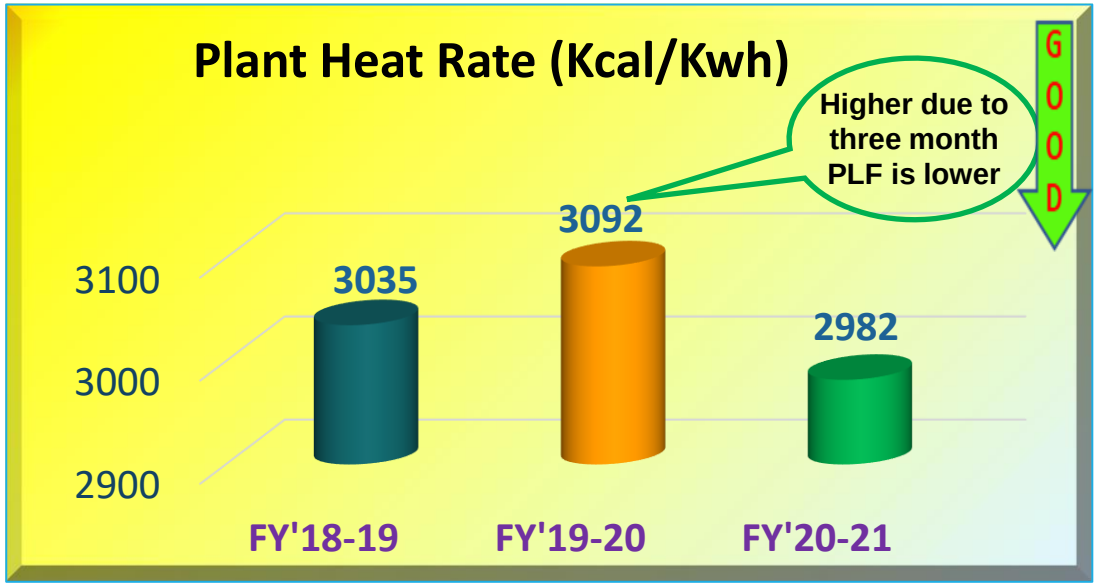


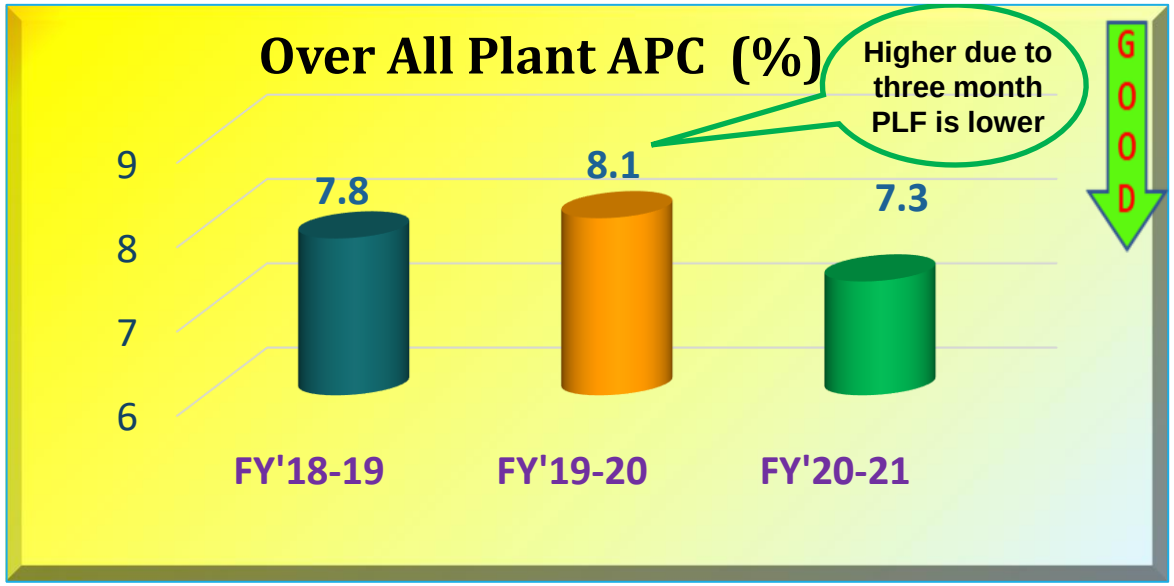
EQUIPMENT	TYPE	MAKE
BOILER	IR-CFBC	THERMAX
ESP	4XF-AAA	ALSTOM
TURBINE	CONDENSING	HTC CHINA
GENERATOR	BRUSHLESS EXCITATION	VA-TECH
ACC	HDG/ALE	SLIT CHINA
WTP	RO + DM PLANT	THERMAX
ASH HANDLING PLANT	DENSE PHASE	MACAWBER BEEKEY
COAL & LIME HANDLING PLANT	HAMMER CRUSHER	TECPRO
COOLING TOWER	CROSS FLOW	PAHARPUR
ELECTRICAL SYSTEM	UNIGEAR VD-4	ABB
DCS	800-XA	ABB

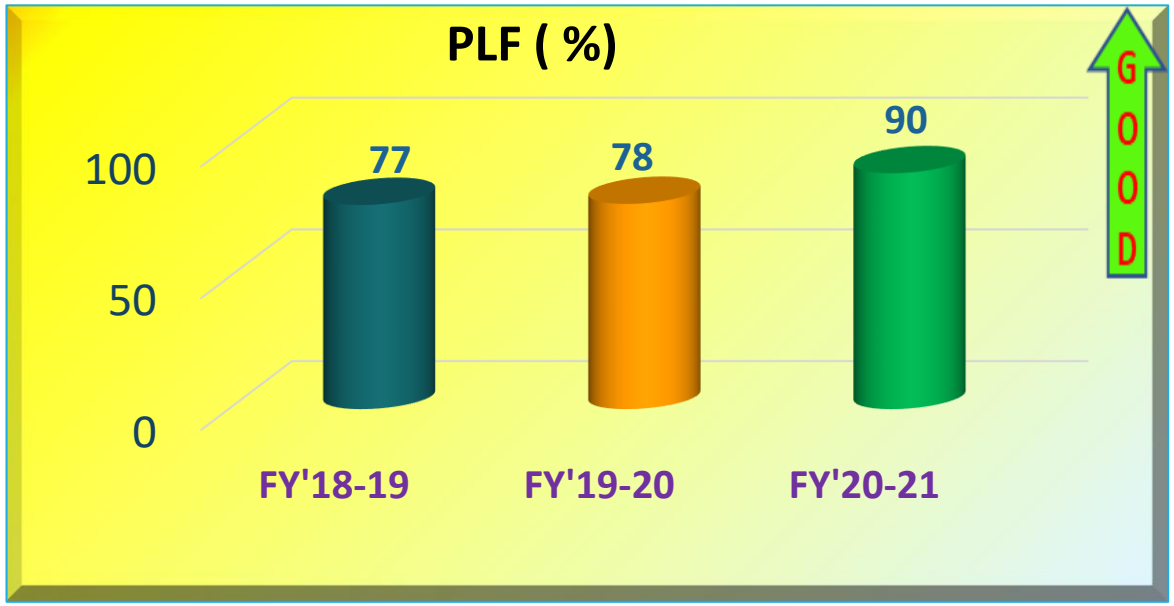
Energy Consumption Overview FY -21

S. No.	Parameters	UOM	Value
1	Power Generation TPP & WHRS	Lacs Kwh	2004
2	PLF-TPP	%	89.23
3	PLF- WHRS	%	76.84
4	Availability	%	100
5	Gross Heat Rate	Kcal/Kwh	2982
6	Auxiliary Power -TPP	%	7.27
7	Auxiliary Power –WHRS	%	2.75
8	Boiler Efficiency	%	87.57
9	Turbine Heat Rate	Kcal/Kwh	2624
10	DM water Consumption	Ltr./Kwh	0.058
11	Raw Water Consumption	Ltr./Kwh	0.194

Specific Energy Consumption Last Three Year



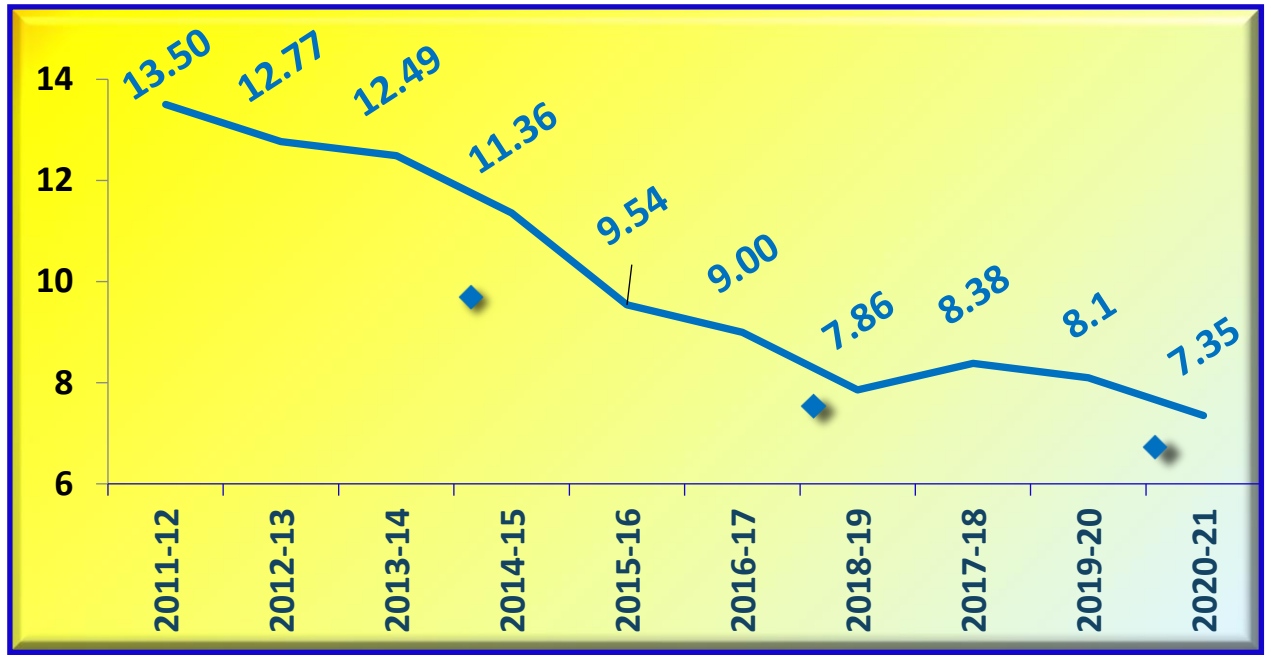




Specific Energy Consumption Variance

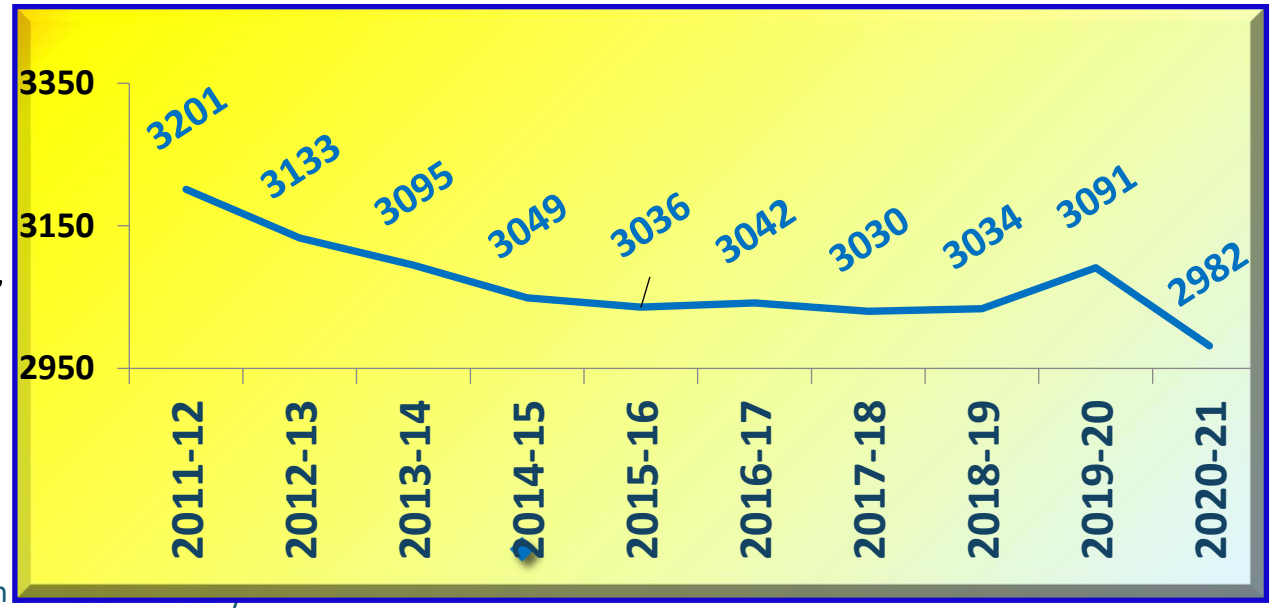
TPP Auxiliary Power Consumption In %

➢ Excellence Journey of energy management Achieved Continual decreasing trend of TPP auxiliary power consumption.



Plant Heat Rate Kcal/Kwh

➢ Excellence Journey of energy management Continuous decreasing trend of plant heat rate



Benchmarking with group Unit FY-20-21

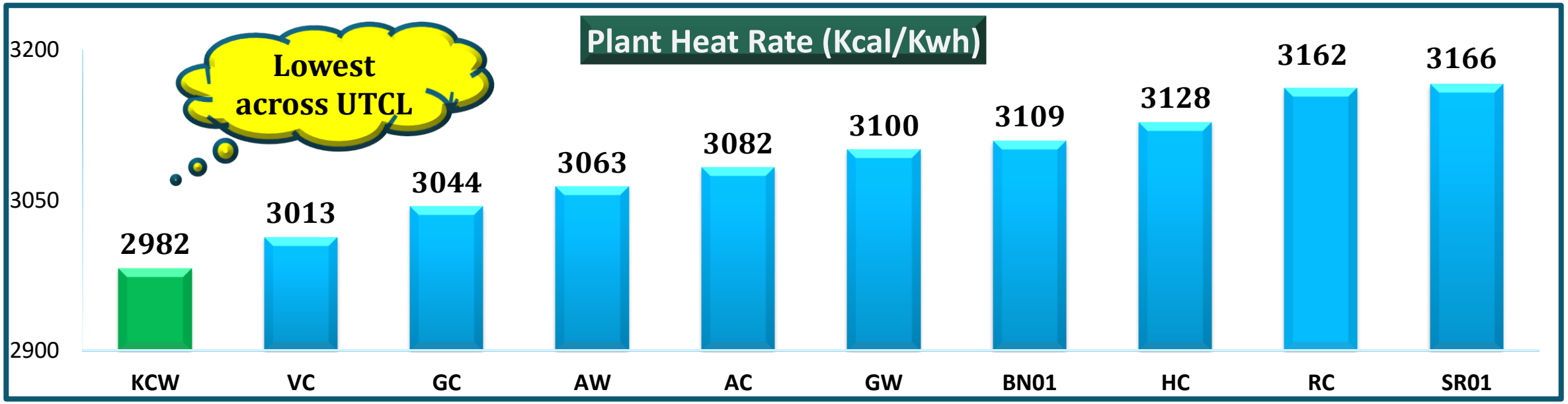
Parameter	Unit	HC	APCW	AC	ACW	GCW	GC	VC	RC	SG	KCW
Installed Capacity	MWH	46	100	73	71	92	55	46	108	57.5	**46**
Type		CFBC	CFBC	CFBC & AFBC	CFBC & AFBC	CFBC	CFBC	CFBC	CFBC & AFBC	CFBC & AFBC	**CFBC**
PLF	%	67.30	70.62	82.56	93.01	75.06	68.62	68.86	72.97	55.16	**89.23**
Plant Heat Rate	kcal/kwh	3125	3178	3089	3060	3101	3045	3011	3161	3269	**2982**
APC	%	8.69	7.67	8.18	7.43	7.81	7.64	7.08	9.58	9.24	**7.33**

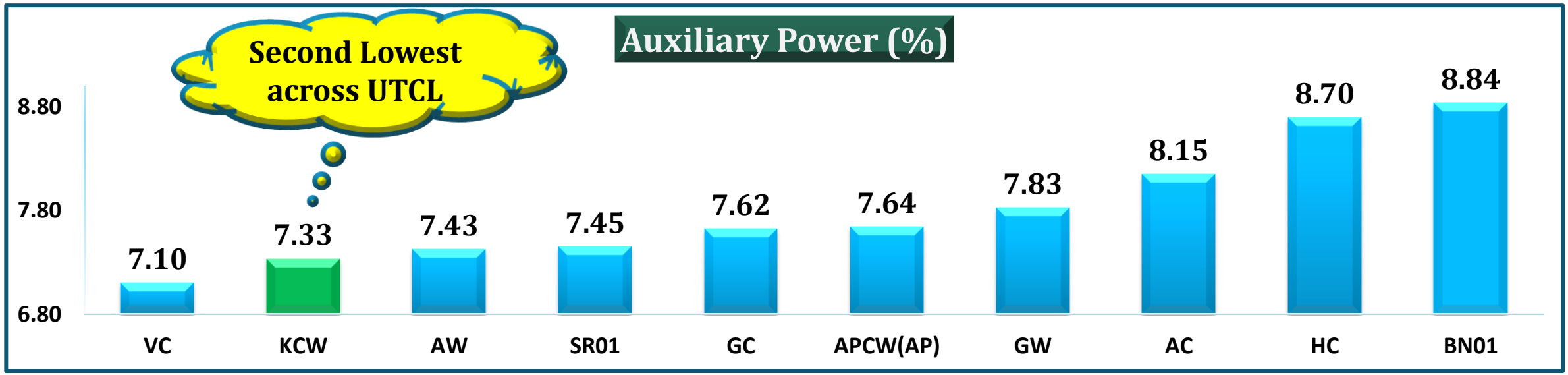
National Benchmarking

3.15 CAPTIVE POWER PLANT

Parameter	Unit	Plant 1	Plant 2	Plant 3	Plant 4	Plant 5	Plant 6	Plant 7	Plant 8	Plant 9	Plant 10	KCW
Installed capacity	MW	15	30	9	15	17.5	12.5	25 x 2	15	17.5	17.5	2X23
Type		AFBC	AFBC	AFBC	AFBC	AFBC	AFBC	CFBC	AFBC	AFBC	AFBC	CFBC
PLF	%	82.3	68.5	88.5	65	84	88	97.4	64	77.8	85	89.2
Heat rate	Kcal/kWh	3250.36	3127	3040	3148	3018	3490	2932	3495	3035	3074	2982
Coal CV	Kcal / kg	5268.83	5503	3204	4062	3213	Petcoke +Lignite (NCV): 4940	6475	4981	3175	3205	6699
LOI – Bed ash	%	20.1	19.42	<1	5.12	<1	0.4-0.5	3.73	14.21	<1	<1	2.5
Inst header pressure	Bar	5.5	5.5	6	5.2	6	6	6.4	5.5	6	6	4.9
Fly ash tpt pressure	Bar	4.5	4	5	3.5	5	4.5	5.2	4	5	5	4.0
APC	%	7.97	8.53	8.96	9.1	9.3	9.5	9.51	9.56	9.56	9.69	7.33

Benchmarking With UltraTech Plant's FY -2020-21





Road Map - Plant Heat rate

1. ACC SRC bundle and energy efficient fan blade replacement
2. Specific steam consumption reduction
3. Single unit TPP Operation
4. Reduction in steam dumping
5. Digitalization – Optimax

Road Map -Auxiliary Power

1. ACC SRC bundle and energy efficient fan blade replacement
2. Single TG Operation
3. Operation excellence
4. Digitalization – Optimax
5. CHP & LHP optimization

Way Forward -Major Encon Project

1. Resizing of boiler Fan's impeller
2. Resizing of boiler feed pump
3. Replacement of Boiler "U" beam
4. WHRS MW Generation
5. Water Conservation

Energy Savings Projects FY-2018-19

SN	Energy Saving Projects	Saving Achieved			Investment (Rs. Million)	Pay back Month
		Electrical Energy (MWH)	Thermal Energy (Ton/Year)	(Rs. Million)		
1	Replacement of ACC-1 HDG tube bundles with SRC tube bundles.	6167	1102	22.35	50.4	27
2	Interconnection of Instrument and service air.	345.0	-	1.56	0.02	1
3	Installation of energy efficient fan's in ACC	183.9	-	0.83	.95	14
4	Unit-2 bed ash cooler fan by installation of VFD in place of DOL.	113.85	-	0.51	.42	10
5	Turbine lube oil pump by replacement of energy efficient pump.	33.12		0.15	0.16	13
6	Reduce heat loss in condensate line by interconnection both unit		16	.15		
7	CHP Power optimization.	27.60		.12		
8	Compressed air system optimization.	20.7		.09		
9	Fly ash power optimization	12.42		.06	0	0
10	Cooling tower fan power optimization	10.35		.05	0	0

Energy Savings Projects FY-2019-20

SN	Energy Saving Projects	Saving Achieved			Investment (Rs. Million)	Pay back Month
		Electrical Energy (MWH)	Thermal Energy (Ton/Year)	(Rs. Million)		
1	Installed Waste heat recovery Power plant.	28964.68		131.62	1180	33
2	Power wheeling & Power selling.		490.05	4.93		
3	Reduction in steam dumping.		428.79	4.31		
4	Reduction in Loss of ignition in boiler (LOI).		214.4	2.15	0.50	3.0
5	Compressed air optimization.	543.15		2.82		
6	Boiler Wind box pressure reduction.	457.95		2.38		
7	Boiler feed pump Differential pressure reduction.	155.33		0.81		
8	Boiler Secondary air (SA) fan header pressure reduction.	117.86		0.61		
7	Air conditioning power optimization.	46.86		0.24		
9	Cooling tower pump pressure optimization.	39.05		0.2		

Energy Savings Projects FY-2020-21

SN	Energy Saving Projects	Savings Achieved			Investment (Rs. Million)	Pay back Month
		Electrical Energy (MWH)	Thermal Energy (Ton/Year)	(Rs. Million)		
1	Installed Waste heat recovery Power plant.	67050.53		281.2	1180	33
2	Single unit TPP Operation.	82.5	3590	37.60	0	0
3	TG #1 & 2 major over hauling.	382.77	1720	18.54	4.0	2.59
4	Digitalization – Optimax		129.0	1.25	10	72
5	Steam Dumping reduction		473	4.57		
6	Turbine vacuum improvement.		301	2.91		
7	ACC bundle cleaning.		2.89	1.87		
8	Boiler wind box pressure reduction.	330.33		1.62		

Energy Savings Projects FY-2020-21

SN	Energy Saving Projects	Saving Achieved			Investment (Rs. Million)	Pay back Month
		Electrical Energy (MWH)	Thermal Energy (Ton/Year)	(Rs. Million)		
9	Water treatment power optimization.	179.36		0.88	Nil	NA
10	Reduction in LOI (loss of ignition)		86	0.83		
11	Boiler feed pump Differential pressure reduction.	165.33		0.81		
12	CHP (coal handling plant) optimization	91.2		0.45		
13	Boiler Secondary air (SA) fan header pressure reduction.	73.48		0.36		
14	Compressed air optimization	73.5		0.36		
15	Cooling tower pump pressure optimization.	71.81		0.35		
16	ESP –power optimization.	54.44		0.27		
17	P&V (Pressure & ventilation) power optimization	50.77		0.25		
18	Air conditioning power optimization.	48.76		0.24		

Encon Project # 1 :- Single Raw Air Cooled Condenser

❑ **Theme:-**

- Technology Up gradation of Unit-1 Air Cooled Condenser.

❑ **Problem Statement:-**

- Higher auxiliary power consumption of TPP.
- Higher plant heat rate.
- ACC contributes about 8-10 % of the total APC of TPP.

❑ **Complexity:-**

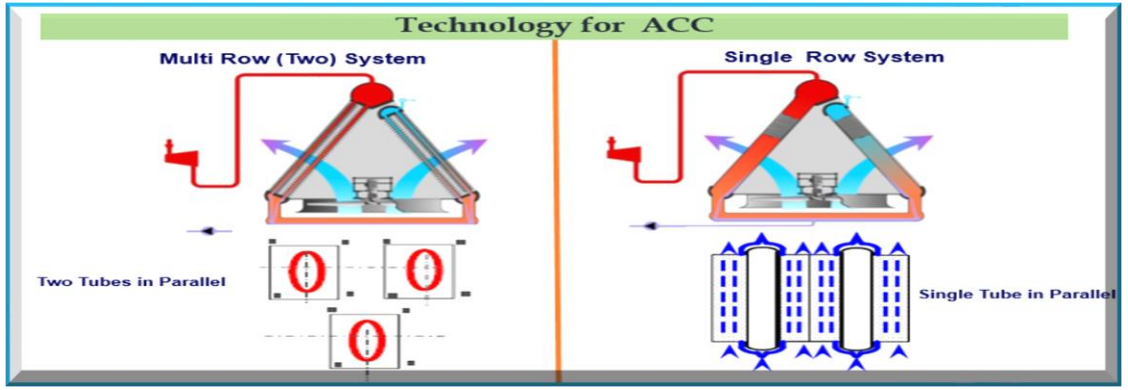
- The Capital for new ALE multi row tube bundle replacement had higher cost (10 Cr).

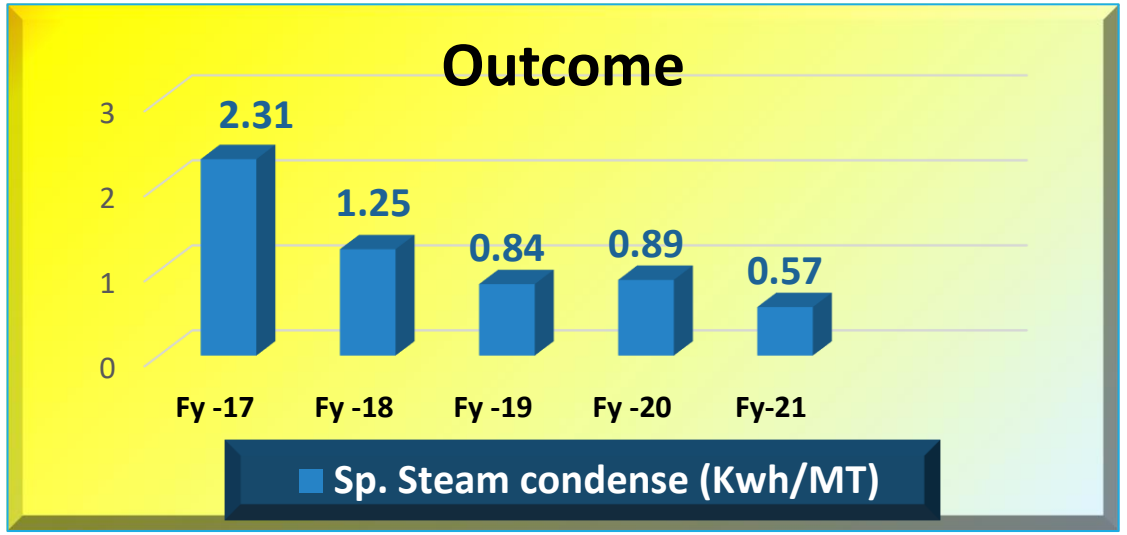
❑ **Approach :-**

- Change of metallurgy of fin material.
- Exploring the low cost & efficient alternative technology.

❑ **Technology Adoption:-**

- Approached new technology Single Row Condenser (SRC)
- **Installed at KCW first time in India.**





❑ **Outcome :-**

- Fuel saving :- 1230 MT/annum.
- Auxiliary Power :- 11.27 Lacs Kwh/annum.
- Cost Saving :- 148.23 Lacs/annum.

Encon Project # 2 :- ACC Fan blade replacement

❑ **Theme:-**

- Technology Up gradation of Air Cooled Condenser fan blade.

❑ **Problem Statement:-**

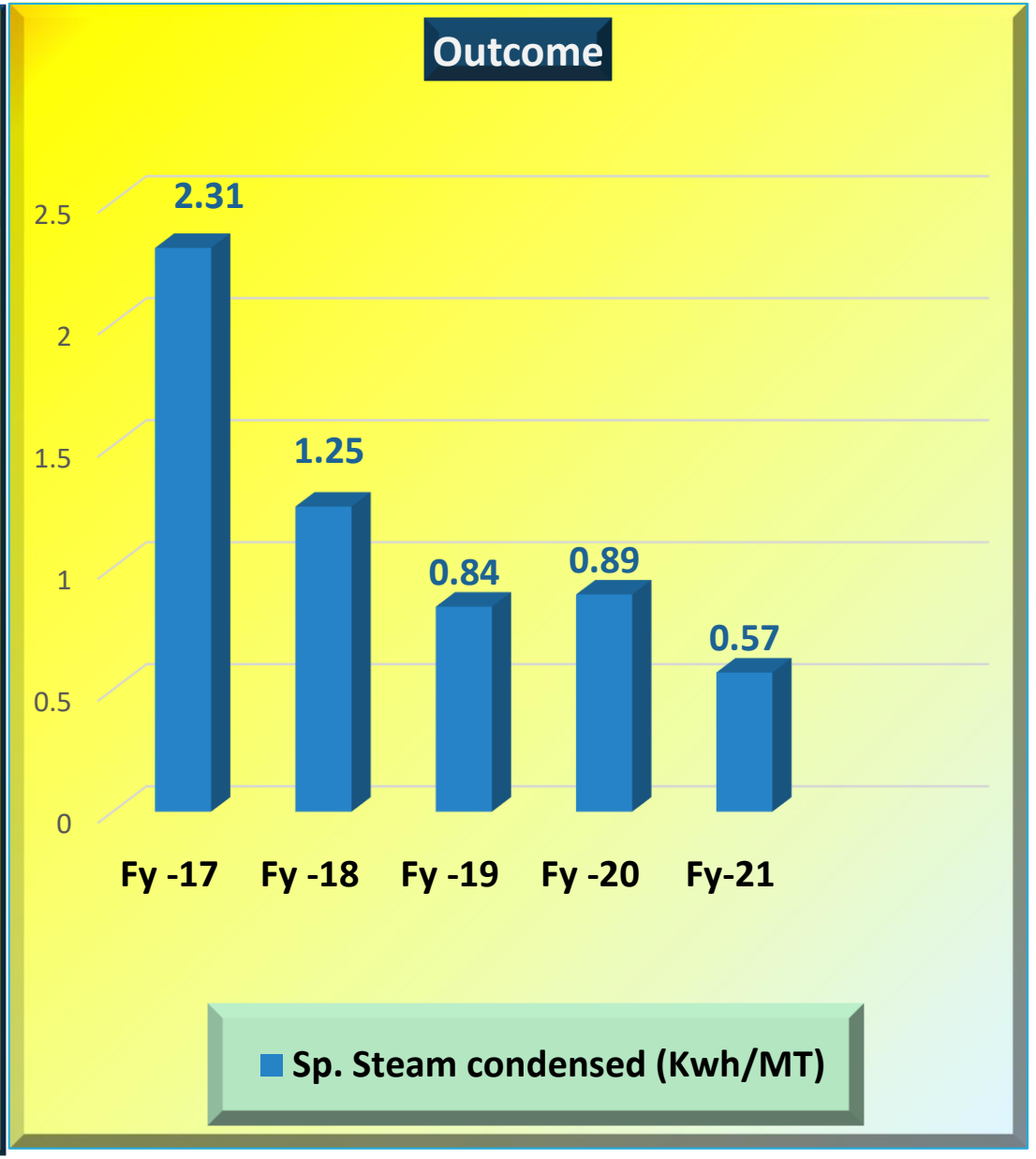
- Higher power consumption of ACC fan's
- ACC contributes about 8-10 % of the total APC of

❑ **Solution:-**

- Replaced new design of ENCON make aerodynamic design high efficiency energy saving E-Glass Epoxy FRP Fan Blades.

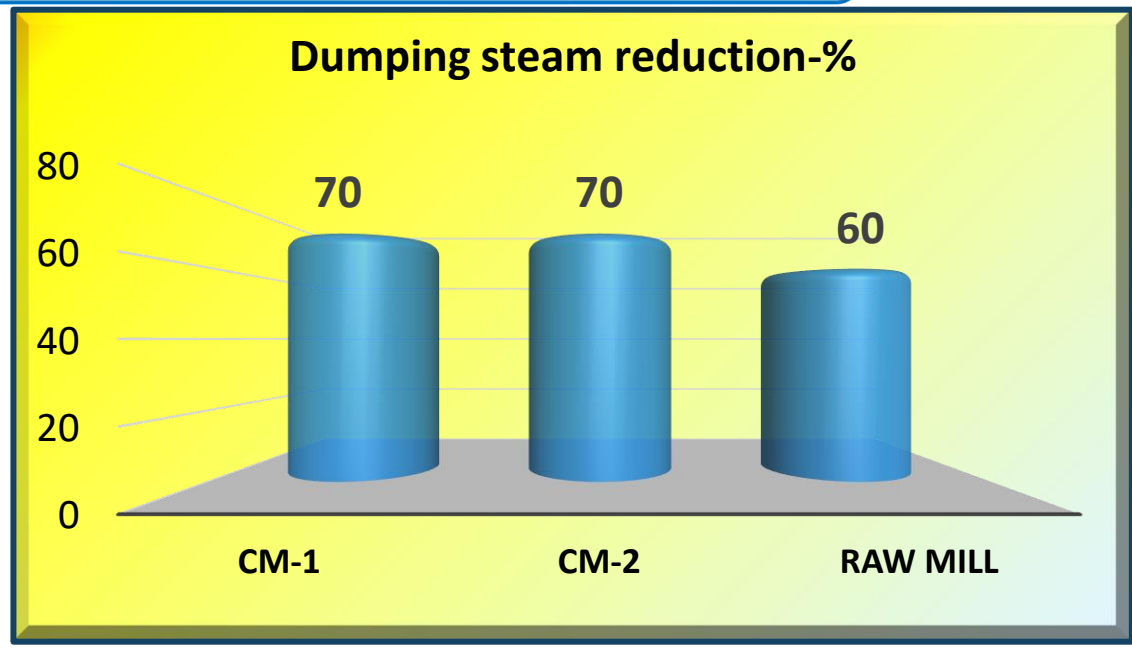
❑ ***Out Come***

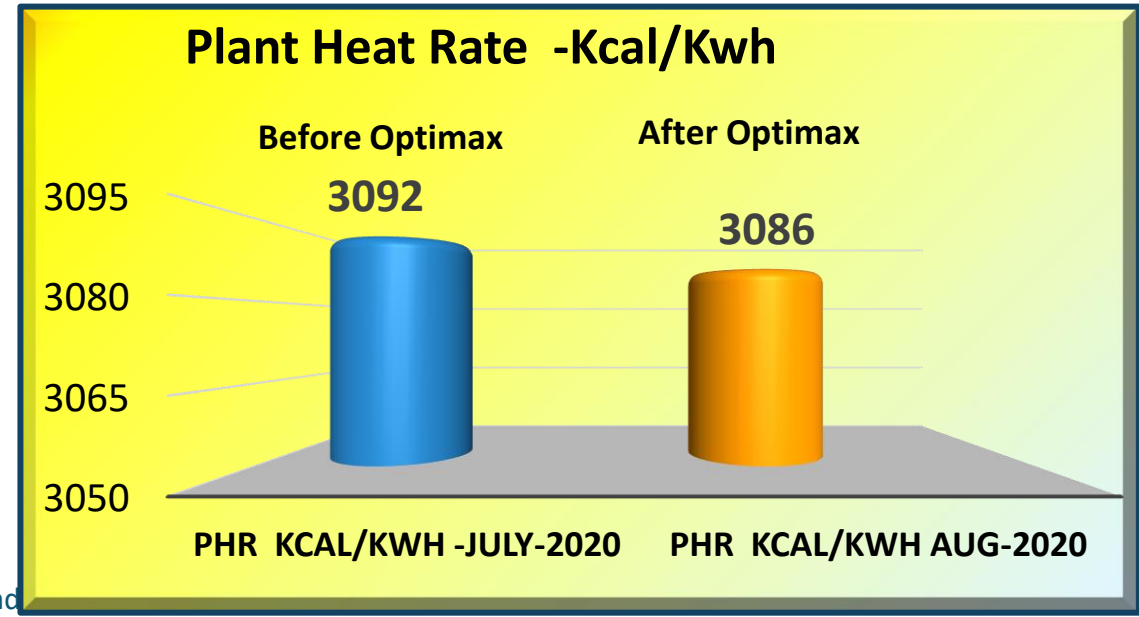
- Power Saving:-1.84 Lacs Kwh /annum.
- Cost Saving- :- 8.34 Lacs/annum.



Encon Project #3 :- Digitalization

- **Theme:-**
  - TPP Process Digitalization by Technology Up gradation.
- **Problem Statement:-**
  - Fluctuating equipment stability with operational demand
  - Efficiency & output disparities, these tracking & corrective systems unavailable.
  - Higher steam dumping during the cement plant drive load deviation
- **Solution :-**
  - Installed ABB-Optimax system for process evenness & automation.
- **Out Come :-**
  - Coal Saving :- 405.92 MT
  - Cost Saving :- 35.21 Lacs. (Fy 20 &21)
  - CO2 reduction :- 1253.27





Encon Project # 4 :- Single unit TPP Operation

❑ **Theme:-**

- Plant Operation with Single unit TPP@ higher PLF >95 % to improve heat rate and auxiliary power consumption

❑ **Problem Statement:-**

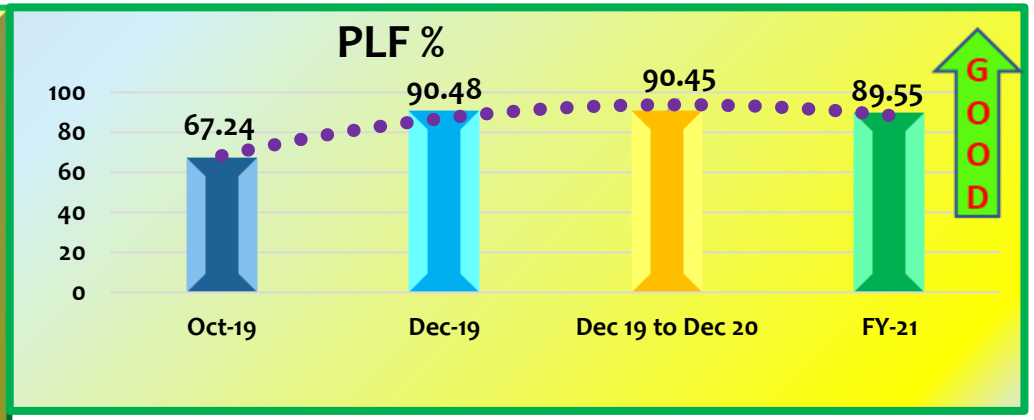
- PLF was at 67.24%
- Plant heat rate at 3168 Kcal/kwh.
- Auxiliary power at 8.03 %

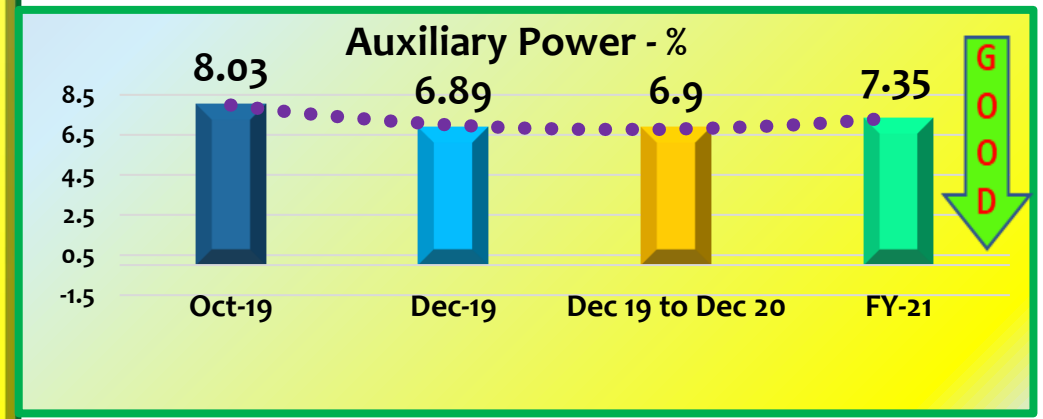
❑ **Solution:-**

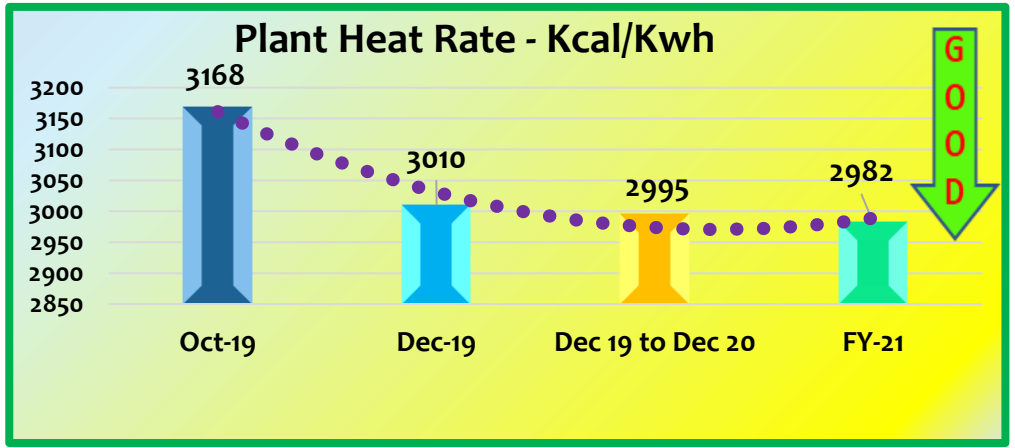
- KCW team has worked out the solution to run the plant with One unit TPP, WHRS and Grid, by taking out 1 unit from operation.

❑ **Outcome :-**

- Fuel Saving :- 3899 MT/annum
- Auxiliary Power :- 5.36 Lacs Kwh/annum
- Total Cost saving :- 347.47 Lacs /Annum.







Project # 5 Waste Heat Recovery Boiler

❑ **Theme:-**

- Waste heat recovery .

❑ **Problem Statement:-**

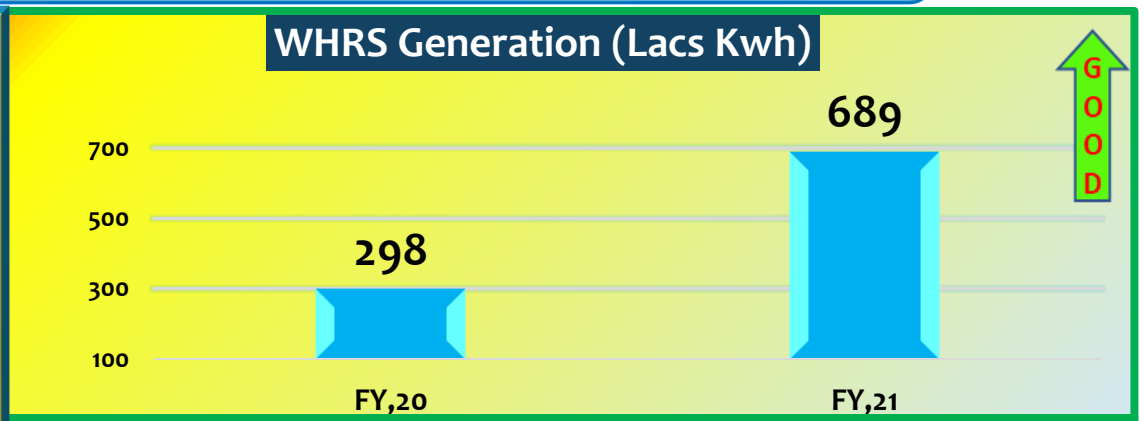
- Preheater and Cooler waste heat account for more than 35.5% of that heat loss.
- In the past few global warming conservation of energy have been given major importance

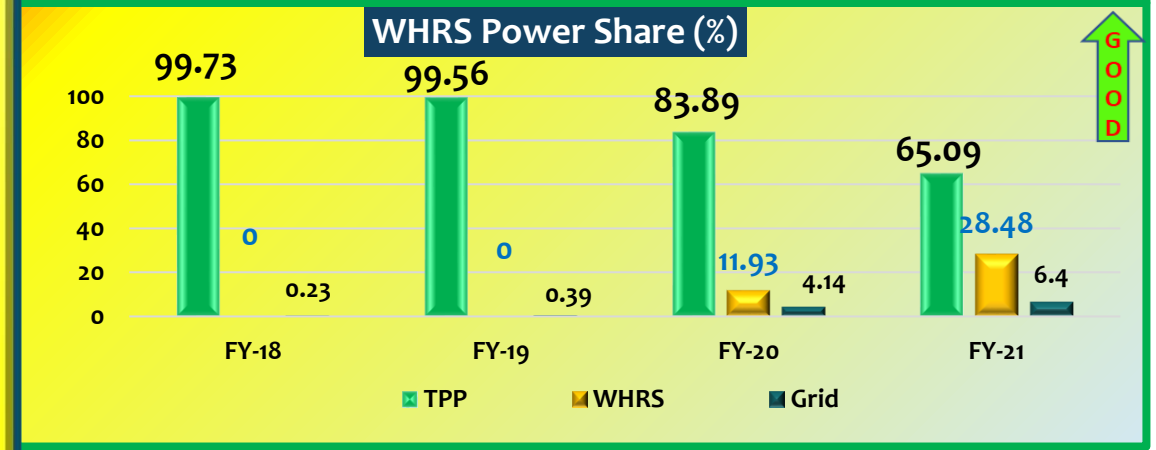
❑ **Solution :-**

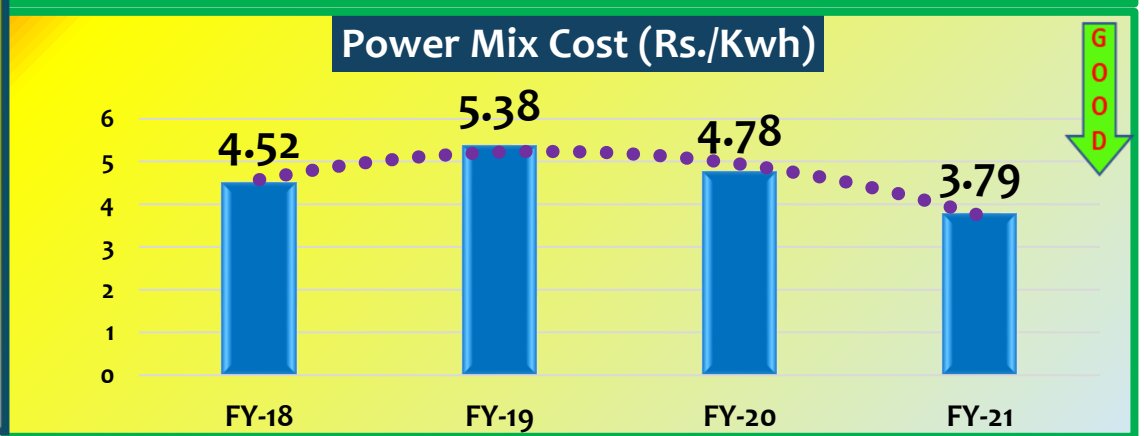
- Installation of waste heat recovery boiler in cooler and Pre heater

❑ **Out Come**

- TPP Fuel Saving :- 3674.38 Lac/ Annum
- Power Generation saving :- 4124 Lac/Annum
- TPP Auxiliary power Saving :- 47.41 Lac/Annum
- Raw water Saving :- 9200 KL/Annum.
- Reduction in CO_2 emission :- 131838 MT.
- Power mix cost : 3.79 from 4.52 Rs/Kwh.



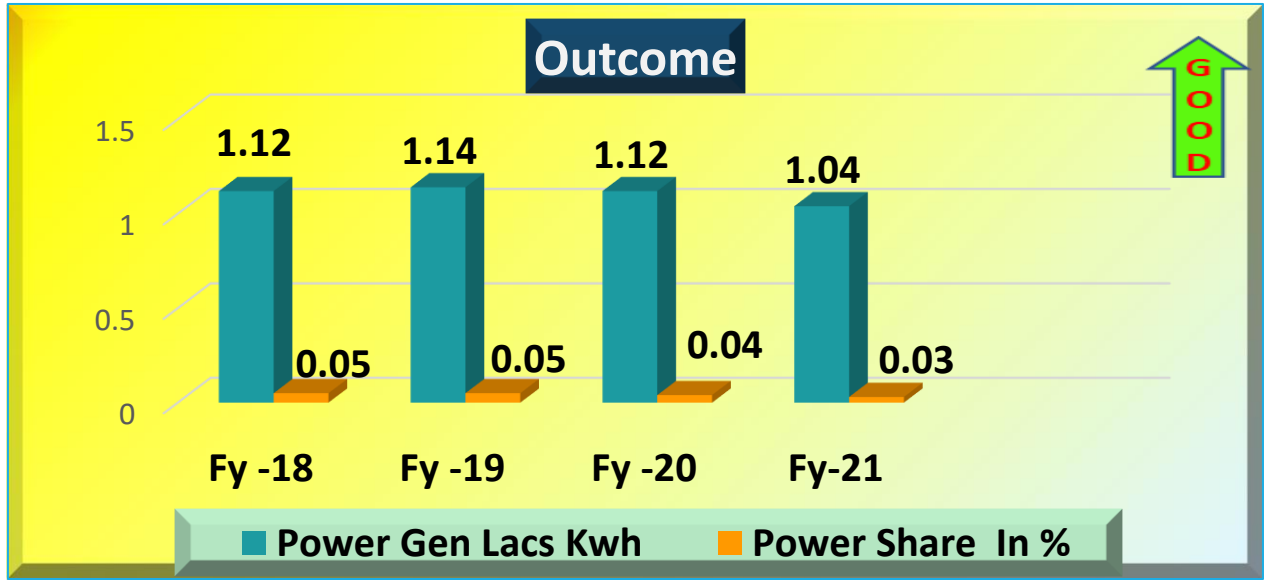


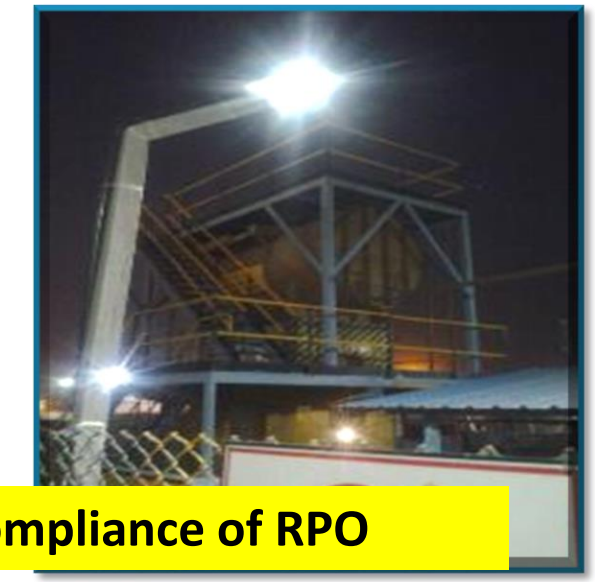


Utilization of renewable energy Resources

Capacity Of renewable energy @ Plant and Colony

- *Installed Solar Power Generation 100 KWH*
- *Installed Solar Power Generation at TPP area : 1 KWH*

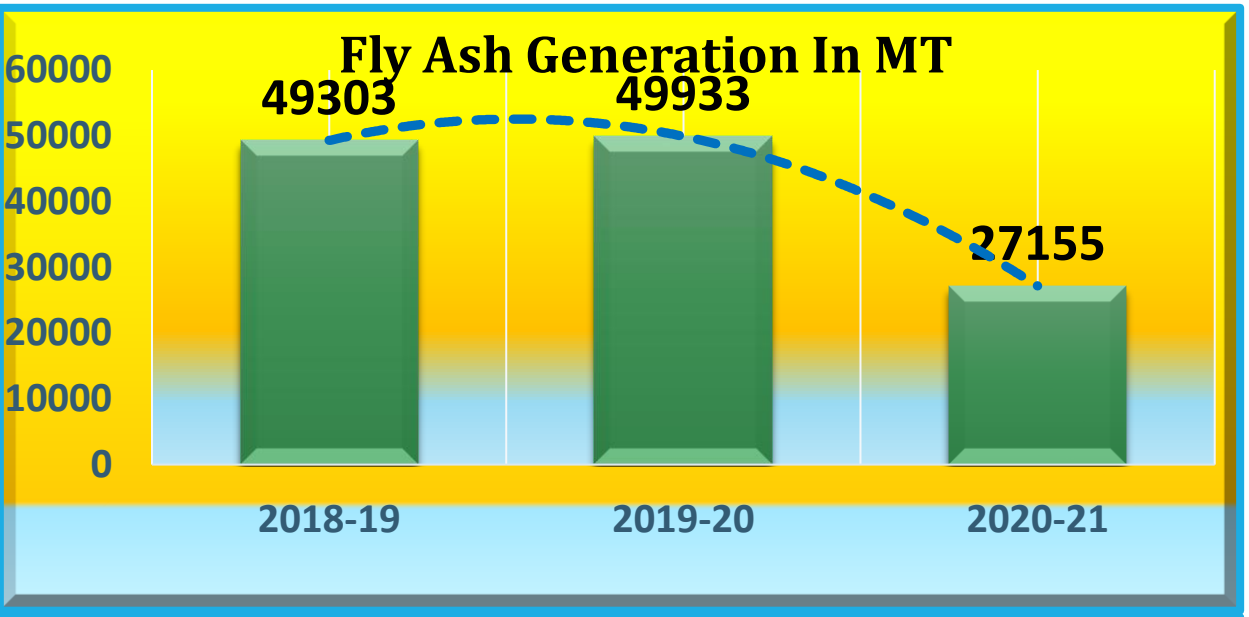


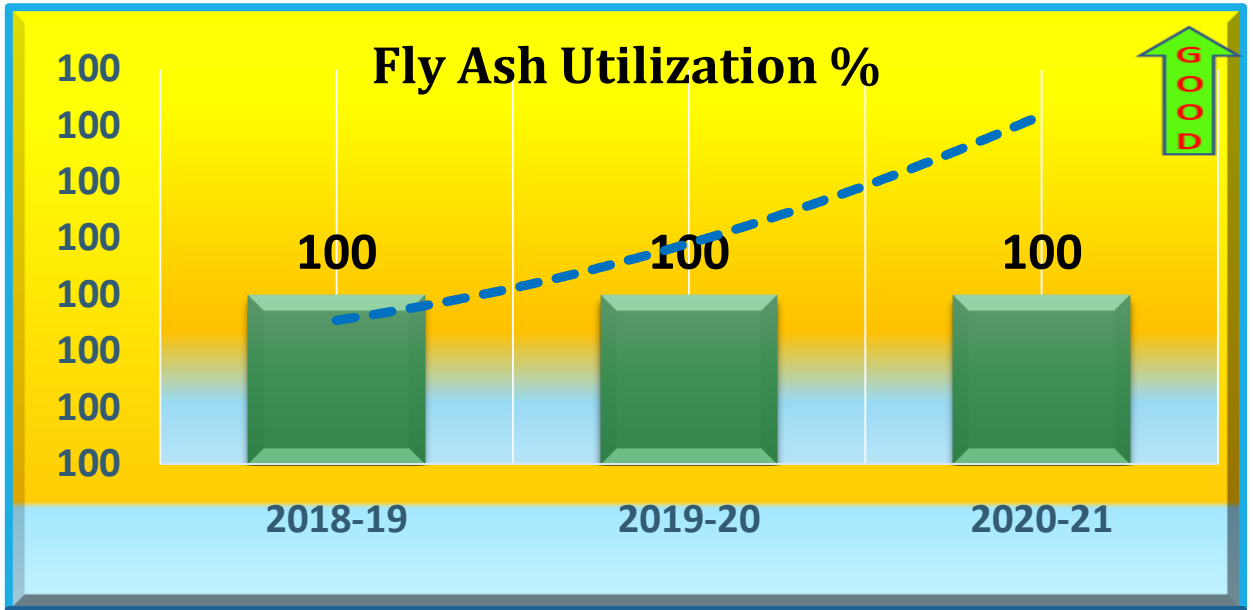


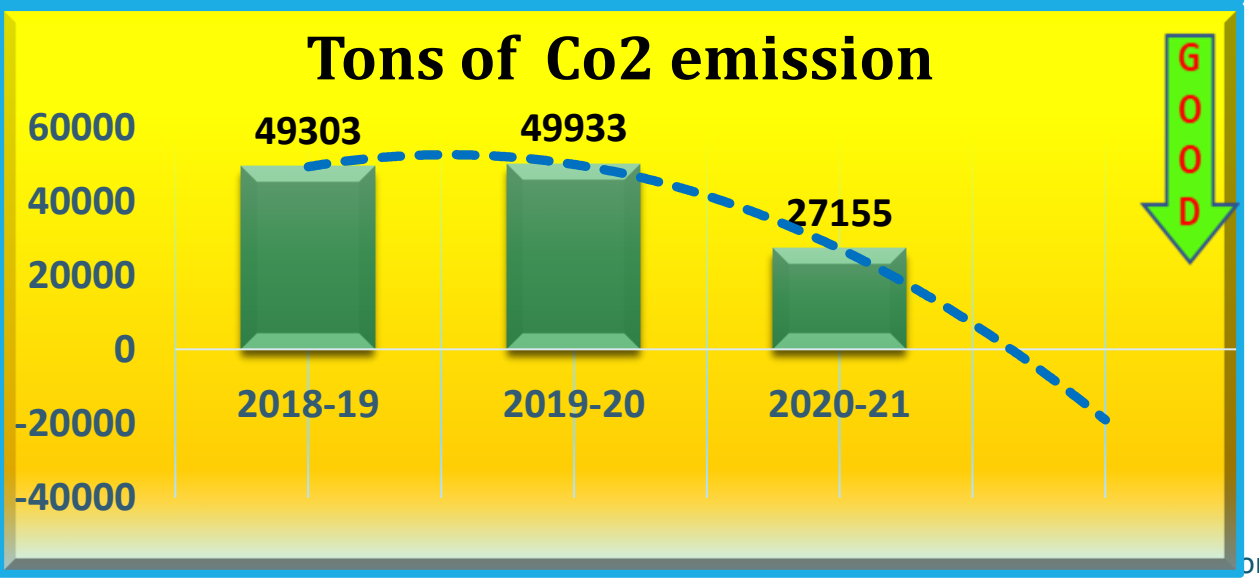
100% Compliance of RPO

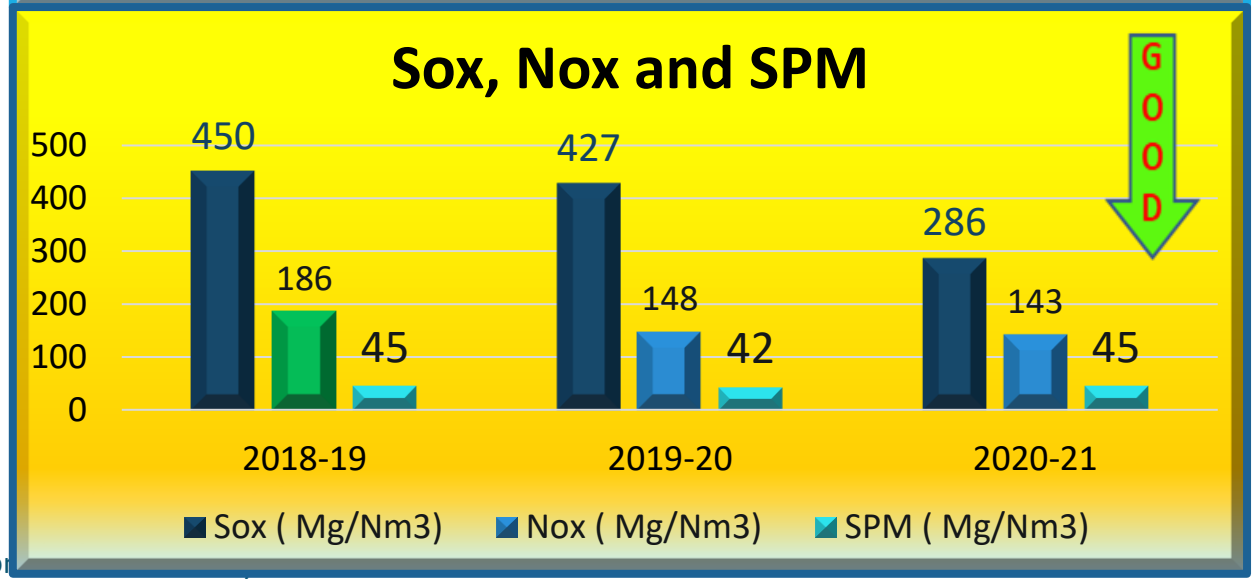
Fly Ash Generation & Utilization

GHG Inventorisation and Sox, Nox and SPM



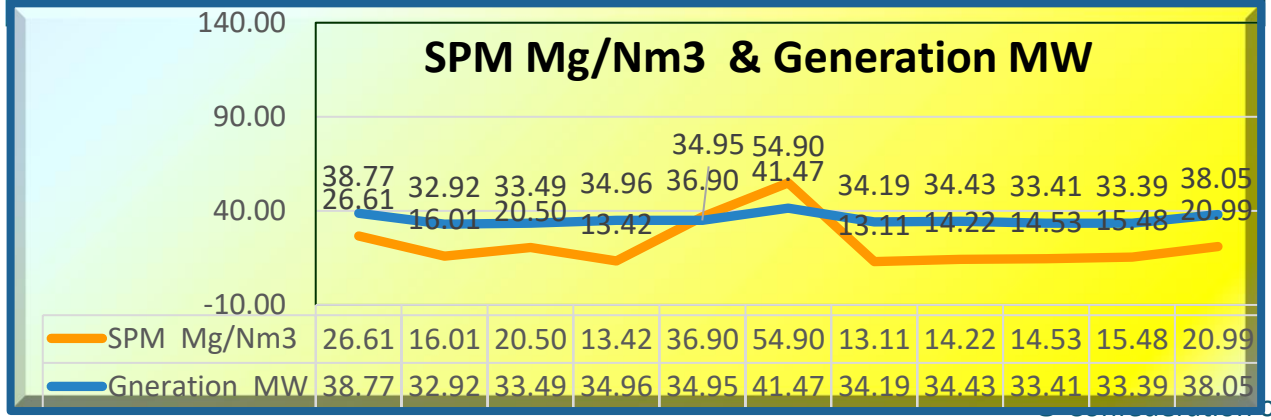




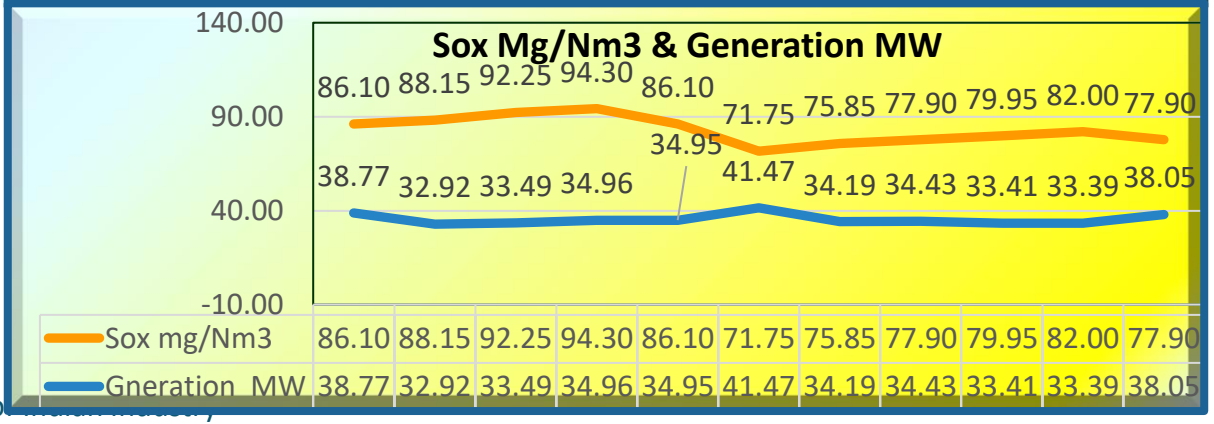


Best Practice for Emission Control & Monitoring

- **Theme :-**
  - Stack emission control
- **Project Title :-**
  - ESP -Panel UP-Gradation from SCR to IGBT Based for emission control .
  - Project Cost :- 61.98 Lacs
- **Outcome :**
  - Even control of stack SPM according to boiler load.

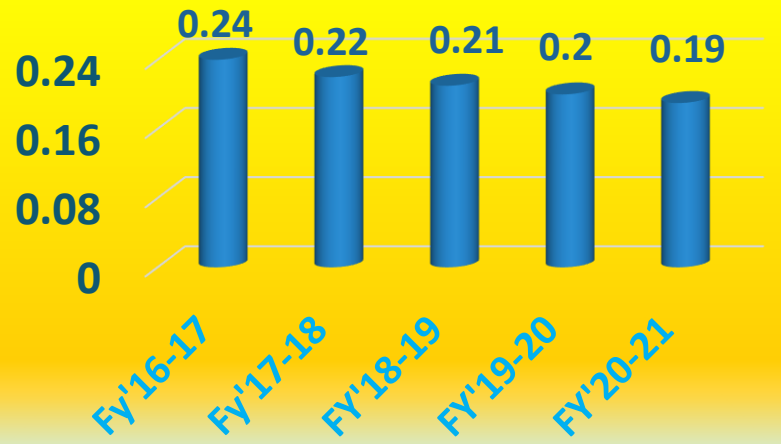


- **Theme :-** Control of sox
- **Project Title :-**
  - Best Controlling of Sox by feed lime stone in boiler with auto control logic
- **Outcome :-**
  - Boiler separate sox analyzer for visual monitoring at CCR.
  - Feed lime stone in boiler by rotary air lock for controlling the Sox.
  - Close loop control from Boiler sox analyzer & Lime stone RAV.



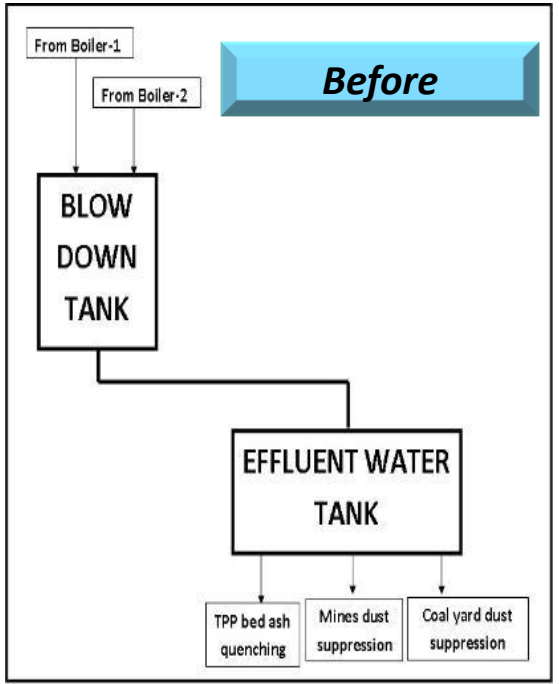
Environment - Water Management

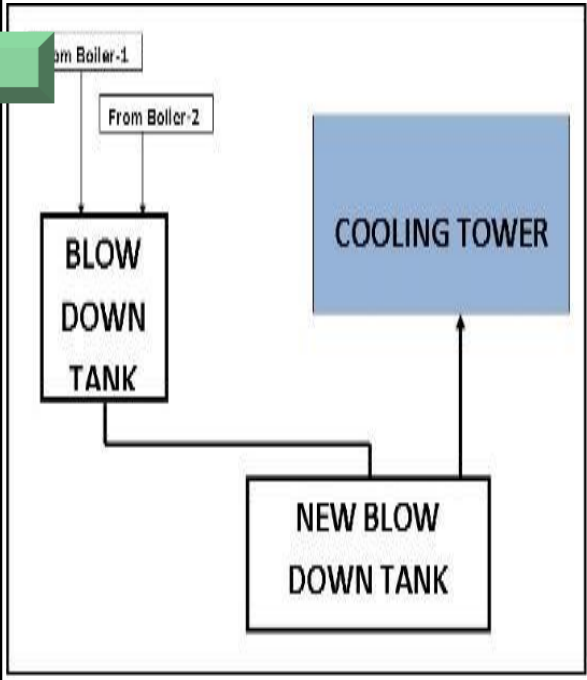
Raw Water Cons. M^3/MW



- **Theme:-** Reutilization of boiler blow down Water
- **Approach:-**
  - Earlier boiler blow down water was collected in effluent pit-no use of that water.
- **Solution :-**
  - Provision made for re-use of the blow down water

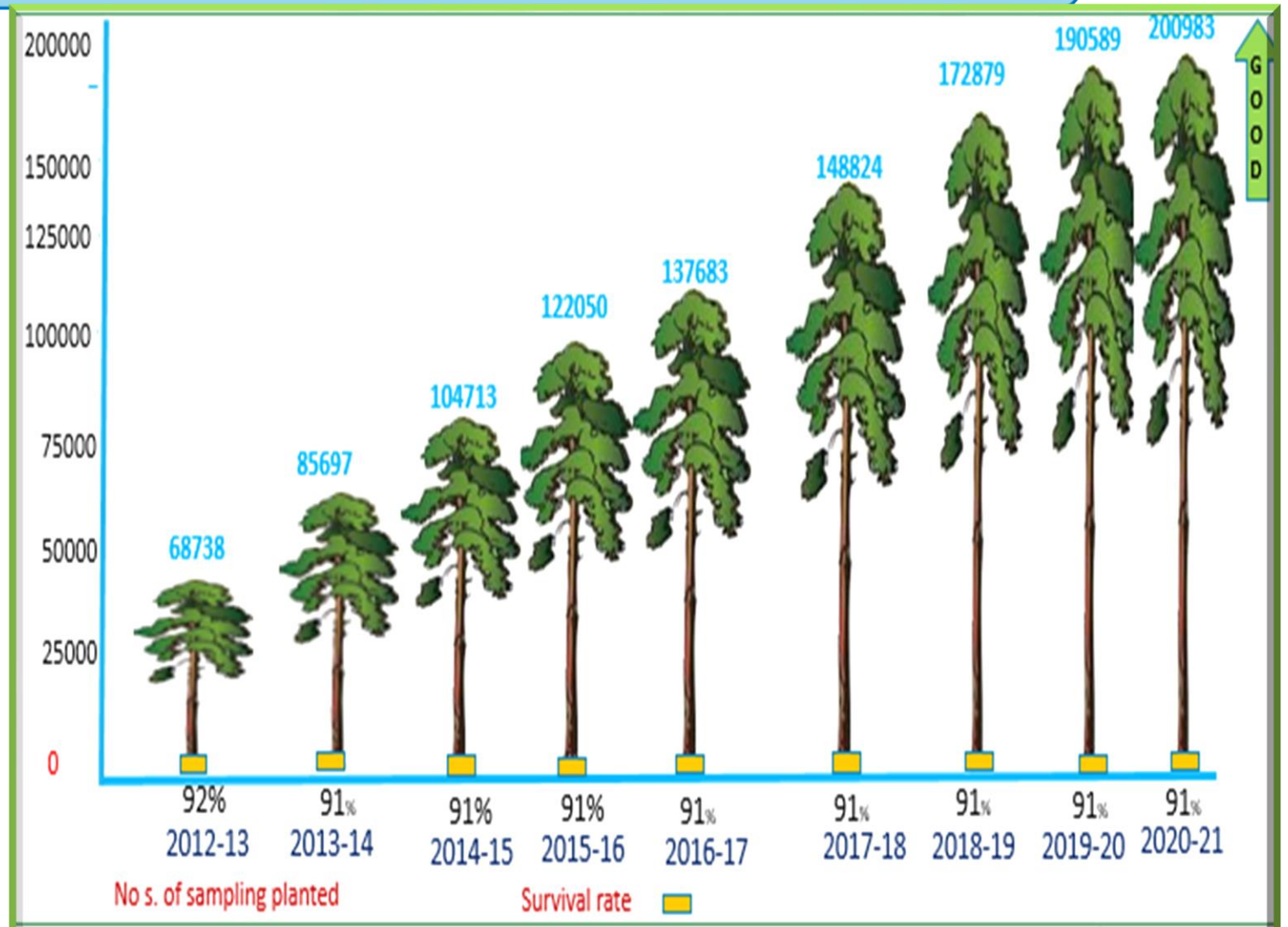
- **Theme:-** Rain water collecting arrangement
- **Approach:-**
  - During Rainy season, large amount water goes in to open trench and wastage.
- **Solution :-**
  - Arrangement done for rain water collection above raw water tank.





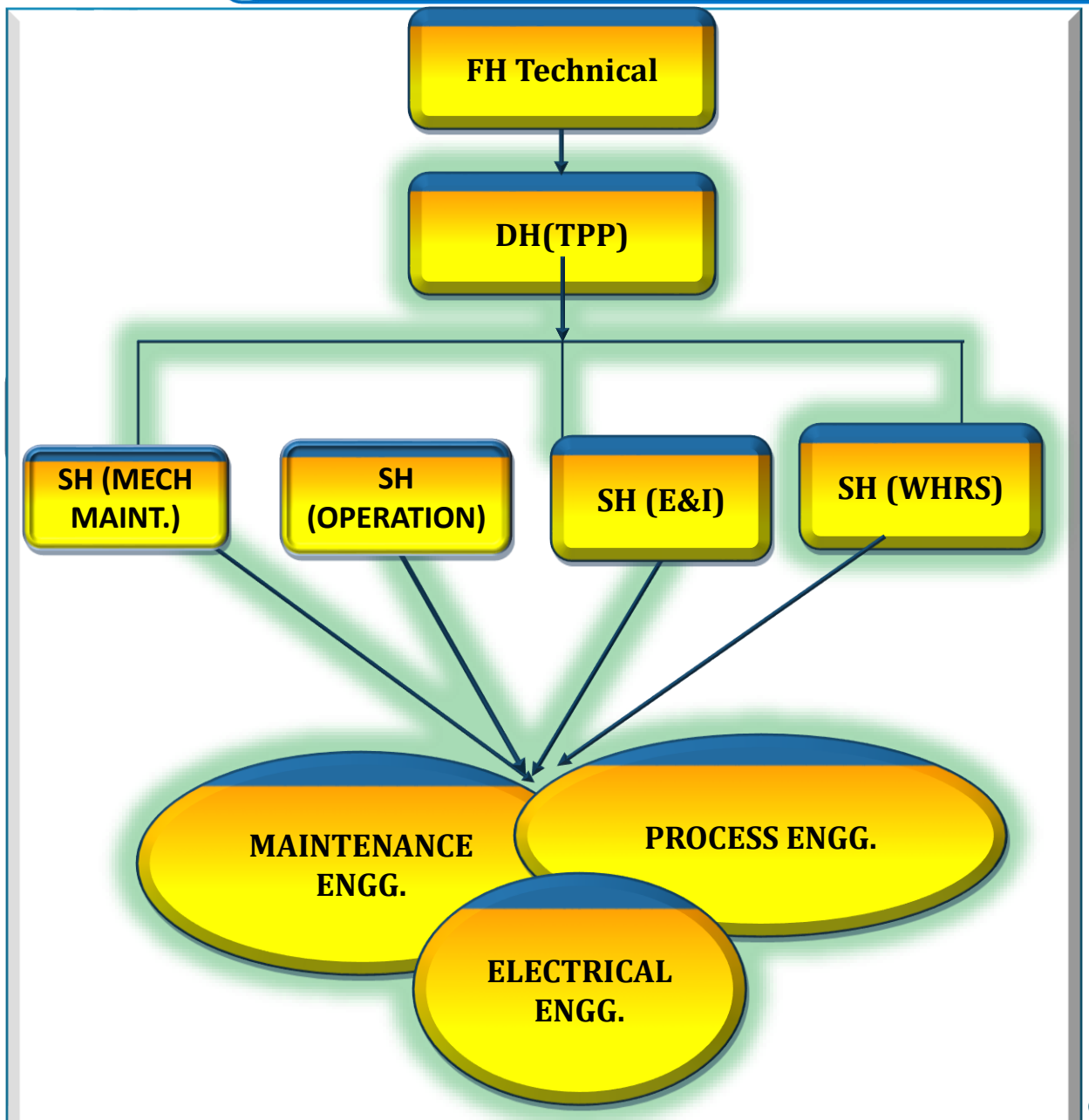
Green belt development

Sapling Distribution to Villagers



Developed 34% area at Plant/Colony and 61% area at Mines
as Green Belt against the statuary requirement of 33%.
Cumulative Survival rate = 91%

Teamwork, Employee Involvement & Monitoring

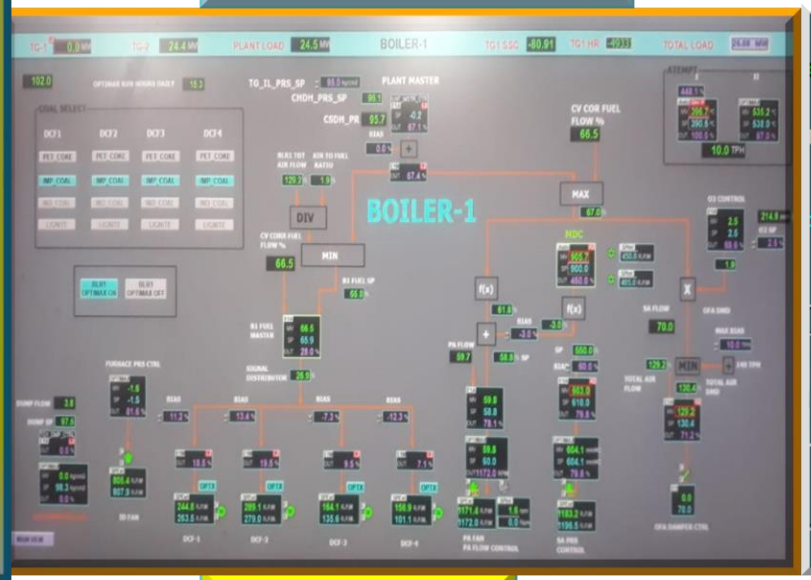


- Well Established energy management cell headed by FH Technical and DH TPP(Certified EM).
- Daily monitoring of Heat rate and Aux. power deviation report.
- Analysis of equipment performance for deviation.
- Identification of energy conservation project/work.
- Theme base suggestions/Kaizens scheme under “Energy Saving ”.
- Feasibility study of suggestions & submit proposal for sanction.
- Preparation of detail action plan.
- Benefits analysis after project implementation.

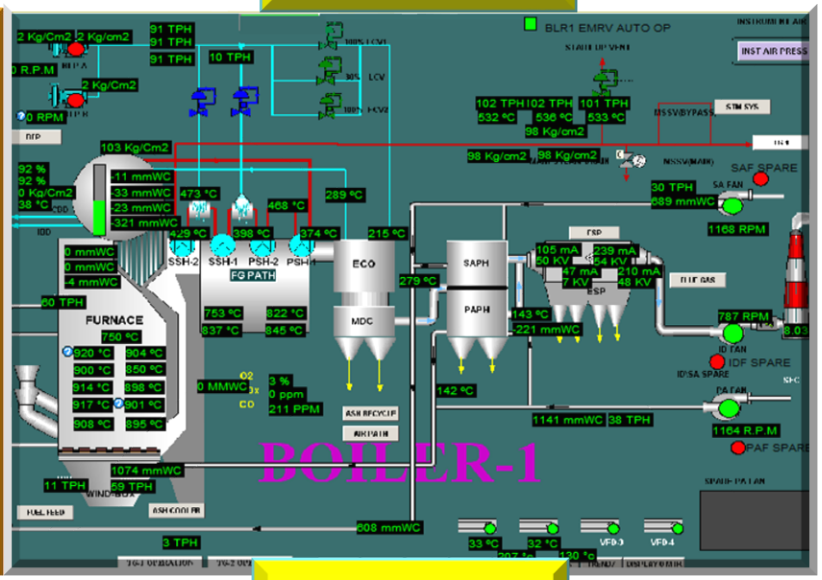
Teamwork, Employee Involvement & Monitoring

- **Process Digitalization (optimax):-** Improve the plant performance
- **PI Server :-** For online data monitoring
- **Asset Vista :-** Analysis parameters and generate the alarm
- **KM :-** For monitoring operation and retrieve video.
- **SCADA :-** Monitoring & Synchronization

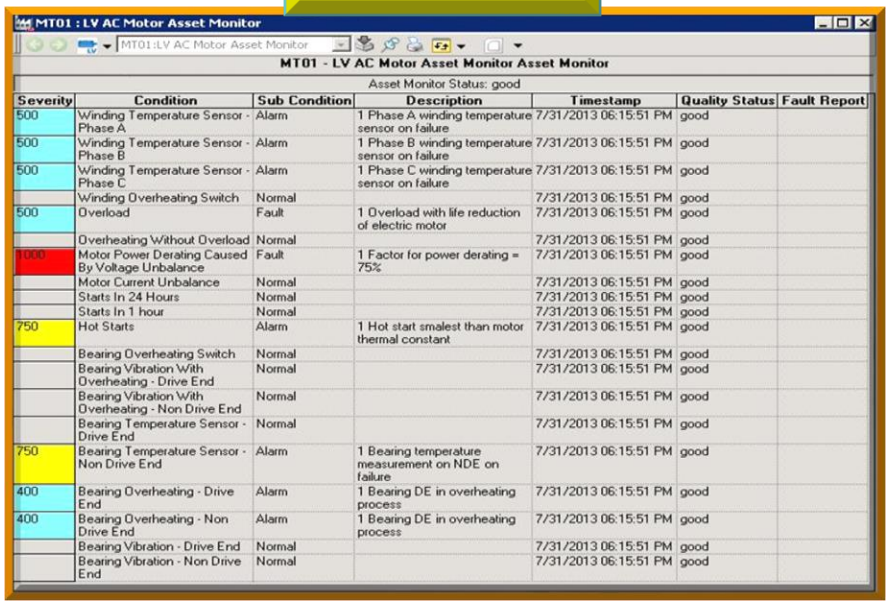
Process Digitalization



PI



Asset Vista



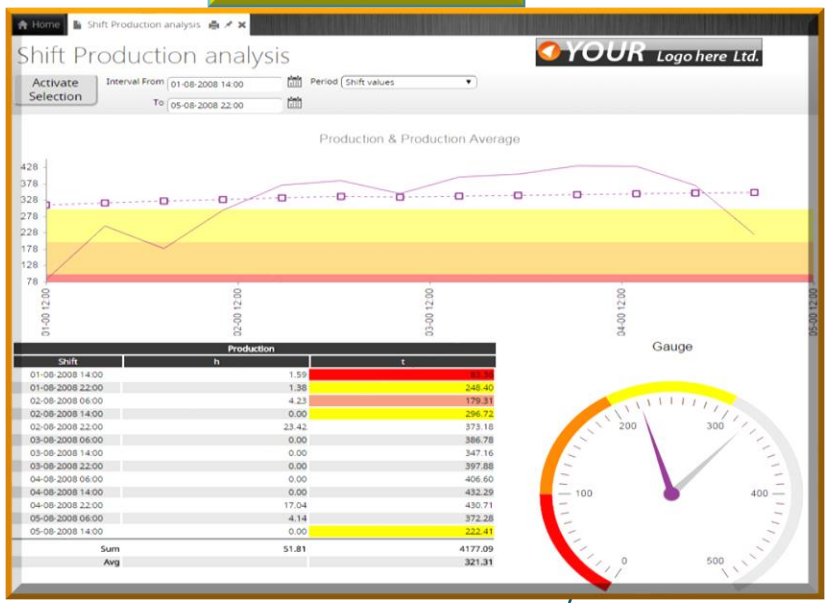
MT01 : LV AC Motor Asset Monitor

MT01 - LV AC Motor Asset Monitor Asset Monitor

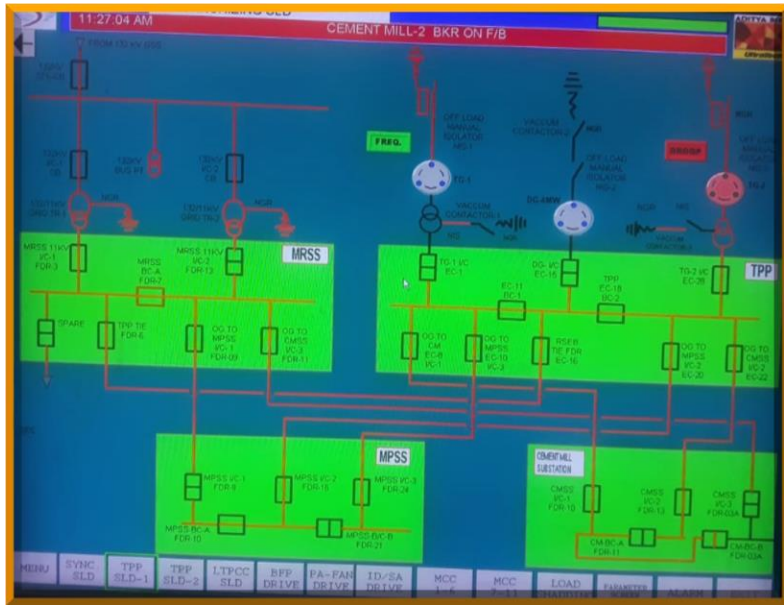
Asset Monitor Status: good

Severity	Condition	Sub Condition	Description	Timestamp	Quality Status	Fault Report
500	Winding Temperature Sensor - Phase A	Alarm	1 Phase A winding temperature sensor on failure	7/31/2013 06:15:51 PM	good	
500	Winding Temperature Sensor - Phase B	Alarm	1 Phase B winding temperature sensor on failure	7/31/2013 06:15:51 PM	good	
500	Winding Temperature Sensor - Phase C	Alarm	1 Phase C winding temperature sensor on failure	7/31/2013 06:15:51 PM	good	
	Winding Overheating Switch	Normal		7/31/2013 06:15:51 PM	good	
500	Overload	Fault	1 Overload with life reduction of electric motor	7/31/2013 06:15:51 PM	good	
	Overheating Without Overload	Normal		7/31/2013 06:15:51 PM	good	
1000	Motor Power Derating Caused By Voltage Unbalance	Fault	1 Factor for power derating = 75%	7/31/2013 06:15:51 PM	good	
	Motor Current Unbalance	Normal		7/31/2013 06:15:51 PM	good	
	Starts In 24 Hours	Normal		7/31/2013 06:15:51 PM	good	
	Starts In 1 hour	Normal		7/31/2013 06:15:51 PM	good	
750	Hot Starts	Alarm	1 Hot start smalest than motor thermal constant	7/31/2013 06:15:51 PM	good	
	Bearing Overheating Switch	Normal		7/31/2013 06:15:51 PM	good	
	Bearing Vibration With Overheating - Drive End	Normal		7/31/2013 06:15:51 PM	good	
	Bearing Vibration With Overheating - Non Drive End	Normal		7/31/2013 06:15:51 PM	good	
	Bearing Temperature Sensor - Drive End	Normal		7/31/2013 06:15:51 PM	good	
750	Bearing Temperature Sensor - Non Drive End	Alarm	1 Bearing temperature measurement on NDE on failure	7/31/2013 06:15:51 PM	good	
400	Bearing Overheating - Drive End	Alarm	1 Bearing DE in overheating process	7/31/2013 06:15:51 PM	good	
400	Bearing Overheating - Non Drive End	Alarm	1 Bearing DE in overheating process	7/31/2013 06:15:51 PM	good	
	Bearing Vibration - Drive End	Normal		7/31/2013 06:15:51 PM	good	
	Bearing Vibration - Non Drive End	Normal		7/31/2013 06:15:51 PM	good	

KM

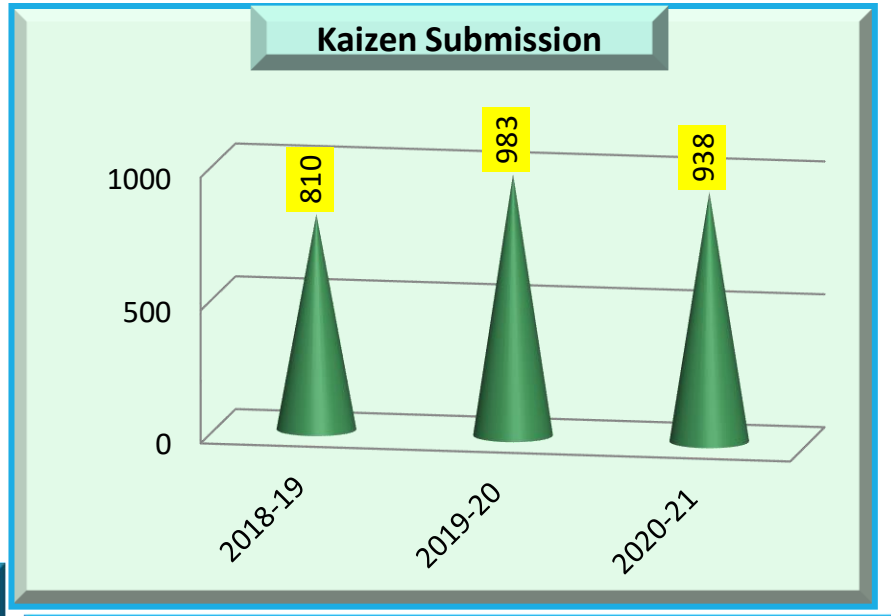


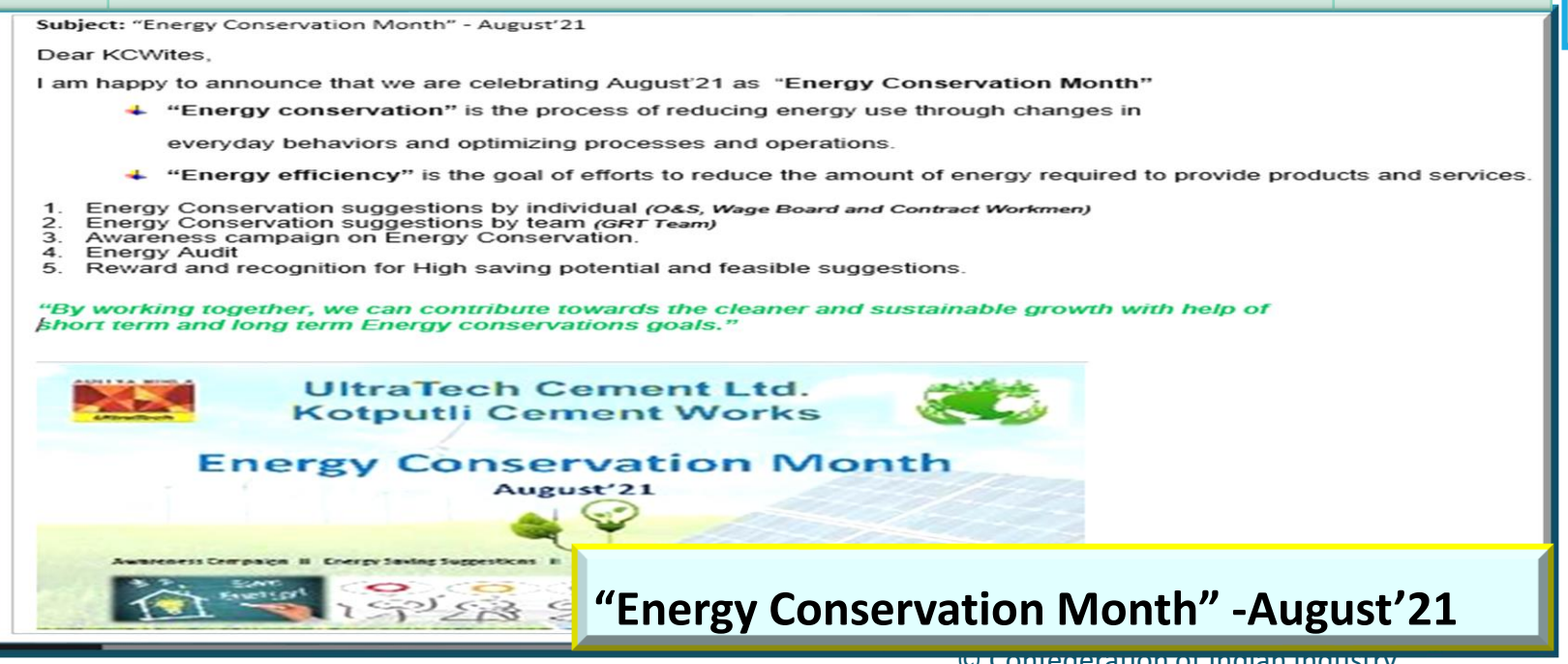
SCADA



Project implementation through Kaizen

SN	Energy Conservation Idea	Status
1	Reduction the auxiliary cooling water pump pressure from 2.7 kg/cm2 to 2.5 kg/cm2	Completed
2	MDC RAV shaft sealing cold air provided by PA fan out let in place utilization of compressed. So power saving of compressor.	Completed
3	Single time start the Coal handling plant for filling the boiler bunker	Completed
4	Pushing air provided to Fly ash conveying system for avoiding line jamming and avoiding continuous utilisation of service air.	Completed
5	Utilization of ESP fist field Ash to coal bunker for recycle and reduction of LOI	Completed




Subject: "Energy Conservation Month" - August'21

Dear KCWites,

I am happy to announce that we are celebrating August'21 as "**Energy Conservation Month**"

- "**Energy conservation**" is the process of reducing energy use through changes in everyday behaviors and optimizing processes and operations.
- "**Energy efficiency**" is the goal of efforts to reduce the amount of energy required to provide products and services.

1. Energy Conservation suggestions by individual *(O&S, Wage Board and Contract Workmen)*
2. Energy Conservation suggestions by team *(GRT Team)*
3. Awareness campaign on Energy Conservation.
4. Energy Audit
5. Reward and recognition for High saving potential and feasible suggestions.

"By working together, we can contribute towards the cleaner and sustainable growth with help of short term and long term Energy conservations goals."

"Energy Conservation Month" -August'21


Kaizen Award

Implementation of ISO 50001 & Energy Management System Policy

ISO 50001

2015

Energy Management

Certificate ISO 50001

DNV BUSINESS ASSURANCE

MANAGEMENT SYSTEM CERTIFICATE

Certificate No. 172280-2015-AE-IND-RvA

This is to certify that

UltraTech Cement Limited
(Unit : Kotputli Cement Works)

Village: Mohanpura, Tehsil: Kotputli,
Dist. Jaipur, 302002, Rajasthan, India

has been found to conform to the Energy Management System Standard:

ISO 50001:2011

This Certificate is valid for the following Scope:

Manufacture of cement and clinker.

Initial Certification date: 9 March 2015
This Certificate is valid until: 9 March 2018
The audit has been performed under the supervision of: Hitesh Dhandhusaria, *Lead Auditor*

MGMT SYS RvA C 024

Place and date: Barendrecht, 9 March 2015
For the issuing office: DET NORSKE VERITAS CERTIFICATION B.V., Zwolseweg 1, 2994 LB Barendrecht, The Netherlands
B. Poldermans, *Management Representative*

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

Accredited Unit: Det Norske Veritas Certification B.V. Zwolseweg 1, 2994 LB Barendrecht, The Netherlands, TEL: +31 10 2922 688 - www.dnvba.com

Energy Management Policy

ULTRATECH CEMENT LIMITED
UNIT: KOTPUTLI CEMENT WORKS
ENERGY MANAGEMENT POLICY

We are committed to demonstrate excellence in Energy performance in all our activities of manufacturing of cement and clinker on a continual basis so as to make our operations environmentally sustainable for future.

We shall achieve this by :

- *Monitoring and control of energy consumption through effective energy management system and periodic energy audit.*
- *Continuous up-gradation of process with energy efficient and ecofriendly technology, support the purchase of energy efficient product, services and design, for continual improvement of Energy performance.*
- *To ensure the availability and providing information & resources to promote and propagate energy awareness among all employees to achieve objective and targets.*
- *Recognizing efforts of our employees in energy conservation initiatives.*
- *Benchmarking our performance with best and starving to beat the best.*
- *Meeting all statutory & legal requirements and other requirements.*

Unit Head

Revision No.: 02

Date: 10/11/2014

Energy Conservation related projects impacting and contributing for natural resources conservation are being approved immediately by the management.

Awards & Accolades

National Energy Conservation Award 2017

"Excellent Energy Efficient Unit" From 2014 to 2017.

" water efficient unit" In year 2016 & 2017.

"Water Efficient" Unit" in year 2012.

Certificate by the Ministry of Power, year 2012-13

The less you burn, the more you earn

Sincere Thanks..

UltraTech Cement Ltd
Kotputli Cement Works
Thermal Power Plant
Hari. K. Chaturvedi
E. Mail ID :-
hari.chaturvedi@adityabirla.com
Mob. No. :- 9844890230