Confederation of Indian Industry

24th National Award for Excellence in Energy Management 2023

24th National Award for Excellence in Energy Management 2023

JSW Energy (Barmer)Limited

Mr. Sumit Gupta

Mr. Dharmendra Kumar

Agenda

- Introduction on Company
- Energy Benchmarking
- Innovative Projects implemented
- Environment Management- Ash Utilization
- EMS System and other requirements
- Any other relevant information
- Energy Consumption Overview
- Energy Saving projects
- Utilisation of Renewable Energy
- Best Practices in the Plant
- NET ZERO commitment
- Reward & Recognition

Introduction on Company

Most efficient plant in India with CFBC technology

SALIENT FEATURES OF PLANT

01 Total Capacity 1080 MW (8x135MW)

02 All Units commissioned by March 2013

03 Lignite based CFBC Thermal power plant

04 Lignite sourced from Jalipa and Kapurdi mines

05 Long Term PPA with State Govt

06 Water Sourced from IGNP canal

Introduction on Company



Top in Merit order in Rajasthan

Plant Availability >80%

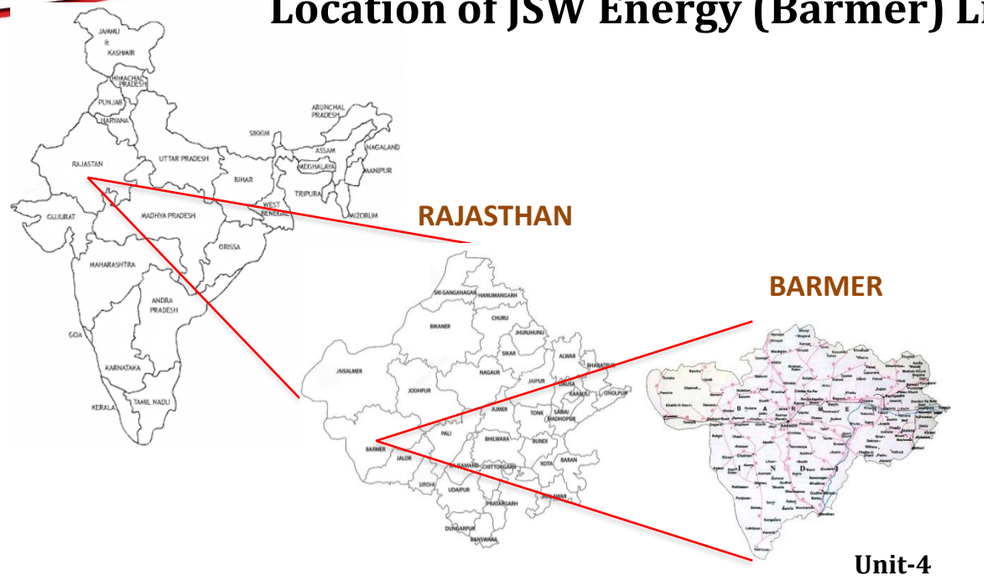
Best Heat Rate in CFBC in India

Operate with CFBC Technology for low grade coal

- **Lowest Cost of generation** among the thermal power plant in Rajasthan.
- Total Installed Capacity 1080 MW
- JSW Energy (Barmer) Limited certified for I**SO 50001:2018 (Energy Management System, ISO 9001:2015 (QMS), ISO 14001:2015 (EMS), ISO 45001:2018 (OH&SMS) & ISO 22301:2019 (BCMS).**

Introduction on Company

Location of JSW Energy (Barmer) Limited



JSW Energy (Barmer) COD milestones

- **Unit-1** 26th Nov 2009
- **Unit-2** 04th Oct 2010
- **Unit-3** 07th Nov 2011
- **Unit-4** 04th Dec 2012
- **Unit-5** 05th Feb 2013
- **Unit-6** 03rd Mar 2013
- **Unit-7** 16th Mar 2013
- **Unit-8** 28th Feb 2013

May 2006: Implementation Agreement (IA) executed with Government of Rajasthan (GOR)

Oct 2006: PPA executed with DISCOMs for entire off take

April 2007: Commencement of project implementation

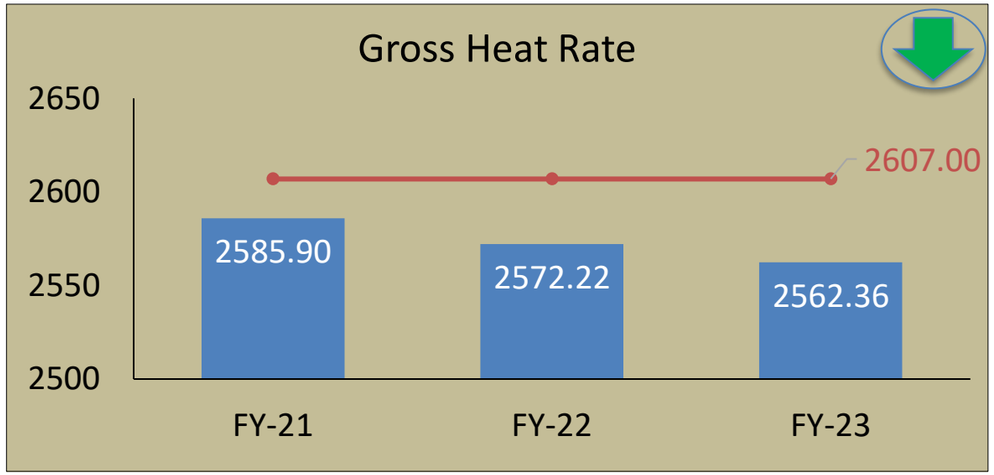
Nov 2009: First Unit achieved COD

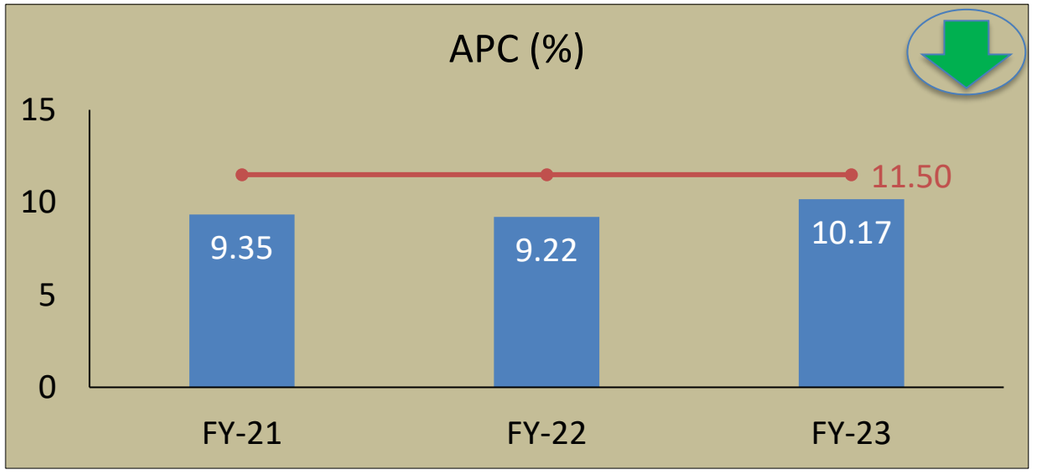
March 2013: All units COD (Last 4 units achieved COD within 40 Days)

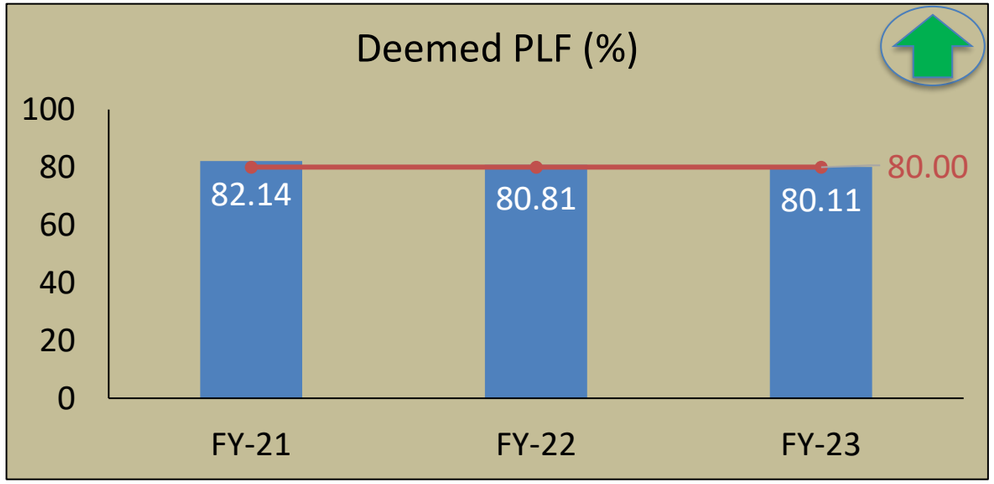
Energy Consumption Overview FY 23

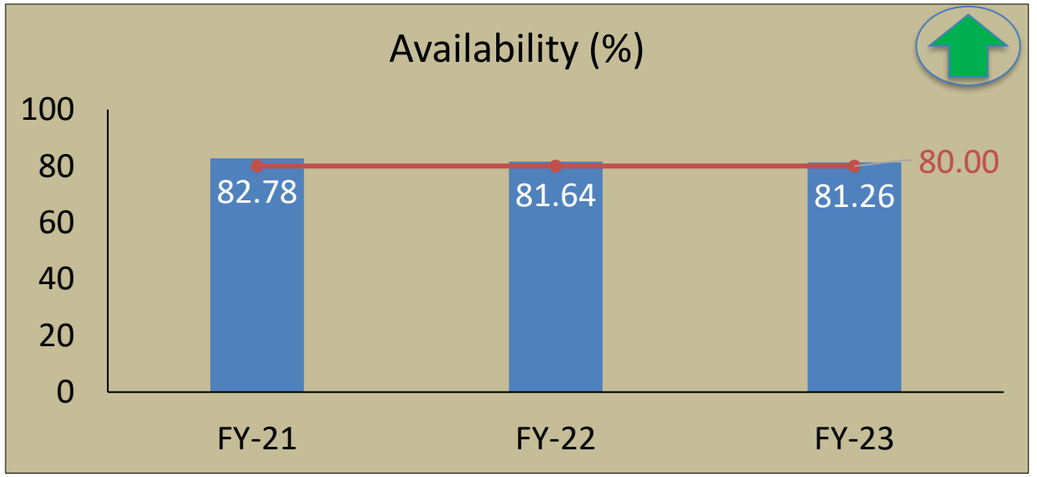
- Power Generation : 7285.66 MU
- Gross Heat Rate : 2562.36 Kcal/Kwh
- Plant Deemed PLF : 80.11 %
- Boiler Efficiency : 80.2%
- Plant Availability : 81.26 %
- Turbine Heat Rate : 2055 Kcal/Kwh
- Auxiliary power Consumption : 10.17%
- DM Water Consump. : 2.19%
- Specific oil Consumption : 0.077 ml/Kwh
- Raw Water Consump. : 2474 m3/MU

Sp. Energy Consumption in last 3 years



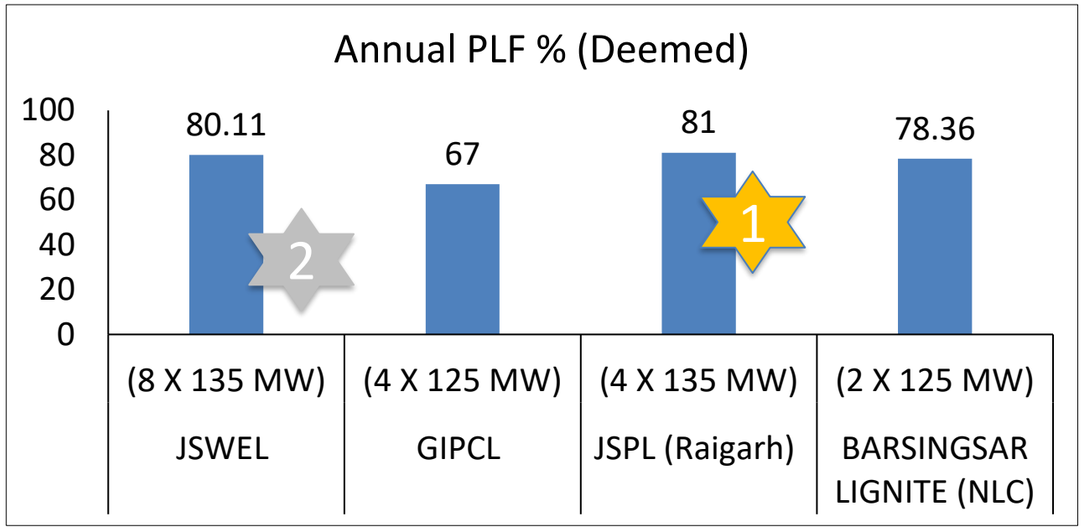


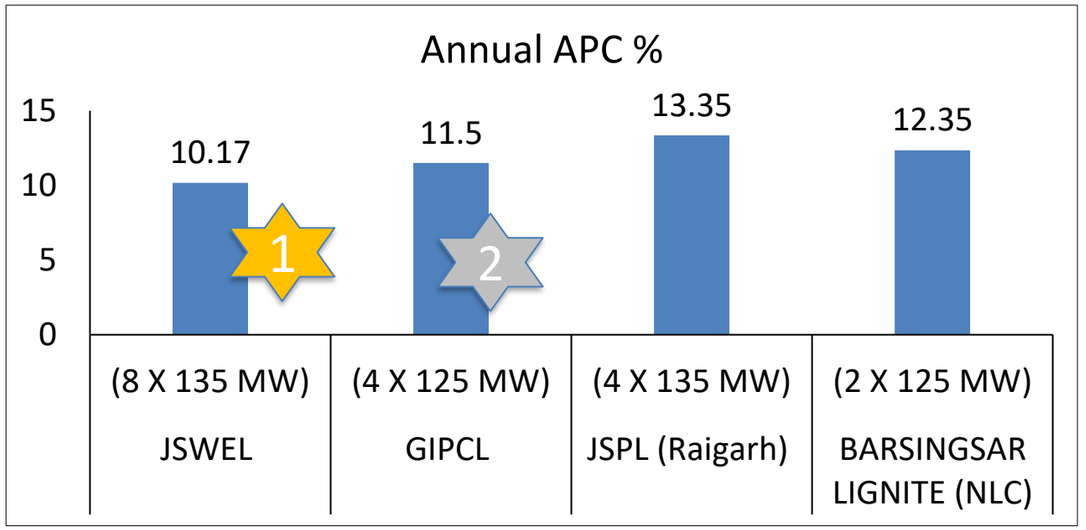


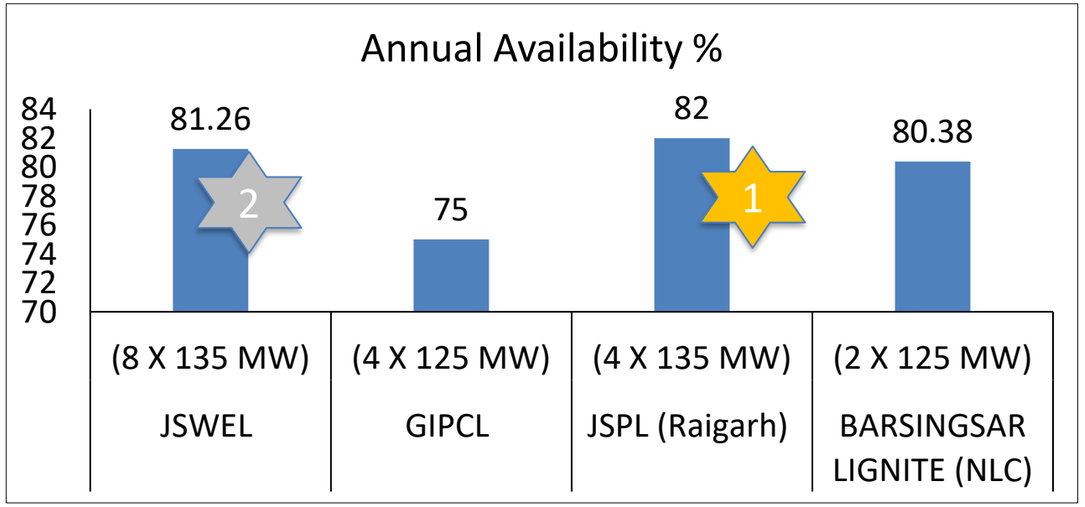


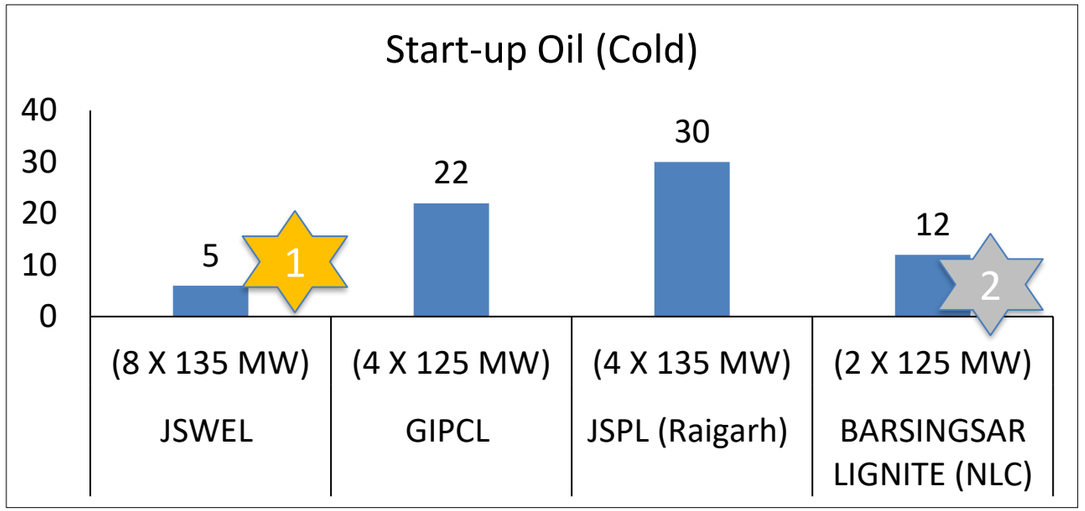
- Reason for high APC is due to deterioration of Air pre heater (high sulpher content in coal), we periodically change the APH in every two year, so plan for replacement of APH in FY 24.

Energy Benchmarking









Note:

1. During the year 2020-21 the average PLF of Thermal Power Stations was 54.51 %
2. During the year 2021-22 the average PLF of Thermal Power Stations was 58.87 %

Energy Benchmarking

Roadmap

GROSS HEAT RATE

- Hydojet Cleaning in boiler 2nd pass to improve RH Temp.
- HPH Correction.

SPECIFIC OIL CONSUMPTION

- Optimized the oil consumption

01

Reduction in Water & power Charges

- Bypass of pump house
- Attain the water leakages
- Improve the pump efficiency

04

06

03

05

02

AVAILABILITY

- RLA of Boilers
- Boiler Water wall panel replacement.
- Precast refractory application in the boiler
- Eco damage coil replacement.

AUX POWER CONSUMPTION

- New MOC based APH Tubes installation and sleeve insertion
- CII assessment audit to explore the energy saving opportunity.
- Upgradation of ESP
- Installation of VFD in CT Fans.
- Platen SH spray bypass line.
- Improve BFP pump Efficiency

SPECIFIC DM CONSUMPTION

- Reutilization of hydro test water

Energy Saving projects- FY 2022-23

S No	Title of Project	Annual Electrical Saving (MU)	Annual Thermal Saving (Million Kcal)	Total Annual Saving (Rs Million)	Investment (Rs Million)	Payback (Months)
1	Energy Saving by arresting APH leakages	**15.43**	**0**	**69.74**	**43.07**	**7.41**
2	Process Optimization in Cooling Water System by running four units with 2 CW Pump instead of 3 in winter season.	**5.99**	**0**	**27.08**	**0**	-
3	Reduction of power consumption by Stopping of 3 Nos of CT fan during winter season	**3.59**	**0**	**16.25**	**0**	-
4	Duct Interconnection between hot PA (Primary Air) Bed Gun Header and Upper SA (secondary Air) header	**2.96**	**0**	**13.38**	**1.6**	**1.44**
5	Installation of Energy efficient Chiller in place of VAM	**1.4**	**0**	**6.31**	**9.12**	**27.8**

Energy Saving projects

S No	Title of Project	Annual Electrical Saving (MU)	Annual Thermal Saving (Million Kcal)	Total Annual Saving (Rs Million)	Investment (Rs Million)	Payback (Months)
6	Reduction of Auxiliary Power Consumption of ID Fan by Slag cooler to APH Vent Modification	**1.31**	**0**	**5.94**	**1.36**	**2.75**
7	Removing RBF & providing direct chute in LHS	**0.26**	**0**	**1.19**	**1.14**	**14.26**
8	Installation of VFD in Guard Pond Pump	**0.26**	**0**	**1.16**	**0.4**	**5.7**
9	APC Reduction Of Air Compressor during Unit Lit-Up by providing gun atomizing from Instrument air instead of service air	**0.18**	**0**	**0.83**	**0.08**	**1.16**

Energy Saving projects

S No	Title of Project	Annual Electrical Saving (MU)	Annual Thermal Saving (Million Kcal)	Total Annual Saving (Rs Million)	Investment (Rs Million)	Payback (Months)
10	Installation of VFD in CMB Pump	**0.05**	**0**	**0.24**	**0.17**	**8.6**
11	Unit-8,Heat rate Improvement (4.2 Kcal/kwh) by HP heater internal modification	**0**	**3990**	**3.52**	**2**	**6.8**
12	0.4 KL Reduction in LDO consumption during Boiler Start Up.	**0**	**225.8**	**1.80**	**0.6**	**4**
13	Hydro Jet cleaning of boiler 2nd pass	**0**	**1.75**	**1.61**	**0.14**	**1.05**
Total		**31.44**	**4218**	**149**	**60**	**4.83**

Energy Saving projects

FY	Nos of Energy projects	Investments (INR Millions)	Electrical Saving (MU)	Thermal Saving (Million Kcal)	Saving (INR Million)
FY 2020-21	**10**	**29.27**	**25.90**	**189.44**	**108.40**
FY 2021-22	**9**	**39.30**	**27.66**	**834.55**	**123.18**
FY 2022-23	**13**	**60**	**31.44**	**4218**	**149**

1. Energy Efficiency Improvement Of Electric Shuttle Kiln

- Business problem: Generation loss due to Pre mature failure of refractory

Reason for Pre mature failure of refractory

- Uncontrolled water quality and quantity at site
- Improper material preparation
- Improper shuttering work
- Improper casting work
- Improper temperature profile along the sections during dry out process

Benefits

- Reduction of LDO Consumption : 150 KL/Year
- Cost Saving – Rs. 296.57 Lacs
- CO_2 Emission Reduced – 419.49 MT
- Additional operational hours to meet out emergency requirement
- Reduce consumption of natural resources i.e. LDO

1. Energy Efficiency Improvement Of Electric Shuttle Kiln

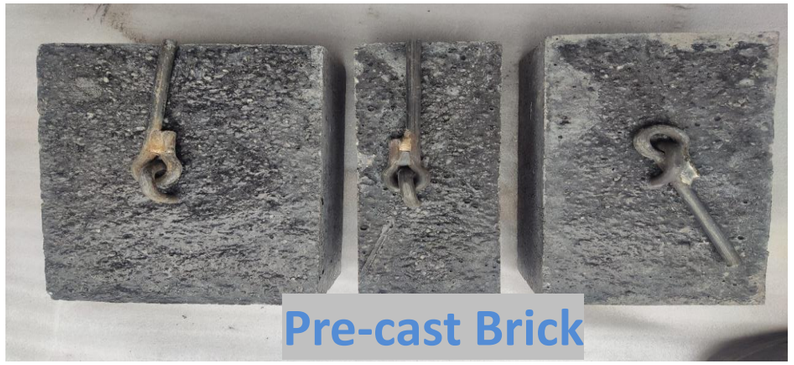
- Pre-Dried refractory block Manufacturing Process


Mixer machine


Vibration on Vibrating Table


Vibration on Vibrating Table


Strength development & Curing


Pre-cast Brick


Storage

Electric Kiln


Final Product

2. Reduction of LDO Consumption during Cold Startup

❖ **Problem:**

LDO Consumption was higher during Cold Startup, which was directly impacting the plant fuel cost.

The LDO Consumption during Cold Startup in FY 20-21 was 6.3 KL

❖ **Initiatives:**

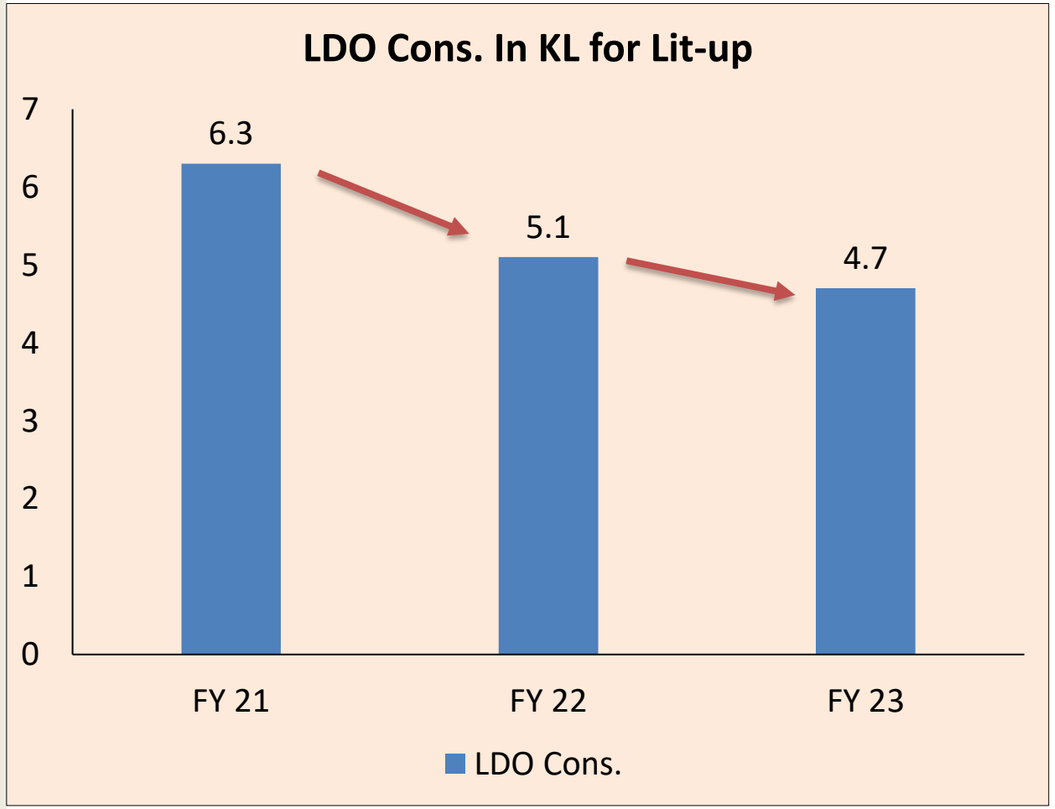
- Coal Inching done at bed Temperature of 300 Deg C instead of 350 Deg C
- Optimization in furnace Bed Pressure.
- LDO Burner Tip size reduced.
- LDO Burner oil pressure regulating.
- Installation of additional filter to avoid gun chocking.
- Total combustion Air flow optimization.

Average LDO Consumption reduced per Cold Startup in FY 22-23 up to **4.7** KL.

❖ **Impact**

LDO Consumption reduced Per lit up 1.6 KL

Monetary Saving : 72.0 Lac



3. SA & PA duct interconnection

❖ **Problem**

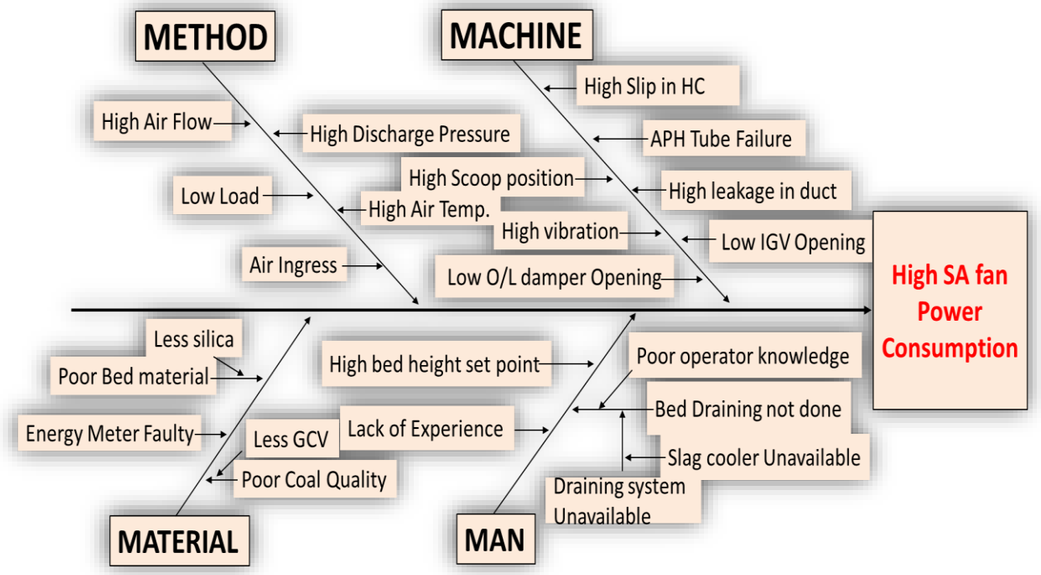
Boiler fan power consumption was higher side as fans were contributing approx 40% of total APC.

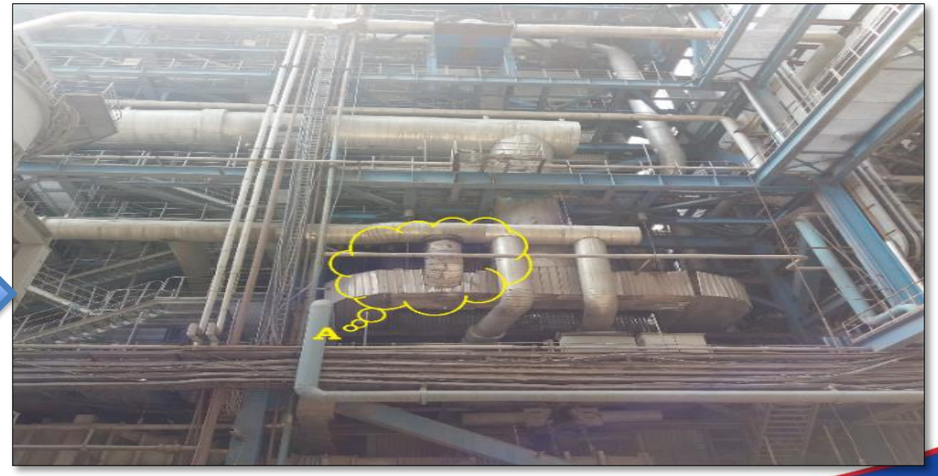
❖ **Action**

By providing interconnection between hot PA and hot SA header, causing SA discharge pressure reduction by Increasing total SA duct area.

❖ **Impact**

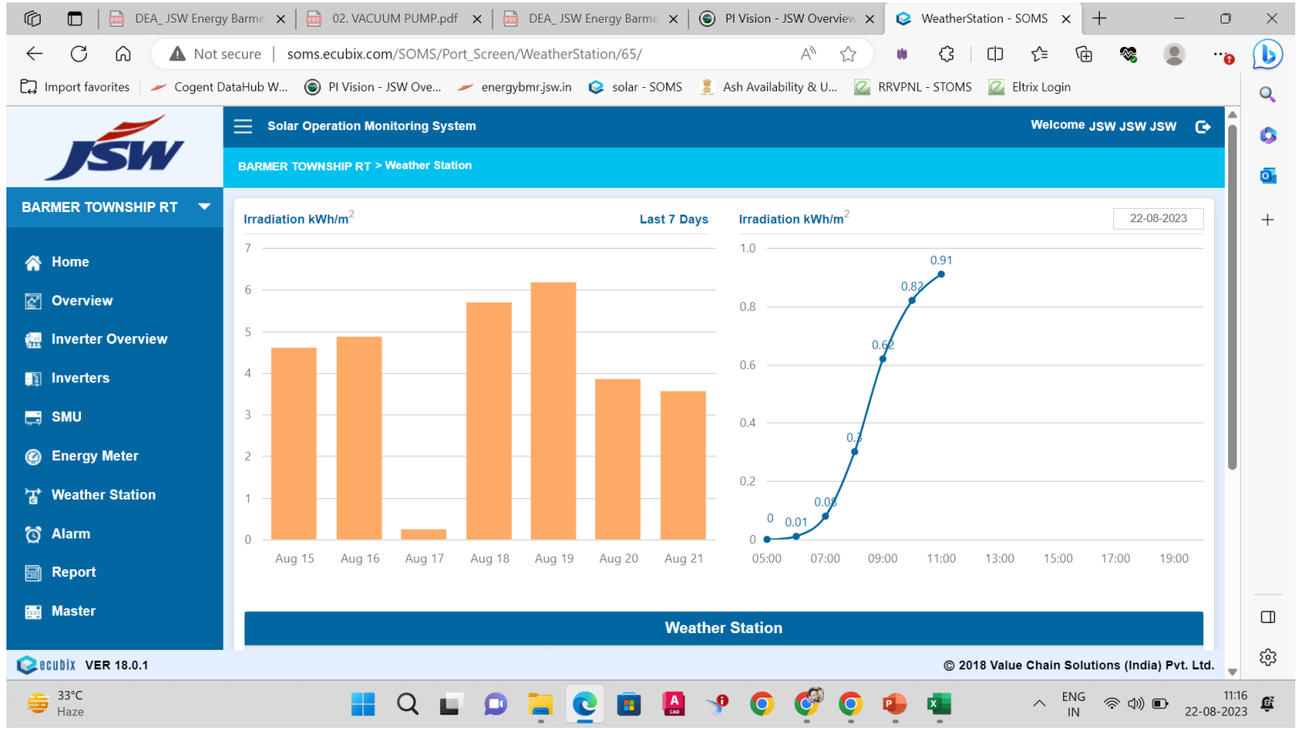
- Fan Power saving of 70 kW in every unit.
- Annual Energy Saving-2959.61 MWh
- Annual Monetary Saving-133.7 Lac





Utilisation of Renewable Energy

- Installation of solar rooftop of capacity 450 KW at township roof top.
- Real time monitoring of solar Generation through SOMS portal.
- As a JSW energy
  - ❑ we are adding 40 GWh / 5 GW Energy Storage by FY 2030



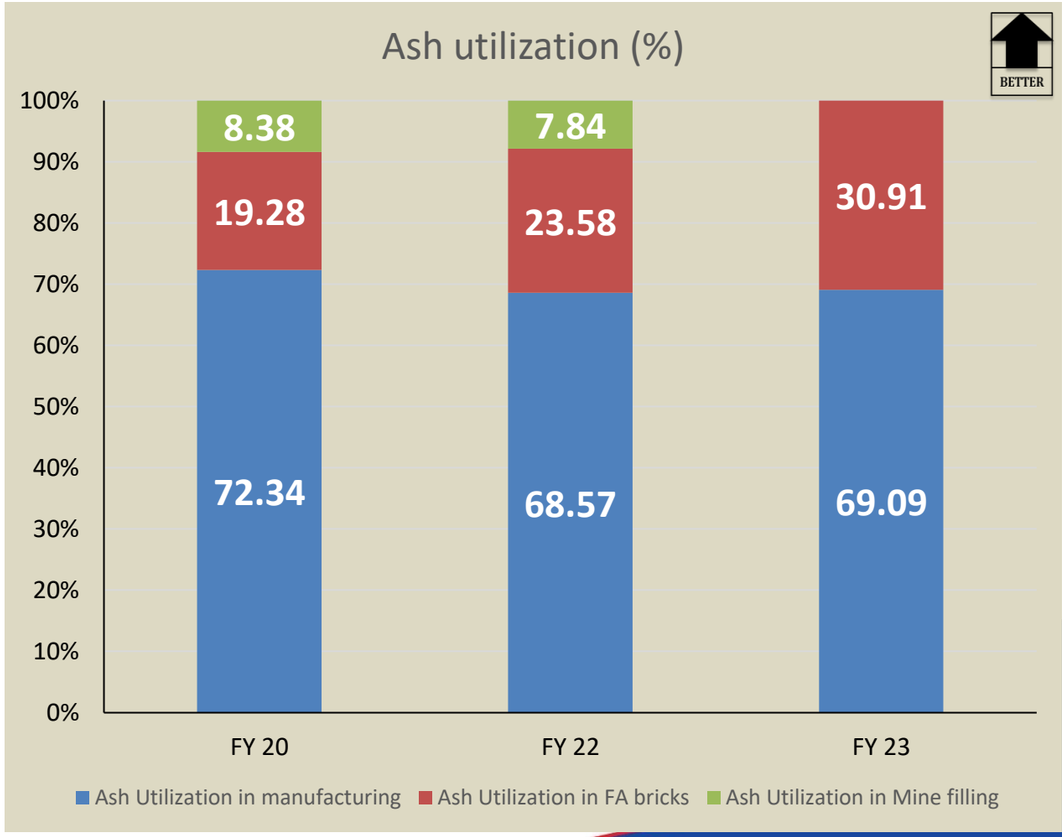
Environment Management- Ash Utilization

ASH MANAGEMENT

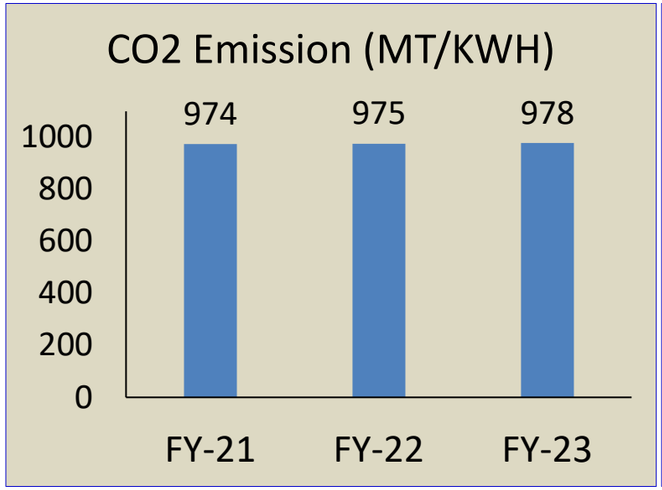
Mode of Transportation of Ash → **DRY** (Through Bulkers)

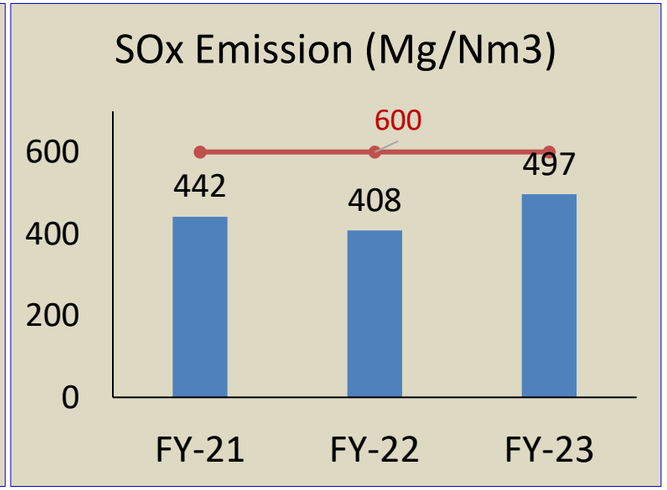
100% Ash Utilization

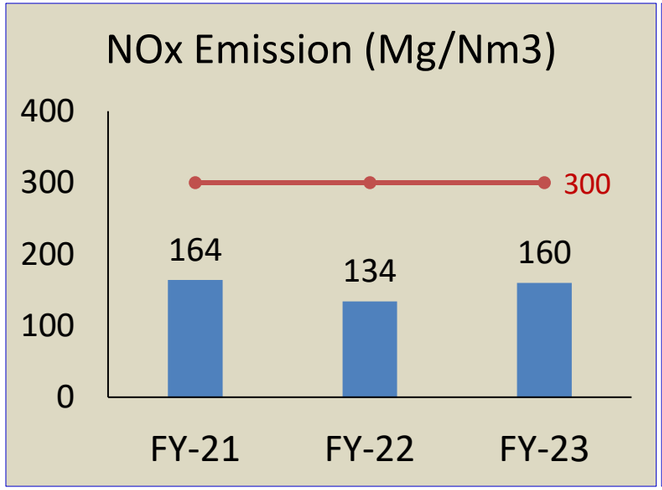
	UOM	2020-21	2021-22	2022-23
Ash Stock in Plant (Yard + Pond)	LMT	**1.41**	**1.92**	**1.56**
Ash Generated	LMT	**8.89**	**8.97**	**9.11**
Ash Utilization	%	**102.91**	**94.38**	**103.92**
Ash Utilization in manufacturing	%	**72.34**	**68.57**	**69.09**
Ash Utilization in FA bricks	%	**19.28**	**23.58**	**30.91**
Ash Utilization in Mine filling	%	**8.38**	**7.84**	**0**

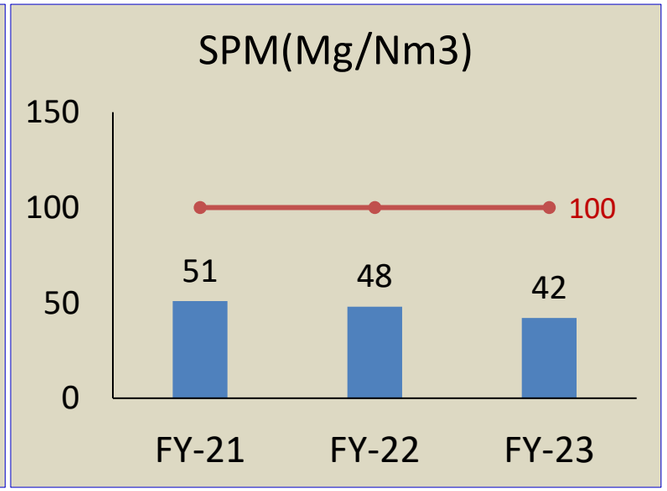


Environment Management- Emission









1. GHG data is submitted to Central Electrical Authority (CEA) **(Scope-1).**
2. The data is also included in BRR (Business Responsibility Report) and available on company website for public interest.
3. Refer link : https://www.jsw.in/investors/energy/jsw-energy- financial-information-business-responsibility-reports

Action Plan to meet the latest emission norms as per Gazette Notification

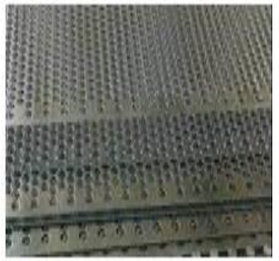
1. Modifications / Up gradation in ESP to reduce SPM level < 50 mg / Nm^3

Step 1 In the 1st & 2nd field the existing T/R sets were replaced with 3 Phase High Frequency Transformer Rectifiers

Step 2 Field 3,4,5,6 retrofitted by replacing the 1-phase controllers used in the existing single phase T/R CONTROLLERS .

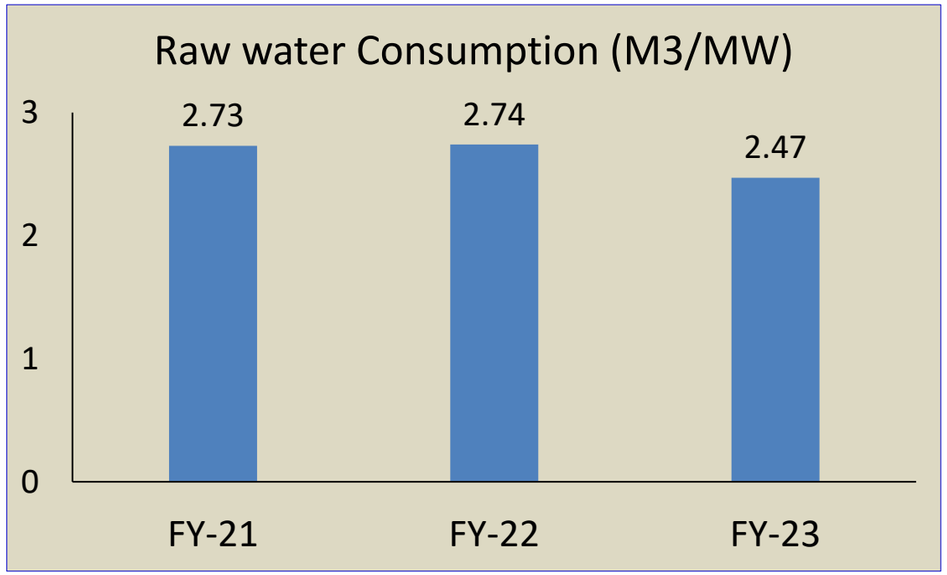
Step 3 The Perforated Filters (PF) PLATES are added behind all rows of Collecting Electrode (CE) panels in electric fields of No. 4&5

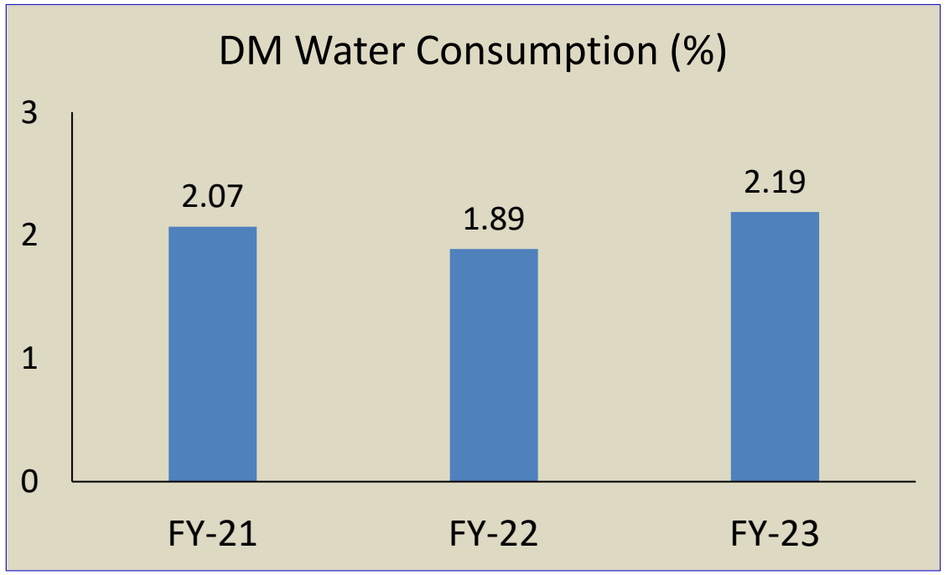
Strep 4 Separate Monitoring and control system set up at control room



2. Enhance Lime plant capacity to control the Sox Emission

Environment Management- Water

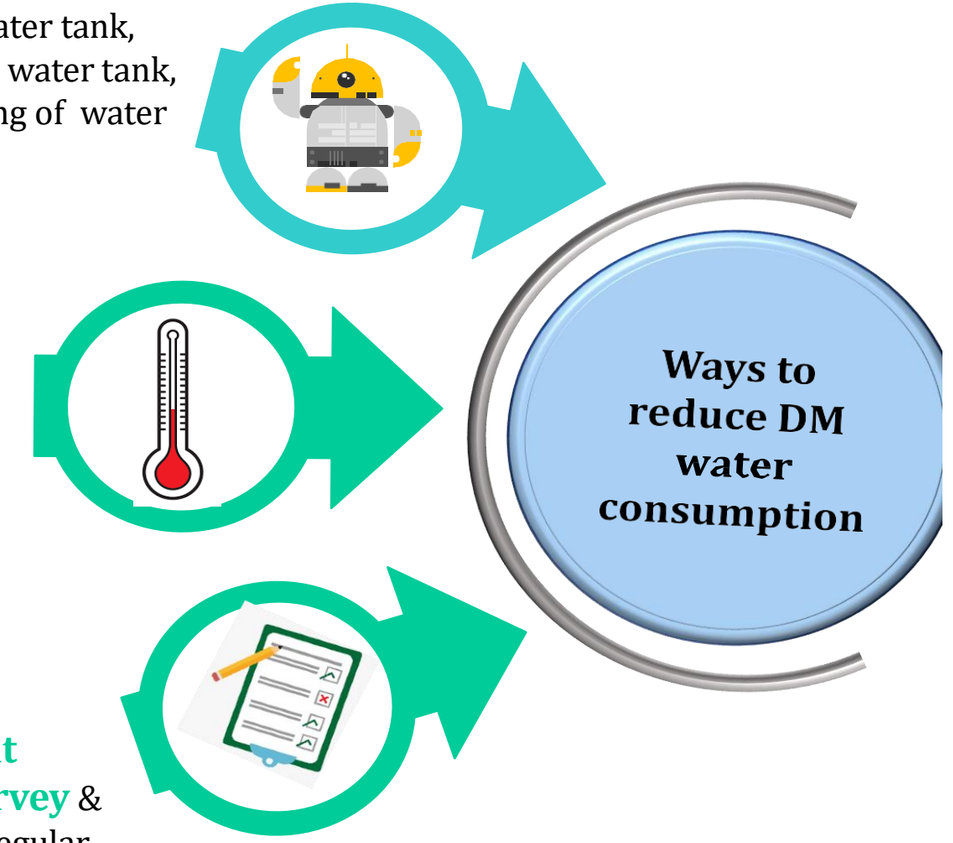




Automation of make up water to all the tanks in plant viz. service water tank, CCW make up tank, Potable water tank, etc. so as to avoid overflowing of water

Installation of RTD in high pressure steam drain line so as to quickly identify passing of valve & attend the same

Drain & Vent temperature survey & thermography on regular intervals. Ensuring proper functioning of steam traps.



Environment Management- Water

Rain water Harvesting

- Rain Water Harvesting ponds are constructed inside the plant premises.
- Total Volume of Ponds= 19,200 m3

100% Effluent water Utilization

- ETP RO water is being used for DM water generation
- Cooling water and balance effluent used for plantation at plant.
- Effluent Water Treated in FY23 is 26,60,254 m3.
- Conducted **Water Audit** to identify the new areas for improving water efficiency
- Reusing of PT Plant Clarifier sludge water –**100% Utilization in Horticulture.**

DM Plant

DM Plant (0utput between regeneration (OBR) improvement- from designed 18 Hrs to **20 Hrs** by installation of Online concentration analyzers & improving supervision & thus reduced regeneration & Backwash wastewater – Water savings **100 m3/Day**

Saving water through Modification in VAM Draining system

- Reroute the VAM System drain to CST Tank.
- Total water saving through this modification **=17100 m3.**

Saving water through Utilization of Condenser flood test water

- Modification has been carried for reuse of condenser flood test water.
- Total water saving through this modification **=300 m3.**

Water Conservation & Reduction in Effluent Generation through changing coagulant regime:

Initiative:

- change in coagulant regime

Benefit

- ETP Loading and further chemical treatment cost of Blowdown has been reduced approx. 23 Lac/year.
- Saving Water Cost 51.11 Lac/year by decreased CW Blow down to approx. 700 M3/day (9%)

Best Practices in the Plant-Digitization

Analytics Dash board in Qlik Sense for KPI monitoring

Digitalization of plant performance data on a single desk with the use of software Qlik sense, which collect data from DCS, Energy meters, SAP and generate daily generation reports in form of trends and graphs.

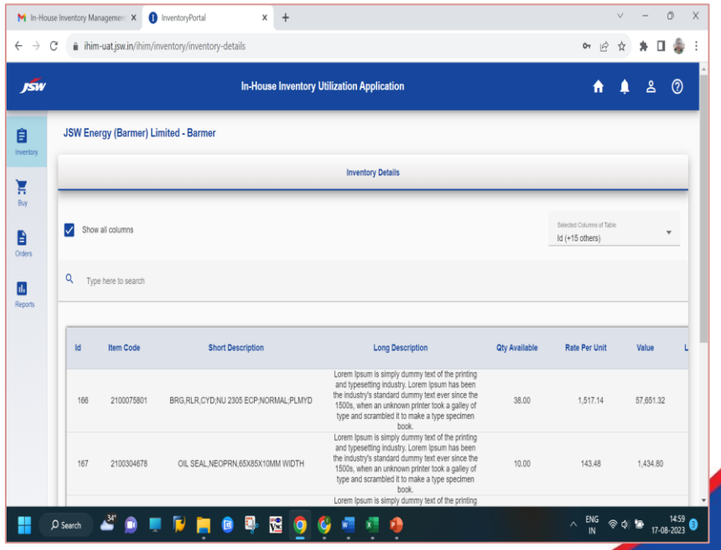
IGNITE Portal for logging improvement ideas

IGNITE portal has been launched for registering the improvement ideas by an individual.

In house Portal for inventory utilization

We set an In-House Inventory Utilization Portal common across each site of JSW Energy group.

1. Overall Non-moving Inventory can be reduced to bare minimum required.
2. Requirement of less resources to store, preserve and maintain the inventory.
3. Reduction in Obsolete Item Inventory.
4. Utilization of the obsolete items before its deterioration.



Best Practices in the Plant-Digitization

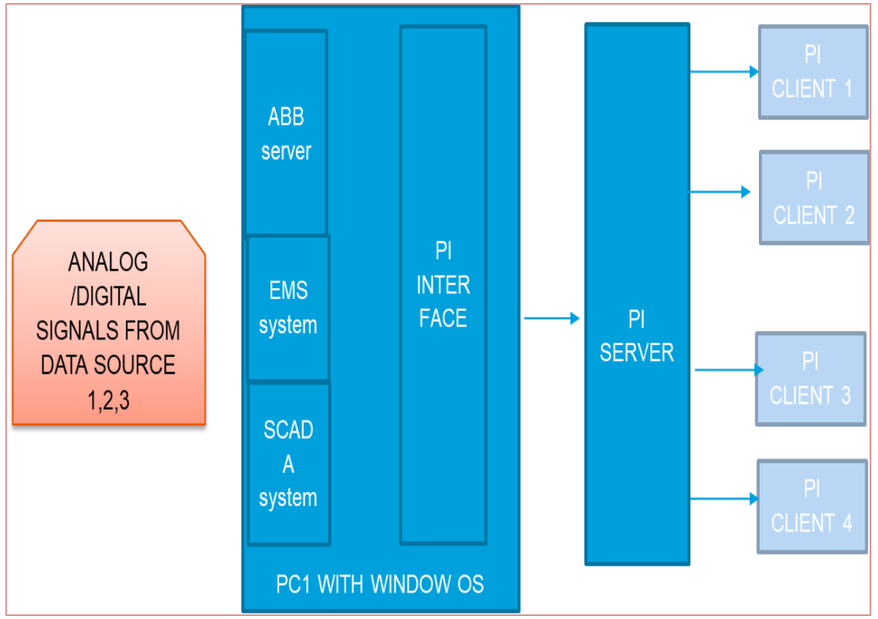
EMS Implementation

With the implementation of EMS system we have achieved following benefits:

- Real Time Comparison of APC.
- Load Monitoring of Transmission Line.
- Identify High consumption area.
- Day wise, monthly basis Report.

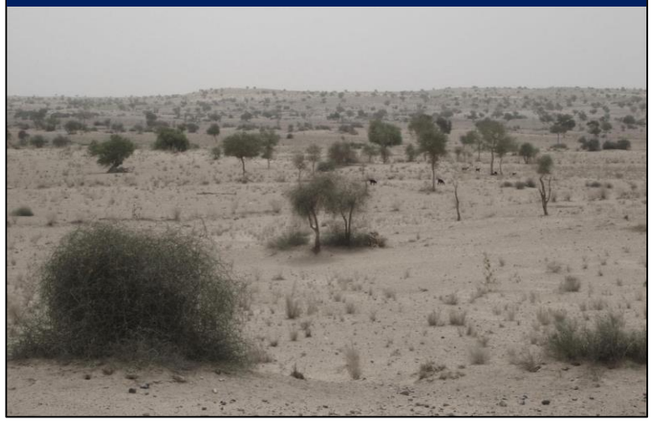
Performance Monitoring (OSI PI)

We have implemented OSI PI system. Through this software, we easily access the DCS parameter and facility to access the historical data for better analysis.



Best Practices in the Plant- Afforestation

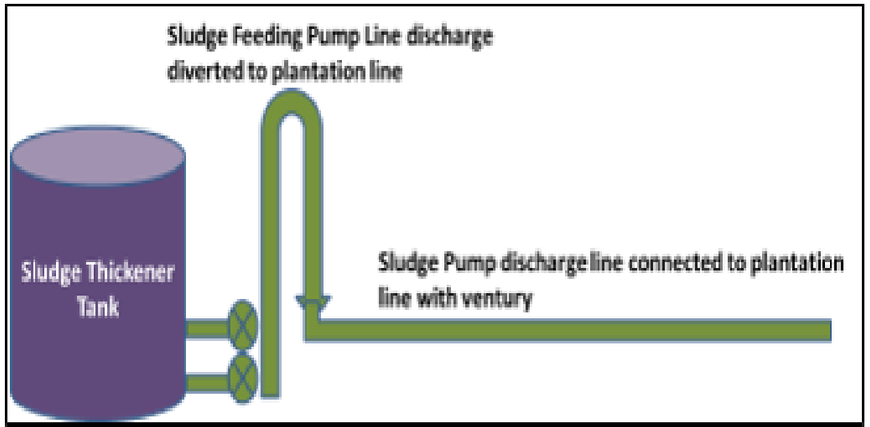
Barren Land



Project Complete

Waste PTP Sludge utilized in Horticulture & Gardening as manure

The sludge generation at pre-treatment plant is approx. 14,000MT/Year. To formation of sludge cake, centrifuge is running continuously which is consuming 37.5 KW/Hr. This waste leads to problem of handle ability while evacuation, transportation and disposal. The disposal of Sludge waste is a costly process. The poly electrolyte chemical dosing (20 Kg / day) for cake formation and transportation through tractor trolley, makes it a costly affair.



Modified Sludge Usage Arrangement

Greenbelt Development

- **Total area of plant -468 Ha**
- **Requirement of Greenbelt Development-154 Ha (as Per MOEF) (33% of Plant Area)**
- **Plantation carried out 173 Ha (MOEF compliance fulfilled) (37% of Plant Area)**

Tree	Up to FY-19	FY-20	FY-21	FY-22	FY-23	Total
No of Tree	120524	3930	2567	5878	3811	136710

Overall area covered under green belt =173 Ha

Best Practices in the Plant- Afforestation

Best Practices in the Plant- Afforestation

Best Practices in the Plant- Biodiversity

Biodiversity Assessment by CII

Floristic diversity

Total of 77 plant species were found during survey:

- Fifty tree species
- Seven grass species
- Eleven shrubs
- Nine Herbs

Faunal diversity

Total sixty three (63) species of birds have been recorded.
Resident – 49 and Mig. - 14

Major Tree/short tree species

- Khejri (Prosopis cineraria)
- Meetha Jaal (Salvadora Persica)
- Khara Jaal (Salvadora oleoides)
- Prosopis juliflora
- Neem (Azadirachta indica)
- Desi babool (Acacia nilotica)

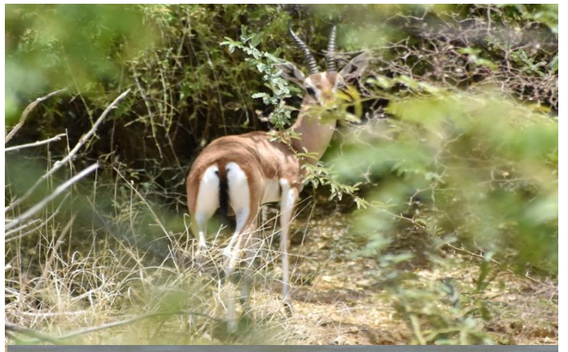
Major shrub and herb species

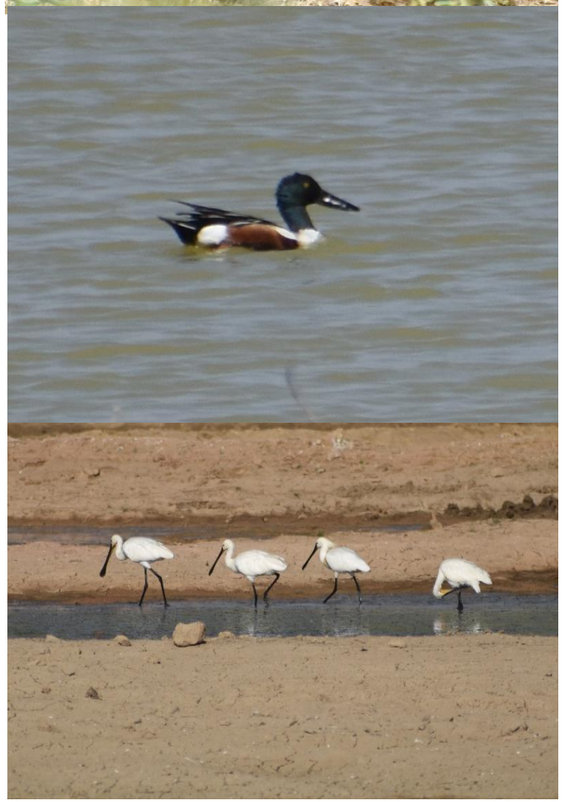
Shrubs

- Euphorbia caducifolia
- Kheep (Leptadelia pyrotechnica)
- Ziziphus nummularia
- Akda (Calotropis procera)

Herbs

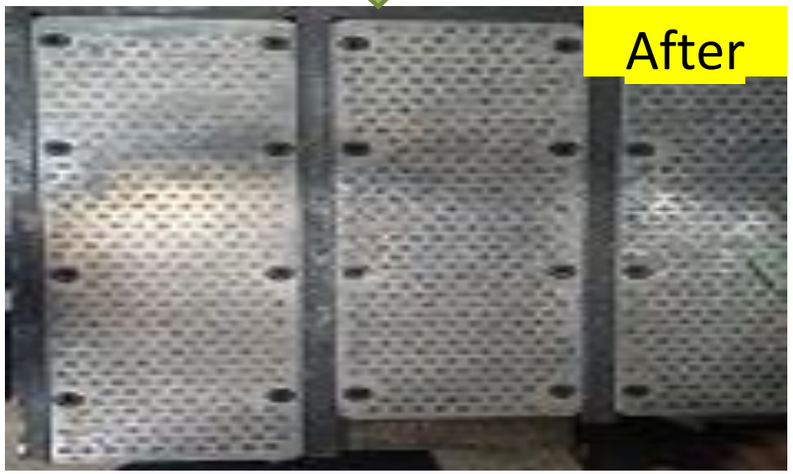
- Choti bui (Aerva javanica)
- Badi bui (Aerva persica)
- Saniya (crotolaria burhia)
- Tephrosia spp.
- Argemone maxicana





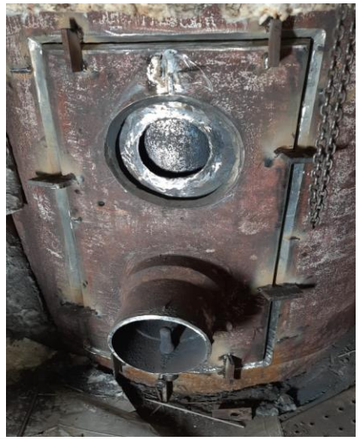
Best Practices in the Plant- Maintenance & reliability

Turbine Front pedestal in house correction to improve RH Temp.



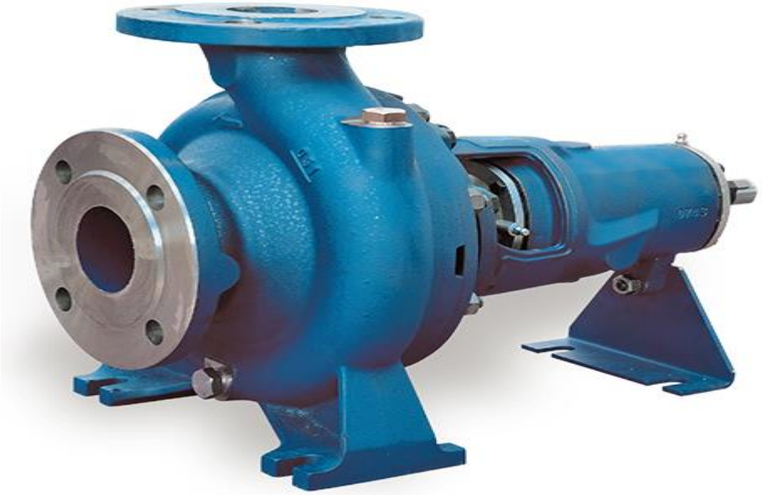
HP Heater internal correction to improve FW temp.

After removed bundle of heater and after inspection its observed that many holes found of inside chamber of sub cooling zone. After correction FW temp. raised by 5 deg C resulting in improvement in Heat rates



BFP Booster pump refurbishment to improve pump efficiency

In house refurbishment of booster pump of boiler feed pump to improve the pump efficiency. Power consumption of BFP has reduced by 10 KW.



EMS System and other requirements

EMS Implementation

With the implementation of EMS system we have achieved following benefits:

- Real Time Comparison of APC.
- Load Monitoring of Transmission Line.
- Identify High consumption area.
- Day wise, monthly basis Report.

ISO 50001:2018 Certified

Bureau Veritas Certification

JSW ENERGY(BARMER) LIMITED

VILLAGE/POST : BHADRESH, DIST. : BARMER – 344 001, RAJASTHAN, INDIA.

Bureau Veritas (India) Pvt. Ltd. (Certification Business) certify that the Management System of the above organisation has been audited and found to be in accordance with the requirements of the management system standards detailed below

Standard

ISO 50001:2018

Scope of certification

GENERATION OF ELECTRICITY THROUGH OPERATION OF LIGNITE BASED THERMAL POWER PLANT

Original cycle start date: **10 December 2017**
Expiry date of previous cycle: **09 December 2020**
Recertification Audit date: **11 November 2020**
Recertification cycle start date: **10 December 2020**
Subject to the continued satisfactory operation of the organization's Management System, this certificate expires on: **09 December 2023**
Certificate No. **IND.20.9107/EN/N** Version : **1** Revision date: **07 December 2020**

Certification Authority
Jagdheesh N. MANIAN
Head – CERTIFICATION, South Asia
Commodities, Industry & Facilities Division

NABCB
EnM003

Local office: *Bureau Veritas (India) Private Limited (Certification Business) 72 Business Park, Marol Industrial Area, MIDC Cross Road "C", Andheri (East), Mumbai – 400 093, India.*

Further clarifications regarding the scope of this certificate and the applicability of the management system requirements may be obtained by consulting the organization. To check this certificate validity please call: +91 22 6274 2000.

Energy Audit by CII

Performance Gap analysis has been conducted by CII Team in FY 23.

NET ZERO commitment- Sustainability

17 Focus Areas with 2030 Targets from 2020 as Base Year

Climate Change:
Committed to being carbon neutral by 2050

Reduce our carbon emissions by more than 50%

Biodiversity: No Net Loss for Biodiversity

Waste Water: Zero Liquid Discharge

Waste : 100% Ash (Waste) utilization

Water Resources: Reduce our water consumption per unit of energy produced by 50%

Resources

Employee Wellbeing

Social Sustainabili

Local Considerations

Indigenous People

Human Rights

Supply Chain Sustainability

Health & Safety

Air Emissions

Business Ethics

Cultural Heritage

Energy

Sustainability: Framework and Priorities

Governance & Oversight by **Sustainability Committee**

2 Independent Directors	**Mr. Sunil Goyal**
	Ms. Rupa Devi Singh
1 Executive Director	**Mr. Prashant Jain**

ESG Ratings

MSCI	**BB**
CDP	**A- (Leadership Level)**

Carbon Neutrality by 2050

SCIENCE BASED TARGETS
DRIVING AMBITIOUS CORPORATE CLIMATE ACTION

Committed to set science based targets to keep global warming to 1.5°C under SBTi

Competency & Problem Solving

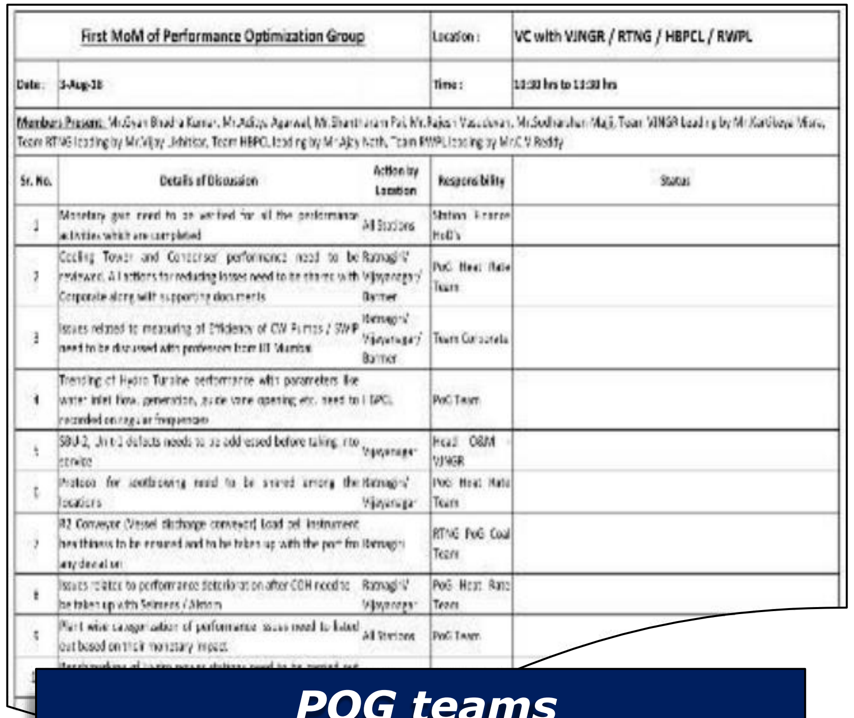
Energy Efficiency Training & Awareness Programs

	No. of Participants	Duration (mandays)
Internal	125	3.25
External	75	1.25

Projects Implemented through KAIZENS

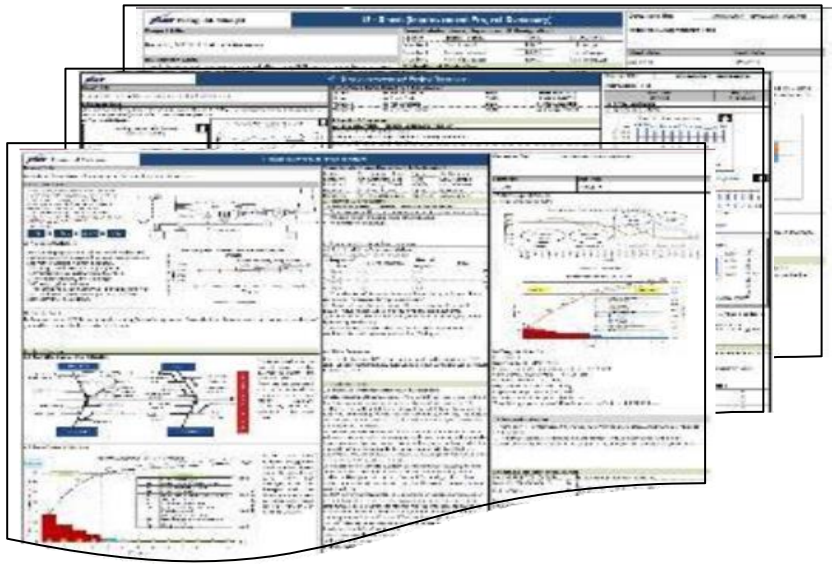
	Raised	Implemented
Supervisors	80	80

- **14 QC** teams for *continuous improvement projects under KAIZEN .*
- **Energy Management Cell** – Core team along with Support team formed with objective of improvement projects for *energy conservation*.



POG teams

- **Cross functional teams** formed at plant level to work for improvement in performance parameters viz. GHR, APC, O&M Cost etc
- Review meetings chaired by HoP & HoT



4i-J2 & J3 Projects

- Identified & trained 27-J2 candidates & 8-J3 candidates to work for a cross functional project involving high end statistical tools & analysis
- The projects adopts our unique ***4i*** improvement methodology (Identify, Ideate, Implement, Institutionalize)

Calibration of Energy Conservation Week

- **Energy Conservation Week** is celebrated every year in the form of various competitions and activities with involvement of company employees, associate employees.

Reward & Recognition

"NECA Award 2020 in Energy Conservation "
Organized by Government of India

"9th FICCI Quality Systems Excellence Award" for Quality Organised by Federation of Indian Chambers of Commerce and Industry.

JSWBL achieved "Five Star grading & sword of Honor in Occupational Health and Safety Audit conducted by the British Safety Council"

"National Efficiency Award – 2023" for Best Energy Efficient Plant-Lignite by Mission Energy Foundation.

"Gold Award 2022 in Sustainability "
Organized by Grow Care India

THANK YOU