INDIAN RAYON

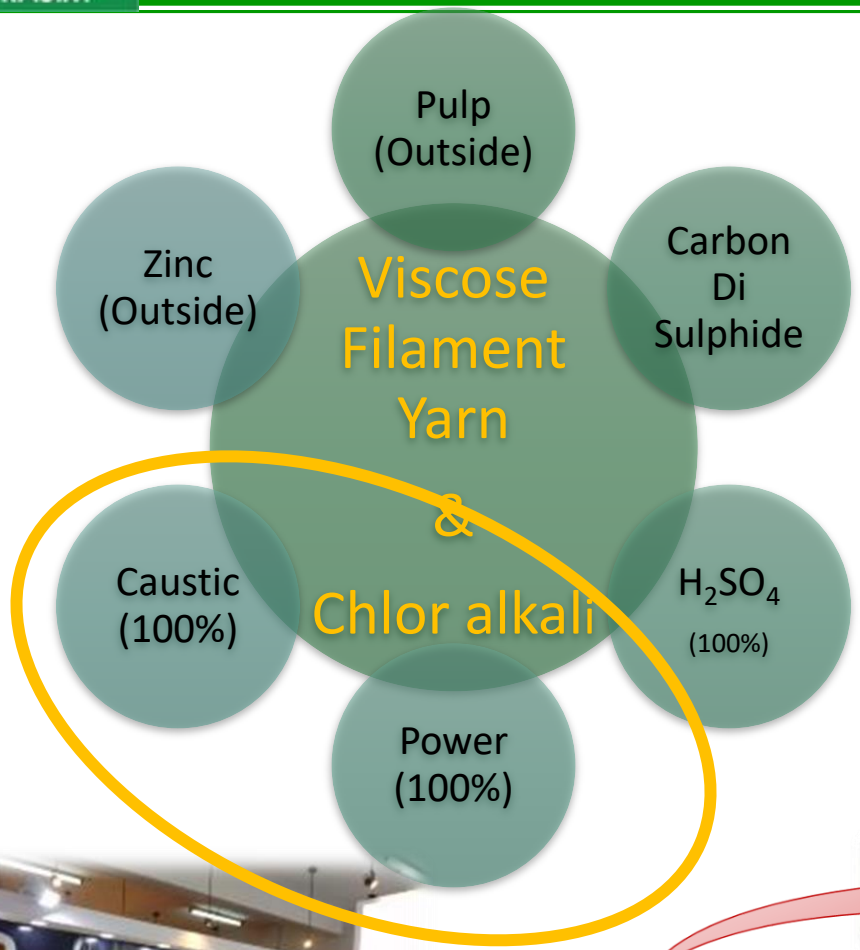
Welcome to CII

23nd National Award for Excellence in Energy Management 2022

Participants

- *Mr. Madhukar Datt Sharma (AVP-CA & PP)*
- *Mr. K Ramesh Rao (AGM-PP)*

Integrated Operation & Major Products

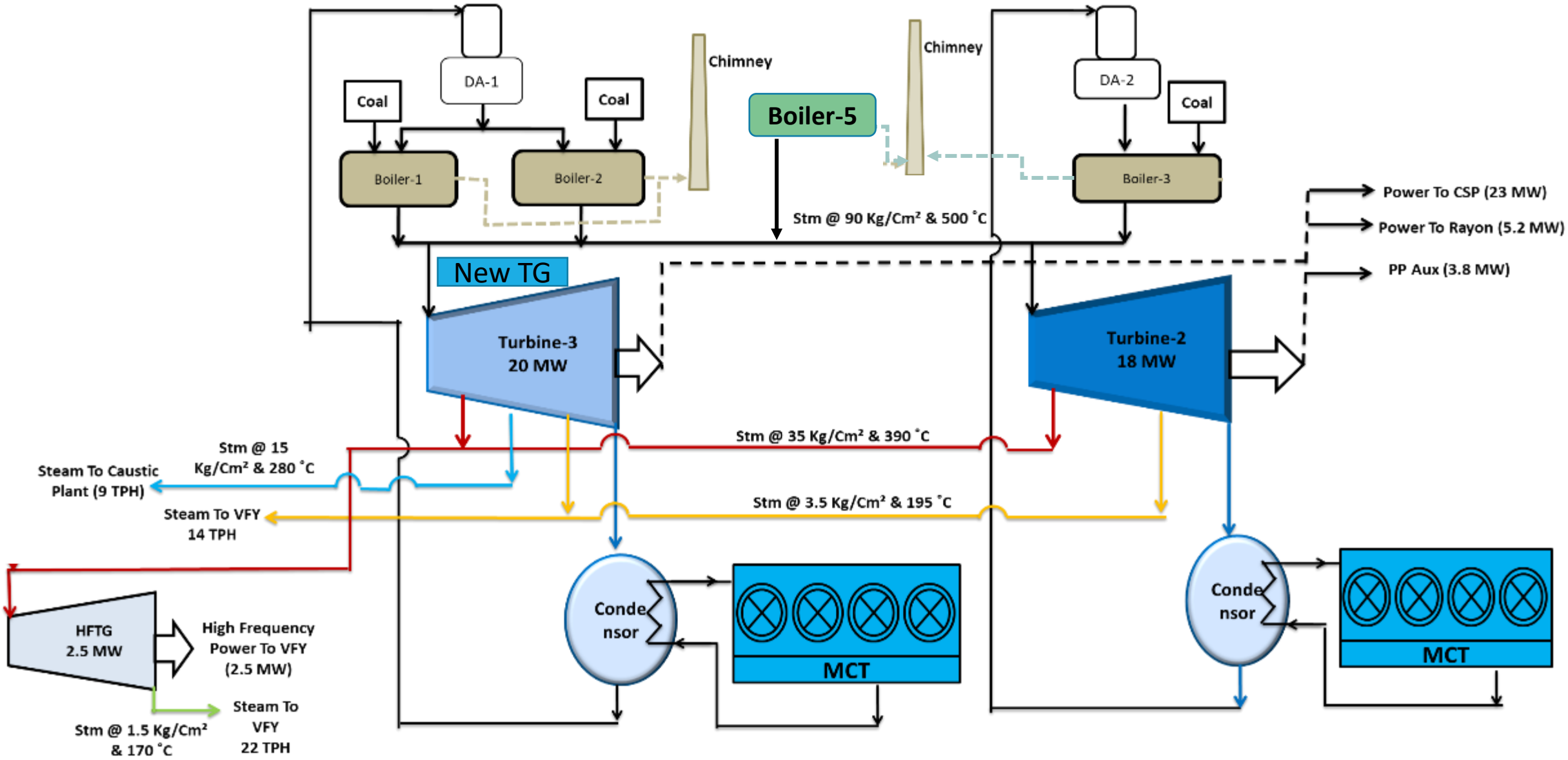


Integrated Operations for Cost Effectiveness

Product	Capacity	Uses
VFY	60.75 TPD	Textile Apparel , Satin, Sarees
Sodium Sulphate	35 TPD	Dye, Organic Chemical
Sulfuric Acid (H_2SO_4)	100 TPD	Captive for VFY
Carbon di Sulphide	27 TPD	Captive for VFY
Captive Power Plant	38 MW	Captive (VFY + Caustic)
Caustic	250 TPD	In process, Dye, Detergent Chemical

Other than Pulp and Zinc, key Raw Materials are produced in house

Process Flow Diagram

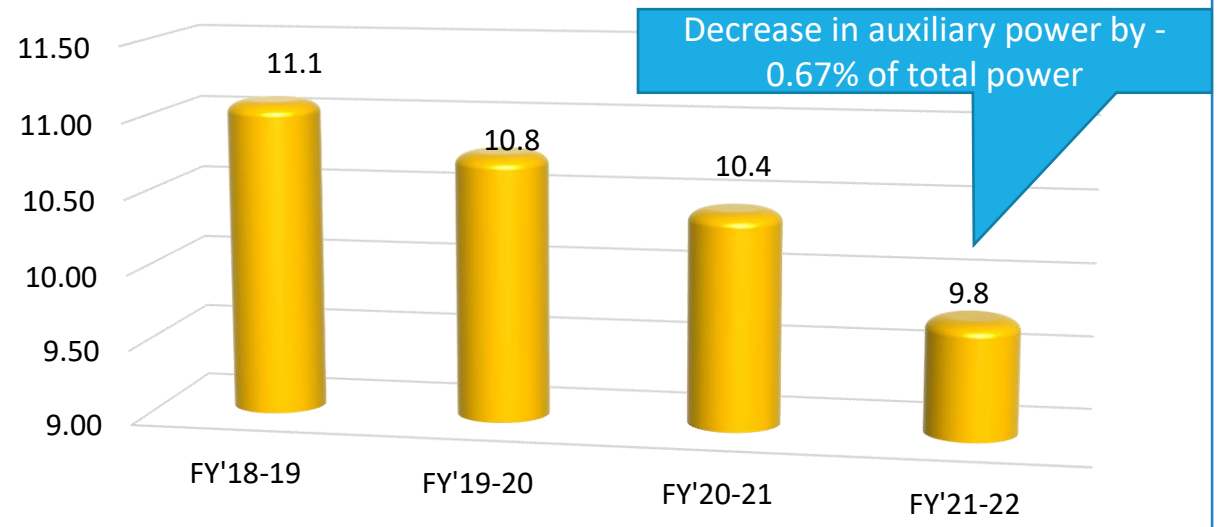


Energy Consumption Overview

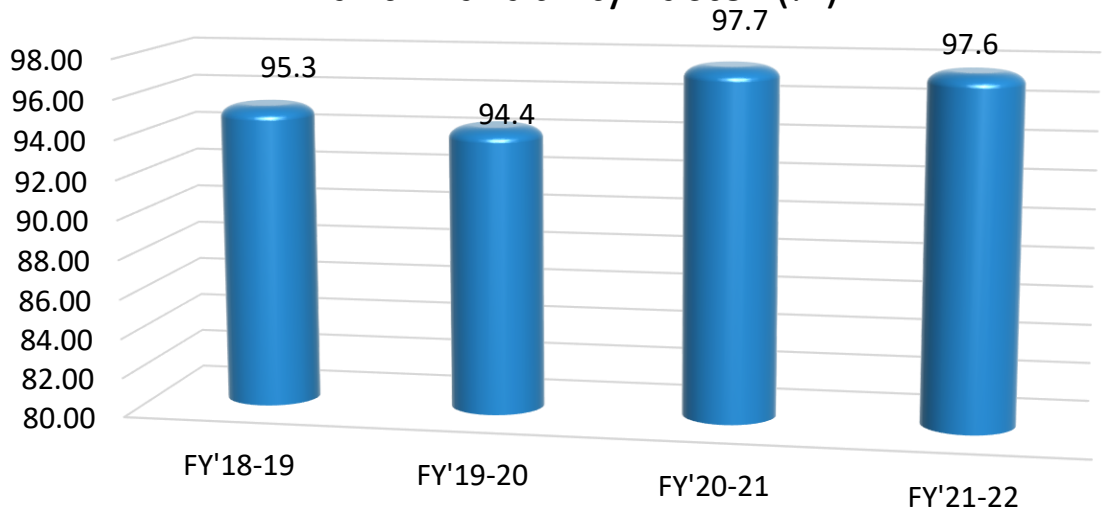
Parameter	UOM	FY 2021-22
Annual Power generation	MW	30.85
PLF	%	89.43
Availability	%	97.6
Gross Heat Rate	Kcal/KWh	3105
Auxiliary Power	%	9.77
Boiler Efficiency	%	82.56
Turbine Heat Rate	Kcal/KWh	2517
DM Water Consumption (exc process steam)	% of steam generation	3.81
Raw Water Consumption	M3/Mwh	1.88
Specific Oil Consumption	L/MWH	0.016

Key Performance Indicators

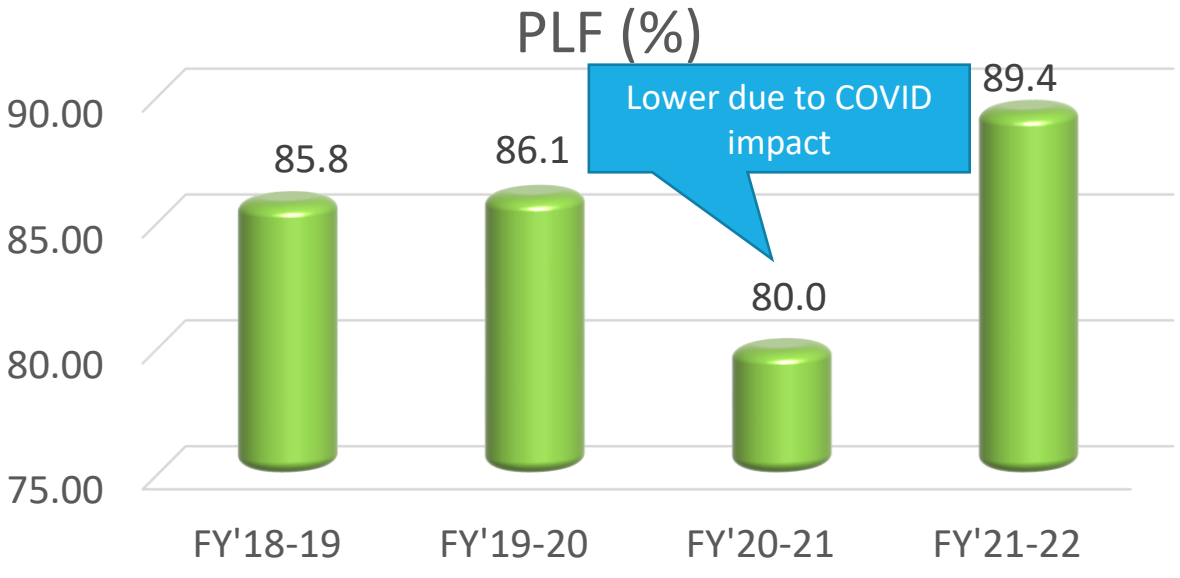
Auxiliary Power (%)



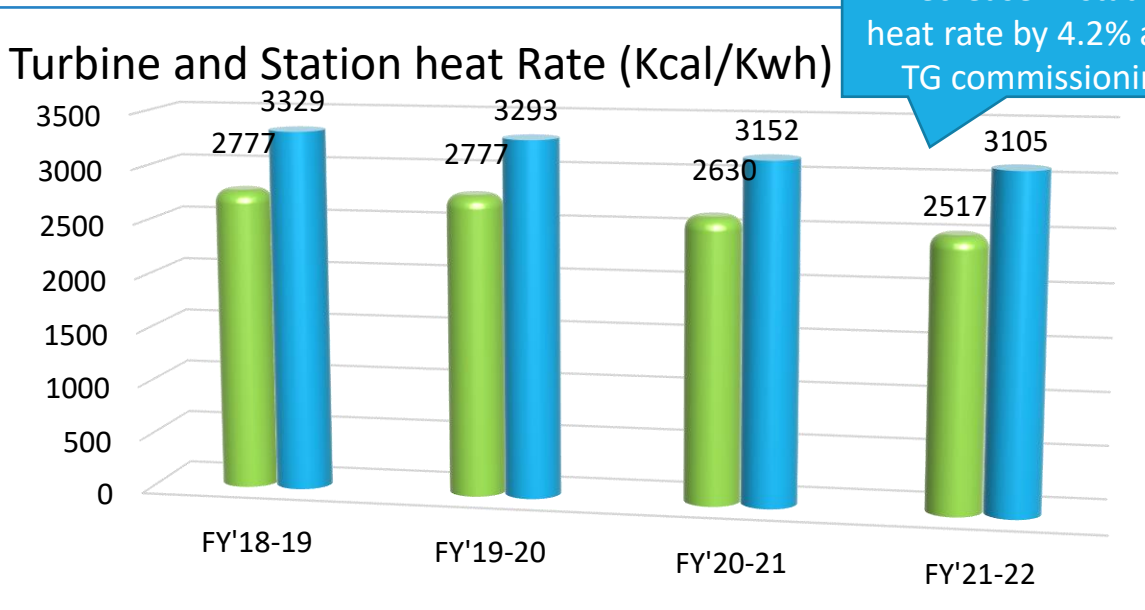
Plant Availability Factor (%)



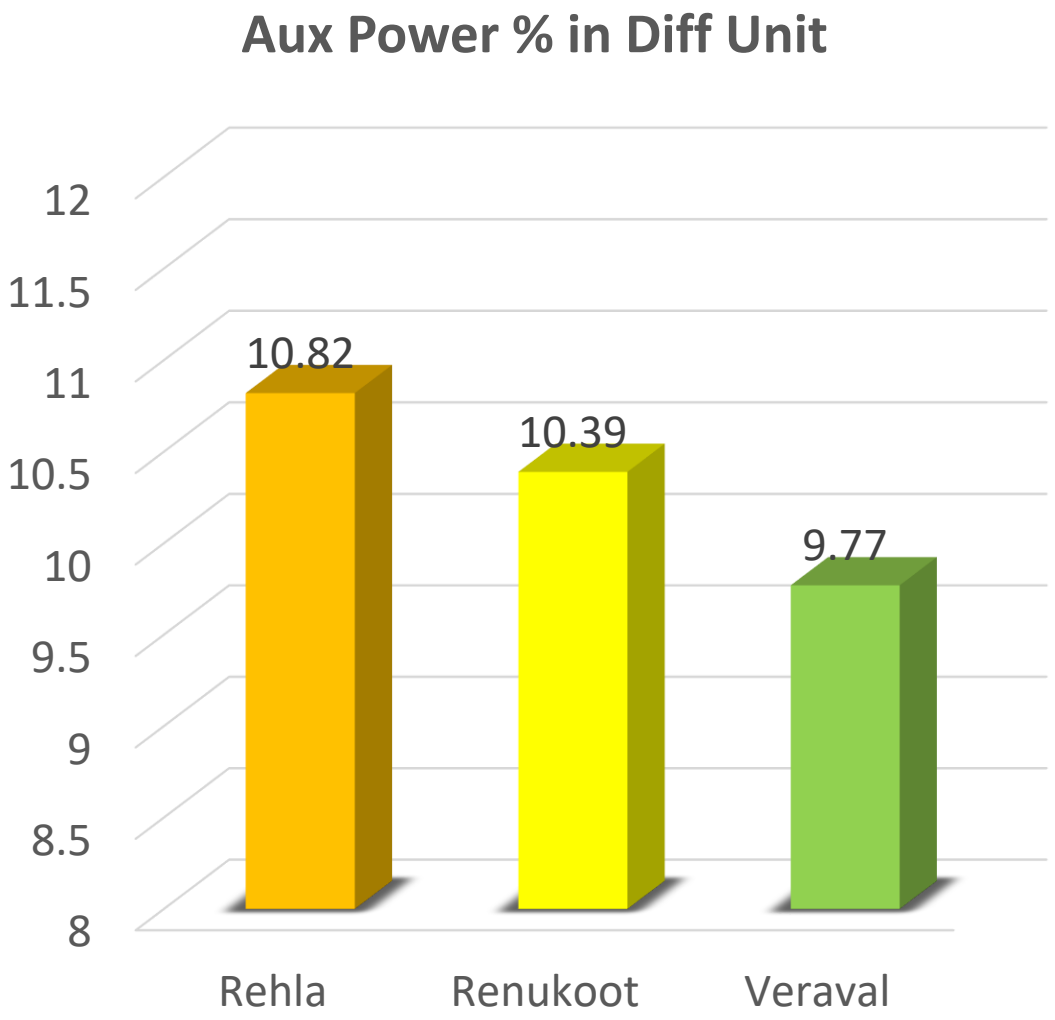
PLF (%)

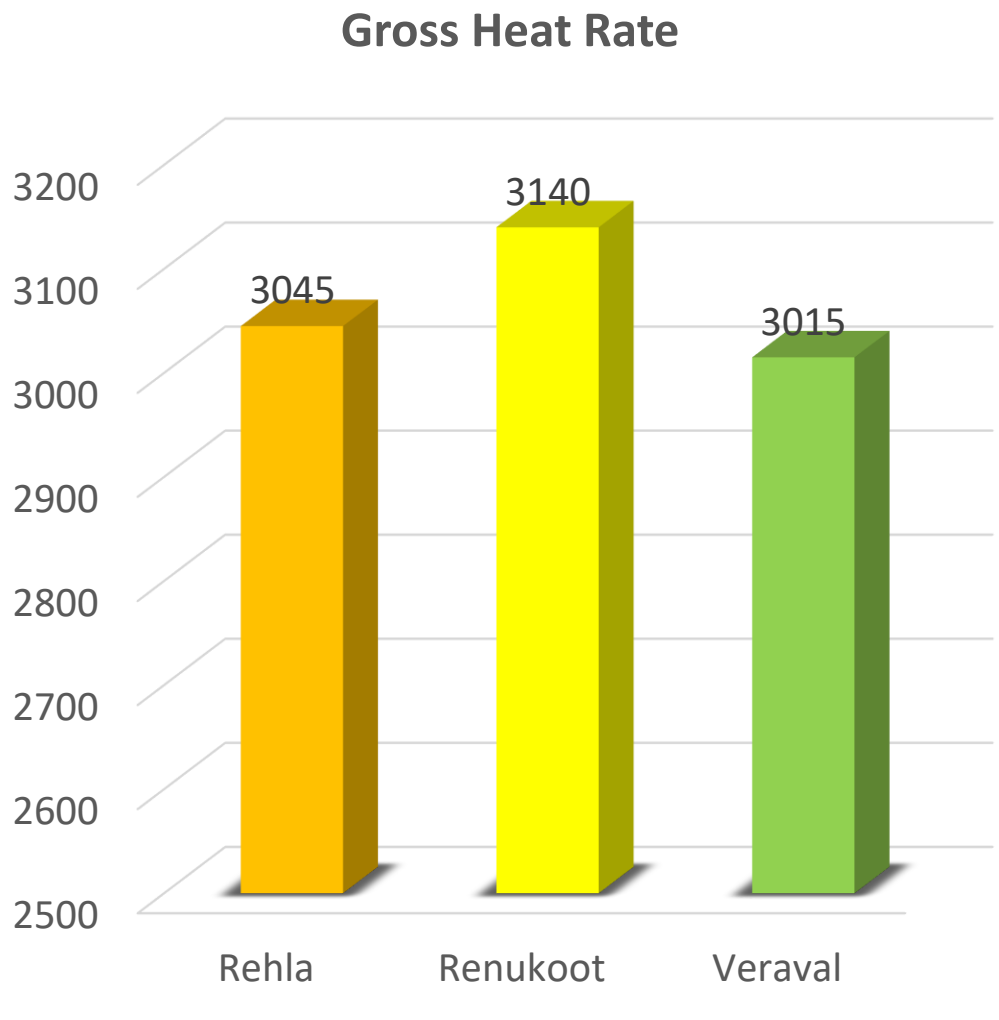


Turbine and Station heat Rate (Kcal/Kwh)



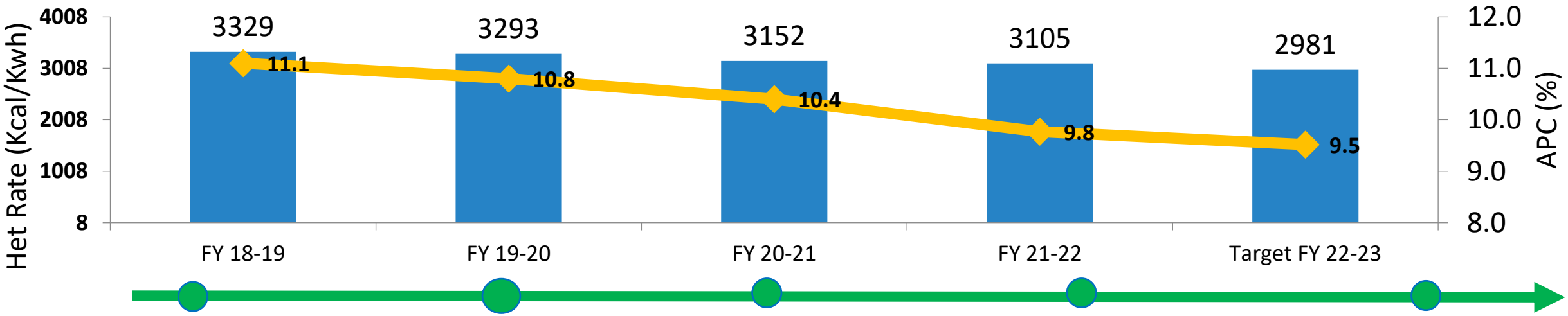
Benchmarking





Heat Rate & APC Roadmap

Het Rate & Aux power Consumption



- Replacement HT fans with LT fans with VFD.
- Installation of VSFC in Boiler Feed pump.
- SA header pressure Reduction.
- IE-3 Motor Installation in MCT pump.

- Energy efficient ACT pump in unit-2.
- Stoppage of one inst. Compressor,
- Incorporated start-stop logic in ACT fan on cooling water temperature of unit-2

- 300 Kcal/Kwh decrease in TG heat rate after new TG installation
- Overhauling of HFTG & Improved specific steam consumption from 11.4 Kg/KWH to 10.8 Kg/Kwh
- Stoppage of Ash handling compressor for 4 hrs/shift.

- Installation of water cooled rotary bed ash cooler
- VFY condensate recovery
- Installation of efficient single ACT pump instead of two pumps
- Installation of efficient CT fans.

- Commissioning of new Boiler.
- Installation of new Pultruded cooling towers with energy efficient fans.
- Installation of single MCT pump with VFD

Energy Savings Projects Planned (2022-23)

SN	Energy Saving Projects	Status	Saving Achieved			Investment (Rs. Million)	Pay back Month
			Electrical Energy (Million KWH)	Thermal Energy (Million Kcal/Year)	(Rs. Million)		
1	Commissioning of new CFBC boiler 110 TPH	Completed	0	73500	274	700	30
2	Installation of condensate polishing unit	Under Progress	0	30.4	9	7	9
3	Installation of energy efficient single auxiliary cooling water pump instead of two pumps	Completed	0.42	0	4.2	4.2	12
4	Relocation & Installation of new Pultruded cooling towers with energy efficient fans & pumps	Target: Feb:23	0.5	0	5.0	45	10

Energy Savings Projects Implemented

Year	No of Energy Saving Project	Investment (INR Million)	Electrical Energy (Million Kwh)	Thermal Energy (Million Kcal/Year)	Saving (INR Million)
FY 2018-19	4	16.15	4.07	0	22.39
FY 2019-20	7	15.9	1.12	38003	23.12
FY 2020-21	12	196.6	2.75	**111204**	**188.28**
FY 2021-22	6	4.7	0.34	4339	9.12

Innovative Projects-1

Rotating Spoke Wheel Wrapper in Bet Conveyor

Trigger for implementing the project:

To avoid manual intervention while removing the large lumps, stones & polybags from running belt. One person was engaged to pull the PCS and remove unwanted material from belt. That result in frequent stoppage of coal handling pant.

Modification Adoption:

Rotating Spoke wheel system installed. Entirely in-house fabricated & erected by Coal Plant Team

Benefits:

- No manual innervation in running belt improved safety.
- Reduced coal handling plant stoppage = 1.5 Hour/Day
- Electrical energy Saving = 106762 KWH/Annum
- Cost Saving = Rs. 10.6 Lakhs/Annum
- Investment = In-house Fabricated using waste material
- Impact on SEC = 1.36

Replicability:

The idea can be replicated in all coal handling plant

Innovative Projects-2

Rayon plant hot condensate utilization in boiler deaerator.

Trigger for implementing the project:

- Trigger for implementation came during the survey for water saving & waste reduction. During this survey it was noticed that hot condensate was being drained in effluent pit & not reused . Thereafter detail analysis & re utilization plan was carried out.

Modification Adoption:

Earlier entire hot condensate was being drained out due to low pH in ETP from many years. But on thorough observation & rigorous sample testing , it was detected that some quantity can be utilized as it was pure condensate & the same was diverted to a collecting tank & used in boiler

Saving:

Coal Saving = 313 MT/Year, DM water Saving = 112 m3/Day

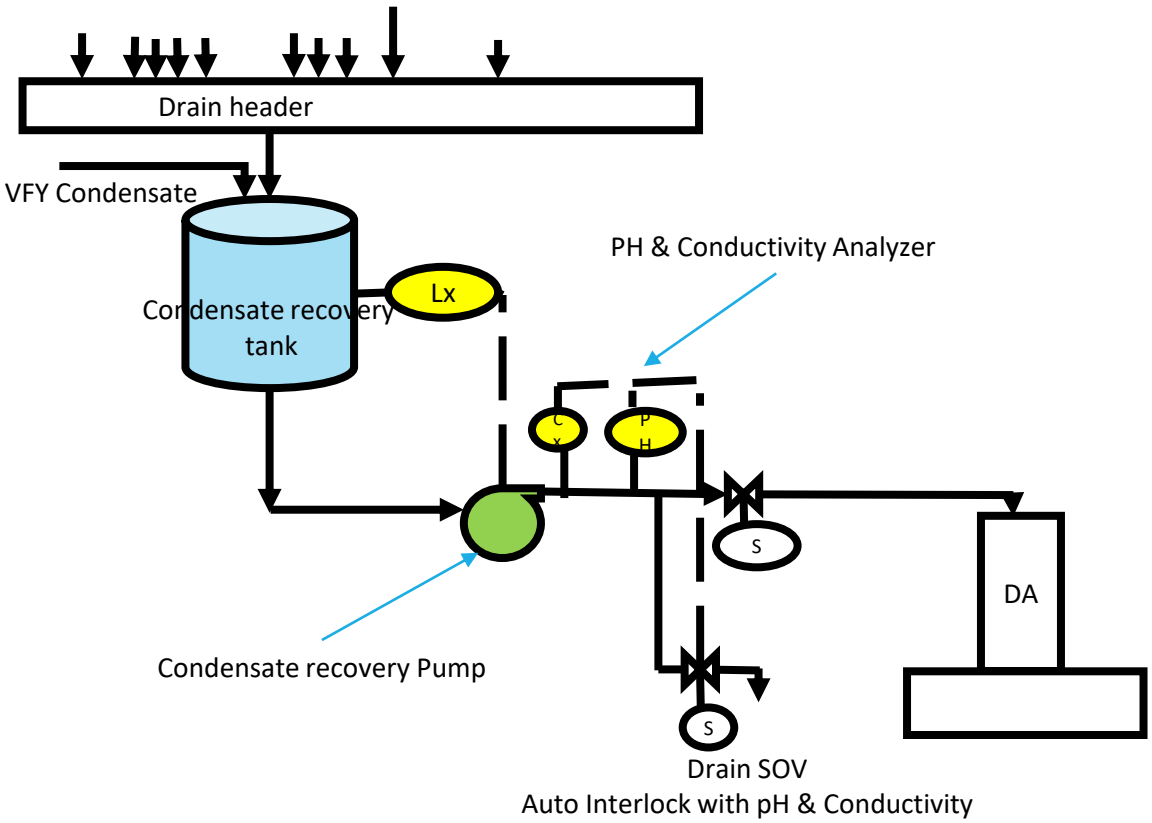
Cost Saving = Rs. 48 Lakhs/Annum

Investment = 4 lakhs

Impact on SEC = 6.2

Replicability:

The idea can be replicated in unit with process steam consumption



Innovative Projects-3

DM water pre heating by installation of water cooled Bed ash cooler

Trigger for implementing the project:

- Considering the high safety hazards during manual hot bed ash drain & also huge heat loss on draining the material outside. It was ideated to recover the heat of bed ash without additional power consumption. For which water cooled bed ash cooler system was procured.

Modification Adoption:

- Due to higher air consumption in air cooled bed ash cooler, our team ideated to utilize the heat of hot bed ash for DM water heating and save air power consumption & eliminate burn hazard.

Saving:

Coal Saving = 754 MT/year

Cost Saving = Rs. 3.84 Lakhs/Annum

Investment = 25 lakhs

Impact on SEC = 1.6

Cooler Inlet Bed Material Temp is ~ 950-980 °C

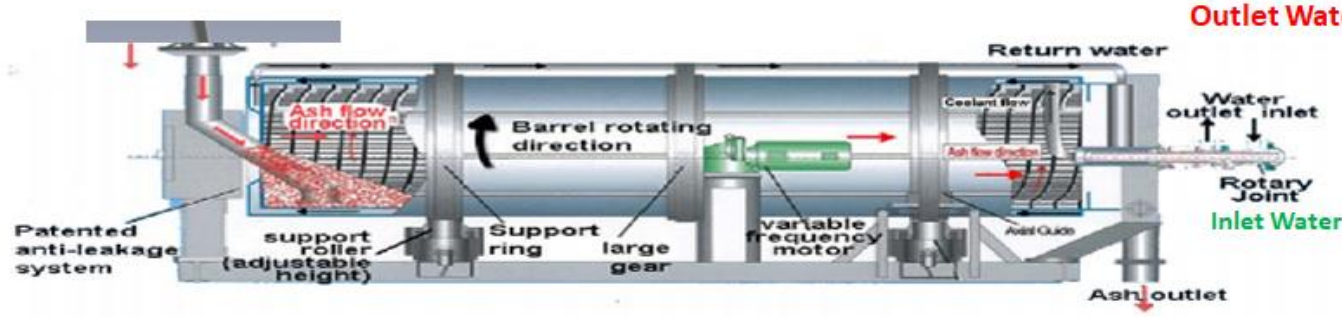


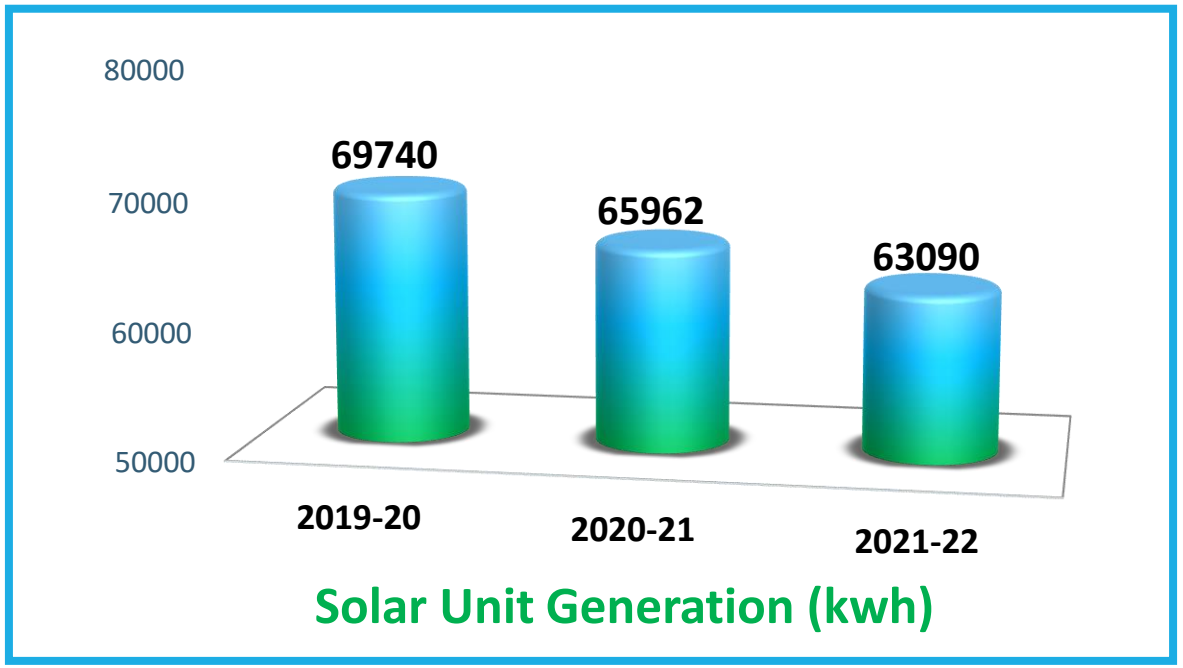
Fig. 3: Rotary Ash Cooler

Replicability:

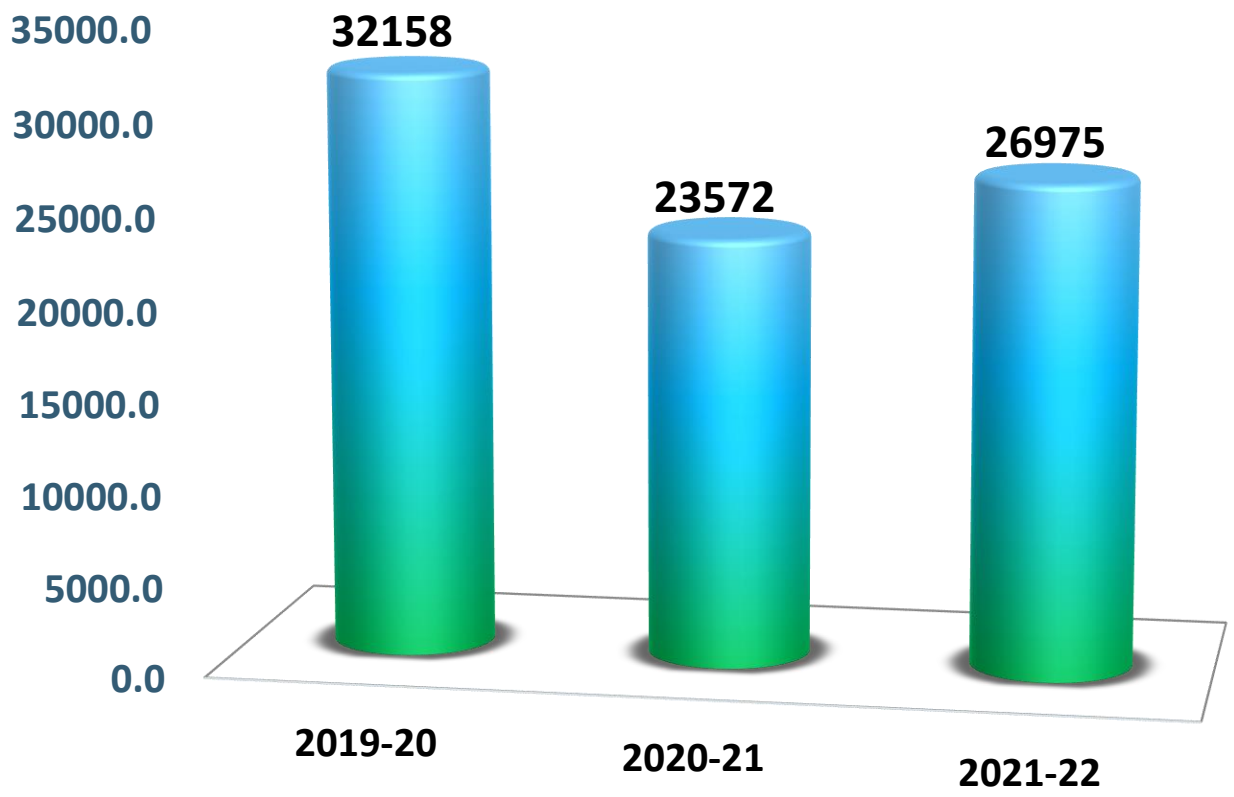
The idea can be replicated for any coal fired AFBC or CFBC boiler

Utilization of renewable energy sources

Year	Technology (electrical)	Type of Energy	Onsite/Offsite	Installed Capacity (MW)	Generation (million kWh)	% of overall electrical energy
FY 2019-20	Solar-PV	Solar	Onsite	0.05	0.069	0.025
FY 2020-21	Solar-PV	Solar	Onsite	0.05	0.065	0.024
FY 2021-22	Solar-PV	Solar	Onsite	0.05	0.063	0.027



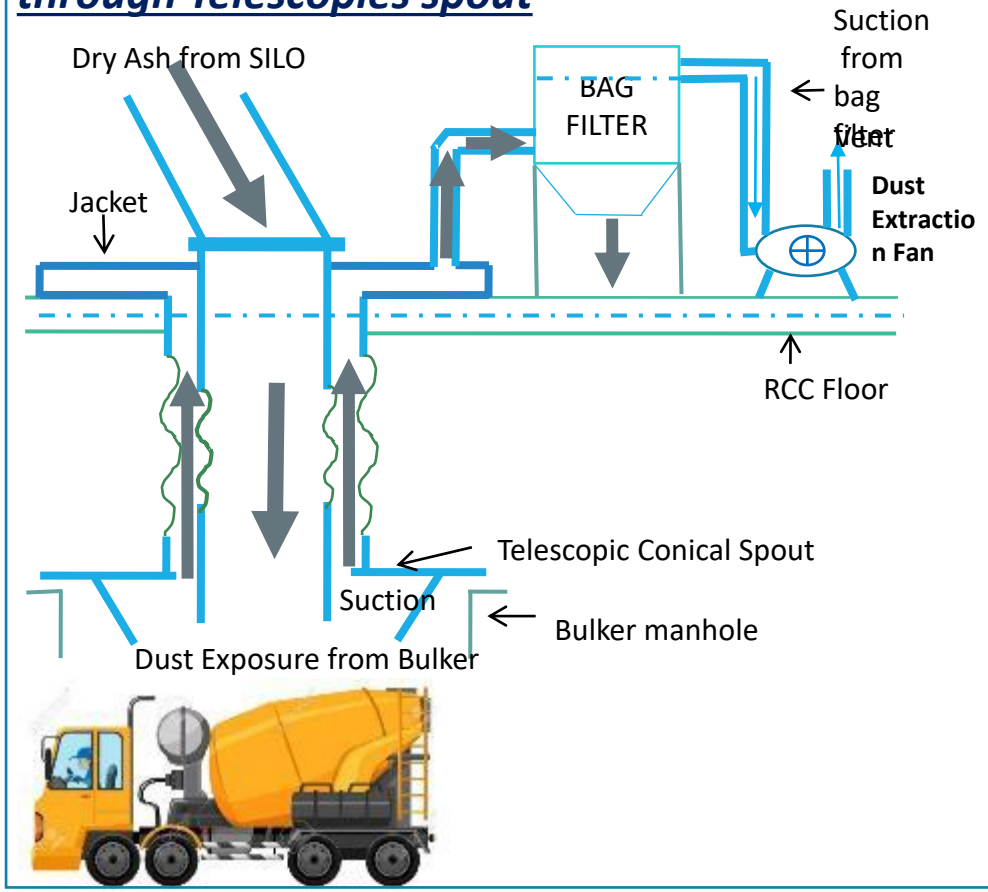
Fly Ash generation & Utilisation



Fly Ash Generation (MT/Year)

100 % fly ash utilization in cement manufacturing & is sent to our unit UltraTech Cement/Ambuja Cement

Method of Ash Unloading: 100% Dry ash unloading through Telescopies spout



Fly Ash generation & Utilisation

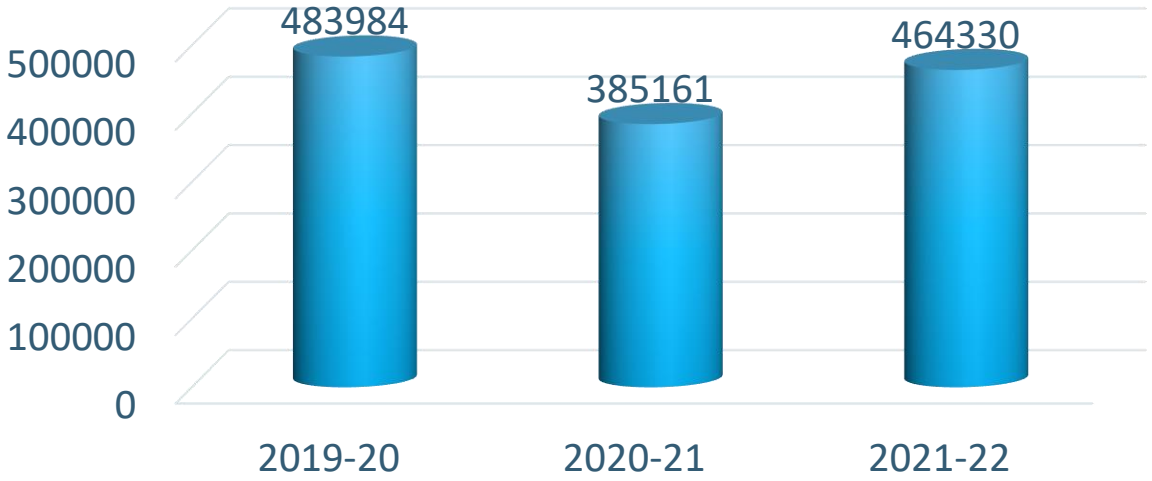
Parameters	UOM	2019-20	2020-21	2021-22
Ash Stock in Plant (Silos)	Tons	392	391	193
Ash Generated	Tons	32158	23572	26975
Ash Utilization	%	100	100	100
Ash Utilized in manufacturing of cement/concrete –other similar products	%	100	100	100
Ash Utilized in Fly Ash Bricks	%	0	0	0
Ash Utilized in Mine filling	%	0	0	0
Ash Utilized for Roads pavements	%	0	0	0
Expenditure on Ash Utilization (annual)	INR (Lakhs)	0	0	0

Ash Handling done through various methods

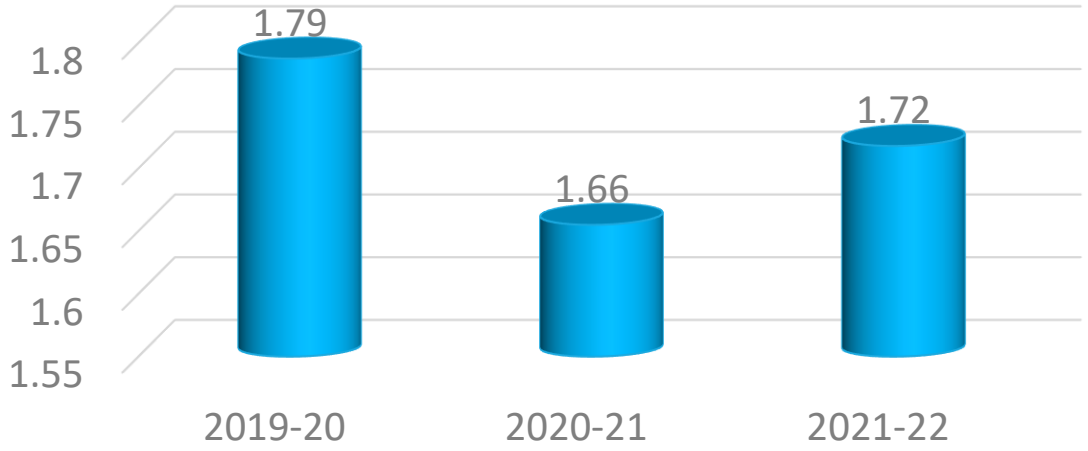
Ash Handled (Wet Method)	%	0
Ash Handled (Dry Method)	%	100
Ash Handled (semi wet)	%	0

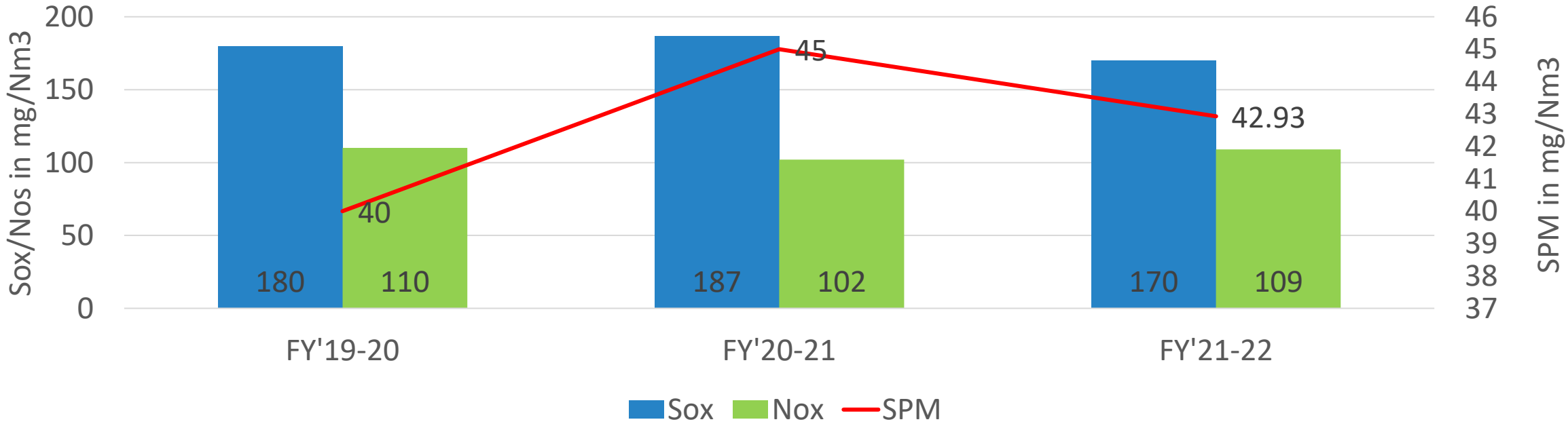
Environment Management- Emission

TONS OF GHG EMMISSION



TONS/MWH OF GHG EMMISSION





Environment Management-Water

Parameters	UOM	2019-20	2020-21	2021-22
DM Water Consumption	%	5.47	4.51	3.81
Raw Water consumption	M3/Mwh	2.17	2.105	1.88

Weather Plant is Zero Liquid Discharge? :-Yes

01 Utilization of SSY condensate water in BH deaerator

Total 17726 M3 condensate recovered till date from sept'21 in boiler -4

02 Utilization of STP/Blow down Water

Utilization of STP/Blowdown Water in Tyre washing and coal handling plant rain gun system. Approx. filter water saving is 40 M3/Day. Zero water discharge plant & Utilization of STP/Blowdown water for floor cleaning.

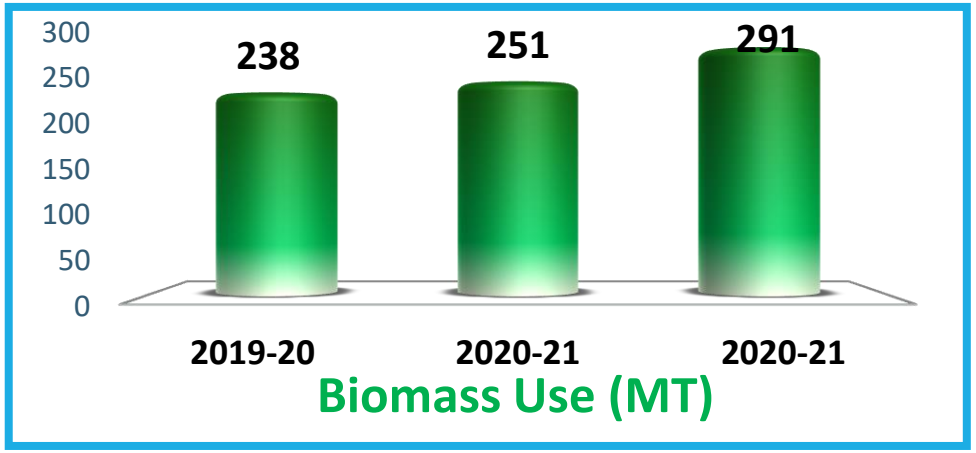
03 Utilization of boiler water which is drained after hydro test

Earlier we used to drain water of water walls in Boiler-1&2 after hydrotest. We had connected all header drains to underground condensate recovery tank

Environment Management- Best Practices

01 Installation of FC(filtering column) system in ESP

02 Biomass (coconut leaves/groundnut waste) being utilized as fuel in Boiler



03 Using limestone to control Sox Emission

04 Dedicated two battery operated car (carts) are used within plant premises for internal transport.

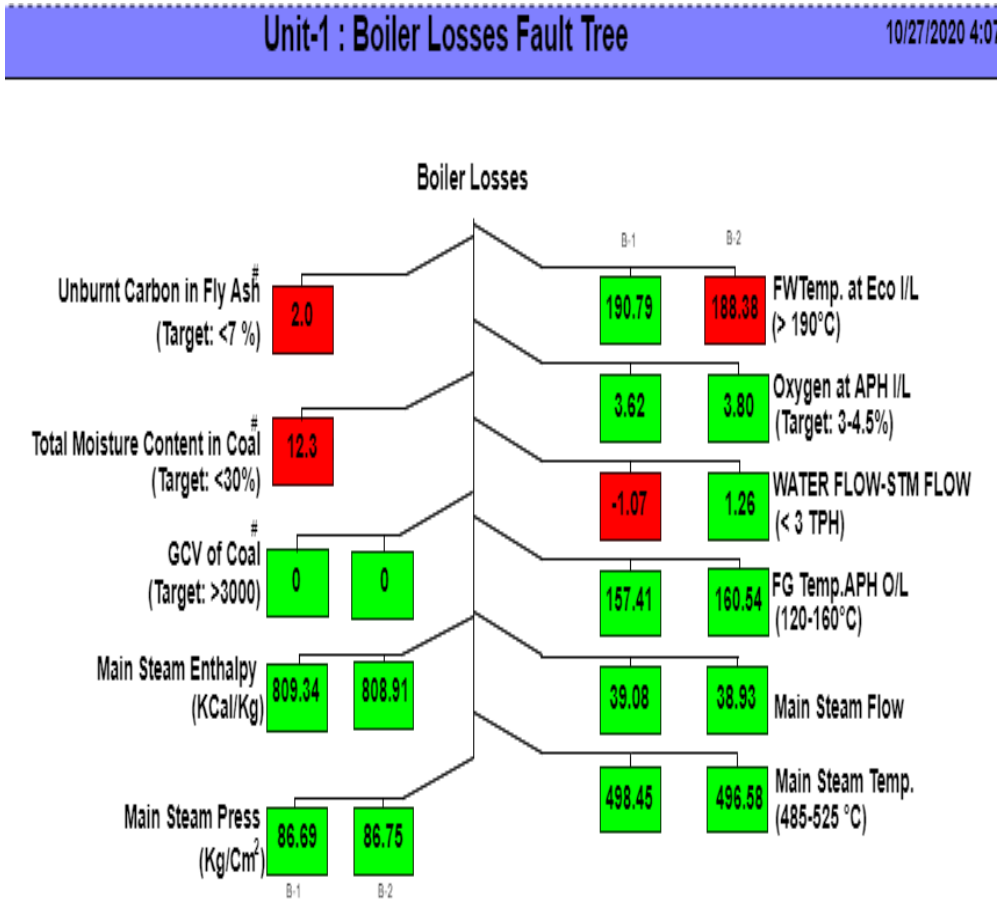
Best Practices – Daily Monitoring

Continuous monitoring of losses due to various performance parameters

Description	Gain/Loss	Impact B1&2	Impact B3	B-1 Actual/Target	B-1 Impact	B-2 Actual/Target	B-2 Impact	B-3 Actual/Target	B-3 Impact
20°C Increase in Comb Air Temp	Efficiency Increase by 1%	35	80	221.10 / 210.00	19.36	221.81 / 210.00	0.03	190.08 / 200.00	40.06
6°C Increase in ECO Inlet Temp	Efficiency Increase by 1%	35	80	190.82 / 194.00	18.40	188.41 / 194.00	32.47	185.23 / 204.00	246.96
21°C Decrease FG APH OL Temp	Efficiency Increase by 1%	35	80	157.41 / 150.00	12.30	157.41 / 150.00	17.61	143.20 / 150.00	25.92

Description	Gain/Loss	Impact TG1 & TG2	TG-1 Actual/Target	TG-1 Impact	TG-2 Actual/Target	TG-2 Impact
0.01 Vacuum in Turbine	13.29 kacl/kwh	20	-0.00 / -0.89	1772.57	-0.90 / -0.89	24.41
5°C Decrease in Main Steam Temp	13.29 kacl/kwh Loss in Heat Rate	28	412.73 / 494.00	477.52	499.65 / 494.00	9.24
Total Impact		2538.99				

Daily online monitoring of auxiliary power by using cockpit



Best Practices – Daily Monitoring

Continuous monitoring of losses due to various performance parameters

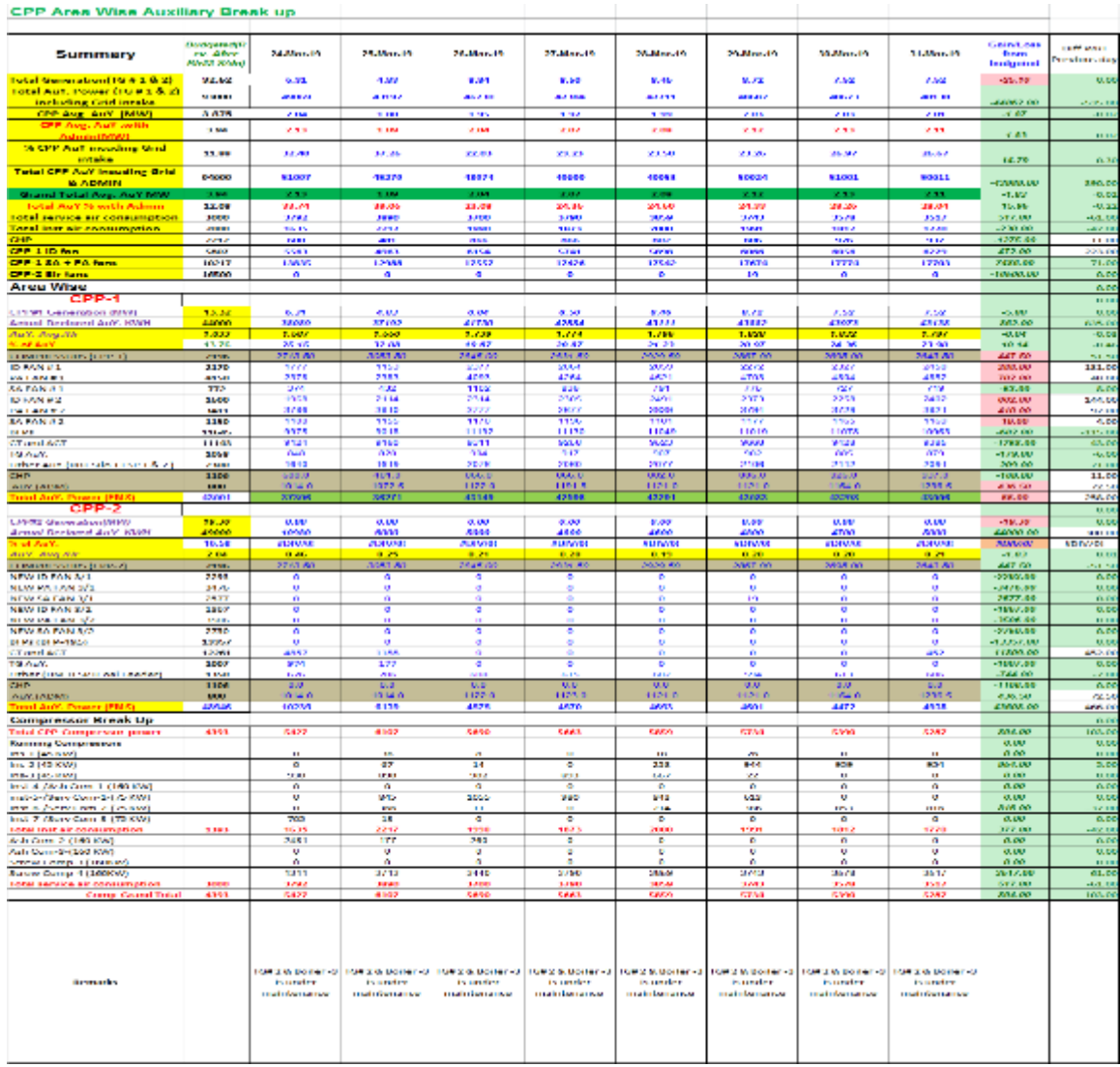
Project Title NO-2	To identify the insulation loss
Theme:-	Energy conservation and power cost Reduction

SR NO	Equipment/Heat Exchanger	Floor	Front side			LHS			Rear side			RHS			Avg. Temp	Amb. Temp	Area	Heat tranfer Coefficient (at assumed air velocity = 3 kph)	Total heat loss
			A	B	C	A	B	C	A	B	C	A	B	C	°C	°C	m^2	KCal/(hm²·°C)	Kcal/h
1	Furnace	1st	86	66	79	57	95	70	99	69	75	110	58	55	66.08	45	740.84	16.104	251469.88
		Manhole	31.68																
		2nd	102	250	104	53	60	72	116	95	120	54	57	72					
		3rd	62	60	70	78	68	60	60	50	47	85	72	62					
		4th	62	79	69	48	58	72	54	60	44	46	61	48					
		5th	32	34	65	51	43	35	50	48	47	61	57	55					
		6th	36	43	50	49	60	38	75	68	63	52	71	60					
3	Superheater	1st	58	61	50	56	75	48				48	91	48	58.72	45	174.36	16.104	38531.550
		2nd	47	55	52	57	66	72				64	60	49					
4	Economiser	1st	42	50	51	37	42	45	50	65	57	41	48	49	46.21	35	258.57	16.104	46671.96
		2nd	40	48	45	48	42	38	44	51	54	42	40	40					
5	APH	1st pass	51	60	60	58	56	45	40	45	45	65	62	56	48.88	35	265.00	16.104	59212.40
		2nd pass	48	50	48	51	49	44	38	40	35	38	48	41					
6	APH hopper-1	1st	32	33	32	36	35	35	40	43	38	37	39	38	39.14	39	80.00	16.104	0.00
		2nd	34	34	34	37	38	36	38	50	38	41	40	39					
7	APH hopper-2	1st	38	34	34	40	43	39	39	44	36	48	43	44					
		2nd	36	39	37	41	43	48	44	48	45	40	43	45					
8	Boiler drum		39	57	42	66	85	51	61	50	55	60	138	58	63.50	45	33.45	16.104	9965.61
9	ESP	1st										36	41	35	40.75	41	80.00	16.104	0.00
		2nd										45	41	41					
10	ESP hopper	1st	33	32	31	36	37	31	32	32	32	33	35	33	33.82	34	35.00	16.104	0.00
		2nd	37	35	34	36	35	32	33	30	31	37	40	33					
11	Pent-house		60	49	83	50	65	82				63	56	85	65.89	45	150	16.104	50459.20

Total heat loss	kcal/hr	456310.60
Coal GCV	kcal/kg	3900
Cost of coal	Rs/MT	4500
Total coal saving	MT/day	2.8
Total monetary saving excluding cyclone parts (in Lacs)	lakhs/day	43.3
Avg coal consumption per day (in Tons)	Kg/day	426000
Total energy input	kcal/kg	1661400000
% Loss		0.66

Daily monitoring system

Online live heat rate display in DCS



Daily Auxiliary Power Consumption Tracking

Other Best Practises

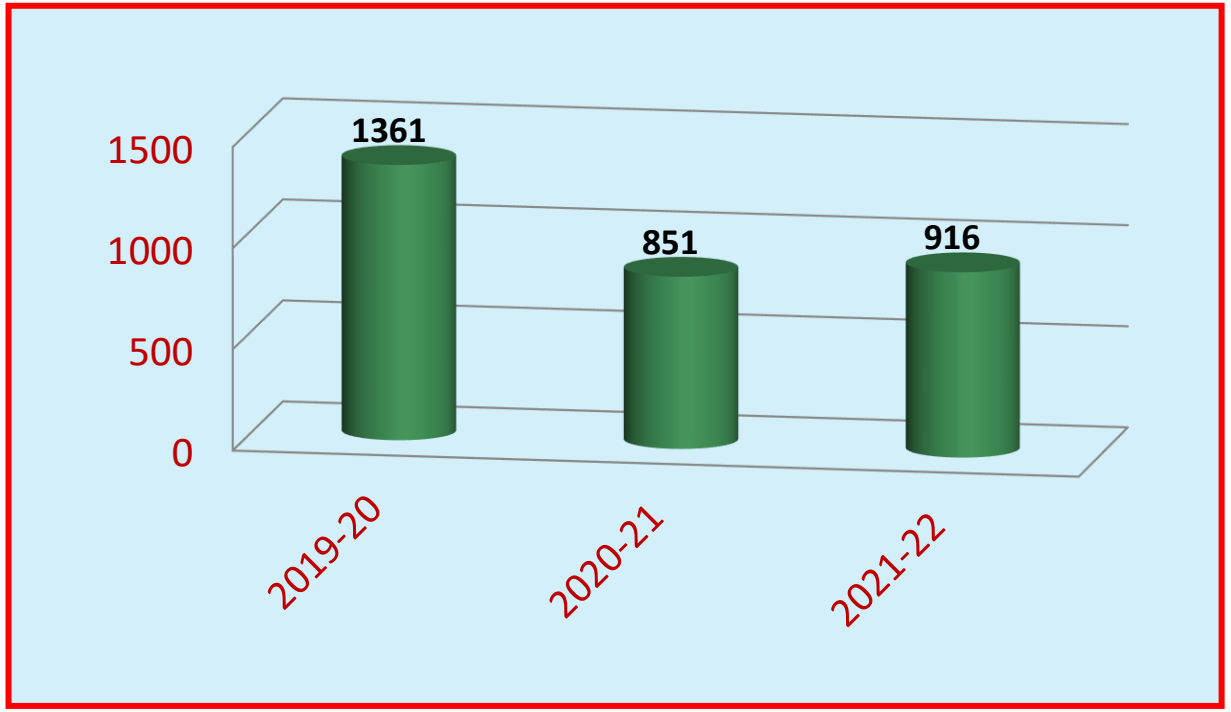
1. All meetings start with safety contact ,followed by Energy contact
2. Energy saving Thumb Rules display across the plant
3. Idea portal- Z idea
4. Ad-hoc budget of 50 Lakhs for Energy Saving
5. Teams like Bachat, PMG, Sustainers & Sanchayan
6. On the spot award & Shabbash card distribution
7. Installation of wireless trans receiver call bell with 200 mtr range at weighing station
8. Installation of remote vibration monitoring sensors in cooling water pumps for online condition monitoring
9. Installation of anemometer with alarm for generating alert during high winds for safe work practice
10. Installation of in house constructed stone removal wheel for online removal of stones, plastics from the belt conveyor without manual interruption.

Project implementation through Kaizen

FIELD OPERATOR AND WORK MAN → CONCERN (dpt) ENGINEERS → EVALUATION TEAM → APPROVER COMMITTEE

Suggestion and kaizen steps

1st Prize in Annual Kaizen Competition Kaizen Award



Kaizen Submission

Implementation of ISO 50001

ISO 50001

Energy Management

DNV

MANAGEMENT SYSTEM CERTIFICATE

Certificate no: 10000157406-MSC-RvA-IND | Initial certification date: 11 June 2015 | Valid: 11 June 2021 – 10 June 2024

This is to certify that the management system of

Grasim Industries Limited, Unit - Indian Rayon

Junagadh - Veraval Road, Veraval, District: Gir Somnath - 362266, Gujarat, India

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

ISO 50001:2018

This certificate is valid for the following scope:

Manufacturing of viscose rayon filament yarn, sulphuric acid, carbon disulphide anhydrous sodium sulphate, sodium sulphide, caustic soda lye, caustic flakes, hydrochloric acid, liquid chlorine, compressed hydrogen, sodium hypo and power generation for captive use

Grasim Industires Limited,
(Unit: Indian Rayon)
Veraval, 362266

ENERGY & CARBON POLICY

We, Grasim Industries Limited, Unit Indian Rayon, Veraval recognize energy consumption and carbon emissions as the most important issues currently affecting the planet. We understand the risk of dependence solely on fossil fuels and associated carbon emissions related to our operations. We are committed to demonstrate excellence in Energy and Carbon Management Performance on continual basis.

To achieve this, we shall endeavor to;

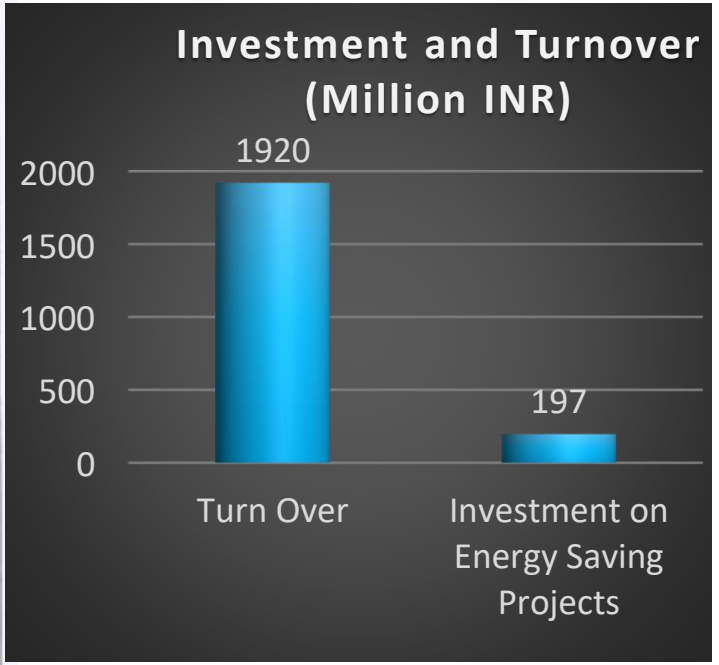
- Maintain positive legal compliance to energy and carbon regulations and other requirements;
- Raise awareness to encourage efficient use of energy resources, with a focus on reducing its energy intensity and carbon footprint;
- Increase the use of renewable energy wherever possible;
- Promote research and development for cleaner and efficient technologies to support the adoption of low carbon solutions;
- Evaluate technically and financially feasible and cost-effective options to reduce potential carbon emissions during the construction and operation of new projects;
- Conserving the natural resources in Power generation and reducing significant energy usage of VFY and chlor-alkali processes;
- Continuous up-gradation of process with energy efficient and Eco-friendly technology to optimize the energy cost;
- Continually improve energy and carbon management within and across the supply and value chains by adopting internationally accepted and economically viable Management Systems and best practices;
- Engage internally and externally with its stakeholders and wider communities to understand and collaborate on actions promoting reduced energy intensity and low carbon approaches to benefit both the Business and associated communities;
- Actively communicate and disclose our approach and achievements to stakeholders and regularly seek feedback through stakeholder forums;
- Provide necessary resources and information to achieve objective and targets and support the purchase of energy efficient product or services; and
- Monitor measure and report energy usage and carbon emissions in compliance with internationally recognized protocols.

This policy shall be reviewed periodically for its suitability and updated as necessary.

Date: 01.12.2020

Shashank Pareek
Unit Head

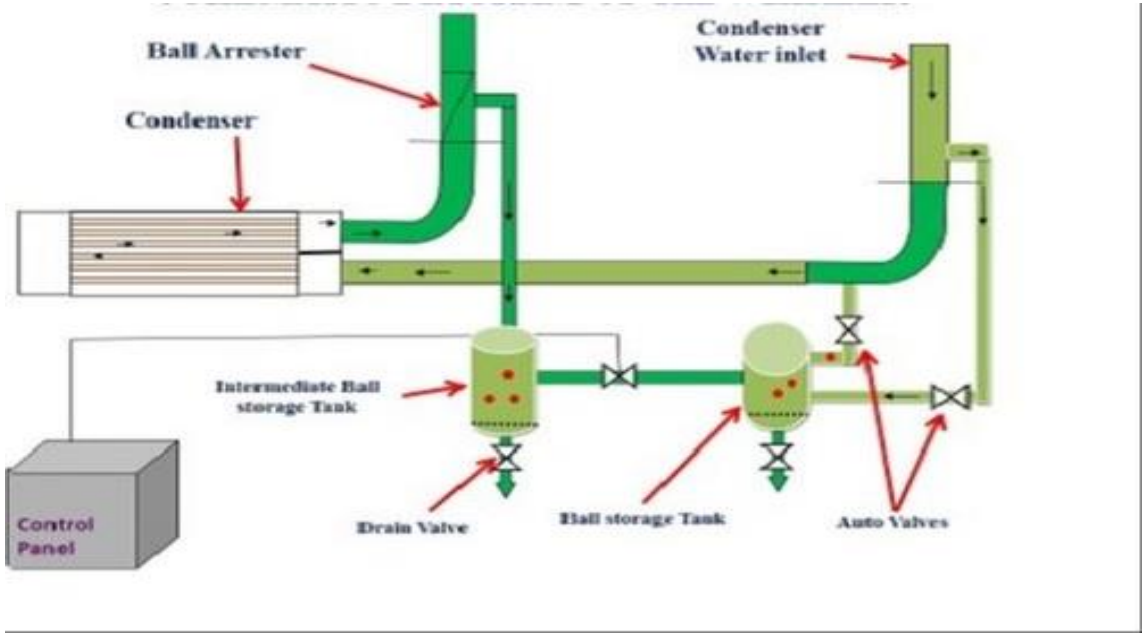
10.2 % investment in energy Saving projects



Learnings from CII energy awards

Installation of online cleaning system in condenser:

We have installed online ball cleaning system in condenser-2. We took trial with different ball sizes.



Reviving the Boiler water treatment to improve quality & reduce cost.

Refurbishing existing flange joint valves by weld end valves to prevent frequent breakdowns

Installation of venti light pipe in new TG building

Employee Involvement

NATIONAL ENERGY CONSERVATION DAY CELEBRATION 14TH DEC'2021

Energy Oath

Employees Using bicycle

Tree Plantation

Way forward

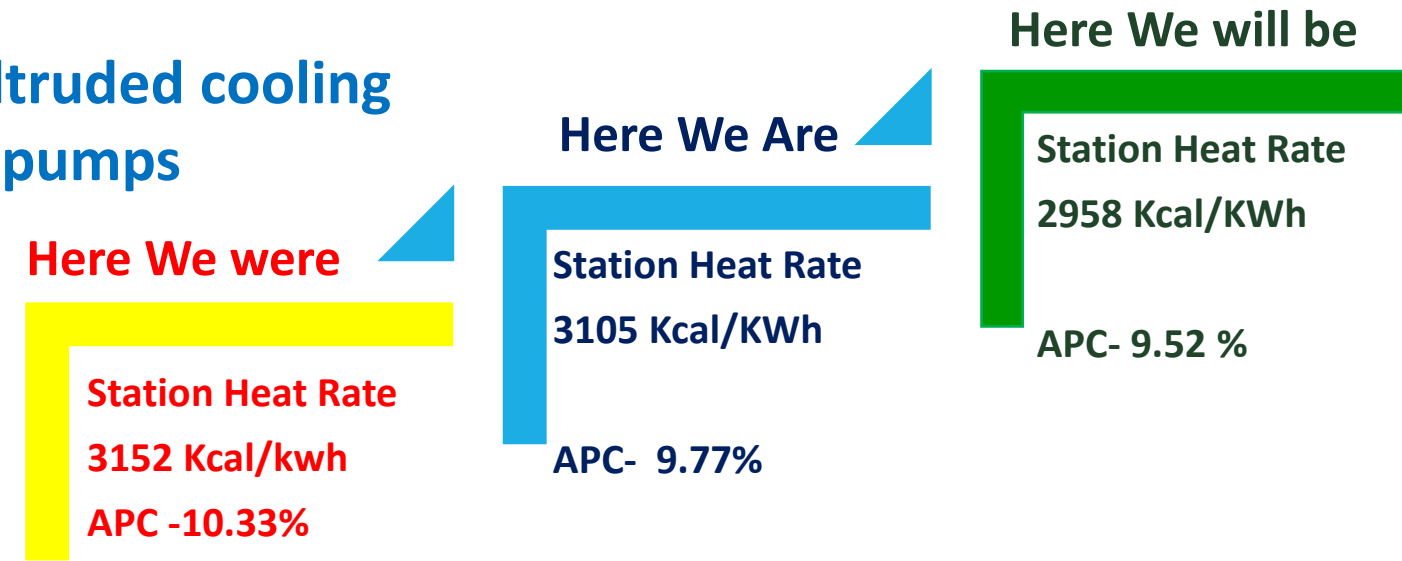
01 Commissioning of new 110 TPH CFBC Boiler and stop old inefficient 2X50 TPH & 1x25 TPH stroker fired boiler.-*Completed*

02 Installation additional ESP field in Boiler-3 to sustains emission norms even with one field out of service

03 Installation of energy efficient single auxiliary cooling water pump instead of two pumps- *Completed*

04 Relocation & Installation of new Pultruded cooling towers with energy efficient fans & pumps

03 Installation of condensate polishing unit



Awards

Indian Rayon CPP won Energy Efficient unit at 20th & 22nd National Award for Excellence in Energy Management.

Indian Rayon Team Awarded gold at ICQCC'19 held at Tokyo Japan on dated 23.09.2019

THANK YOU

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