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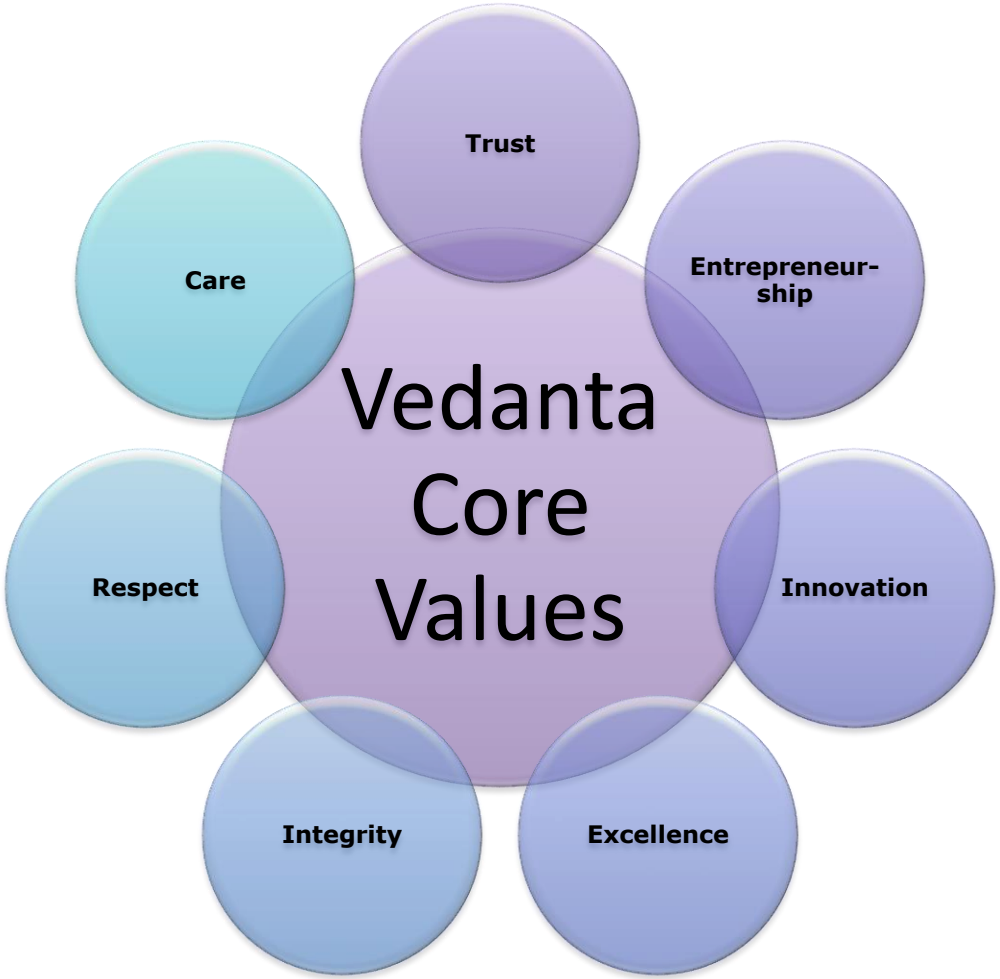
URJA - SOURCE OF ENERGY

VEDANTA LIMITED, JHARSUGUDA

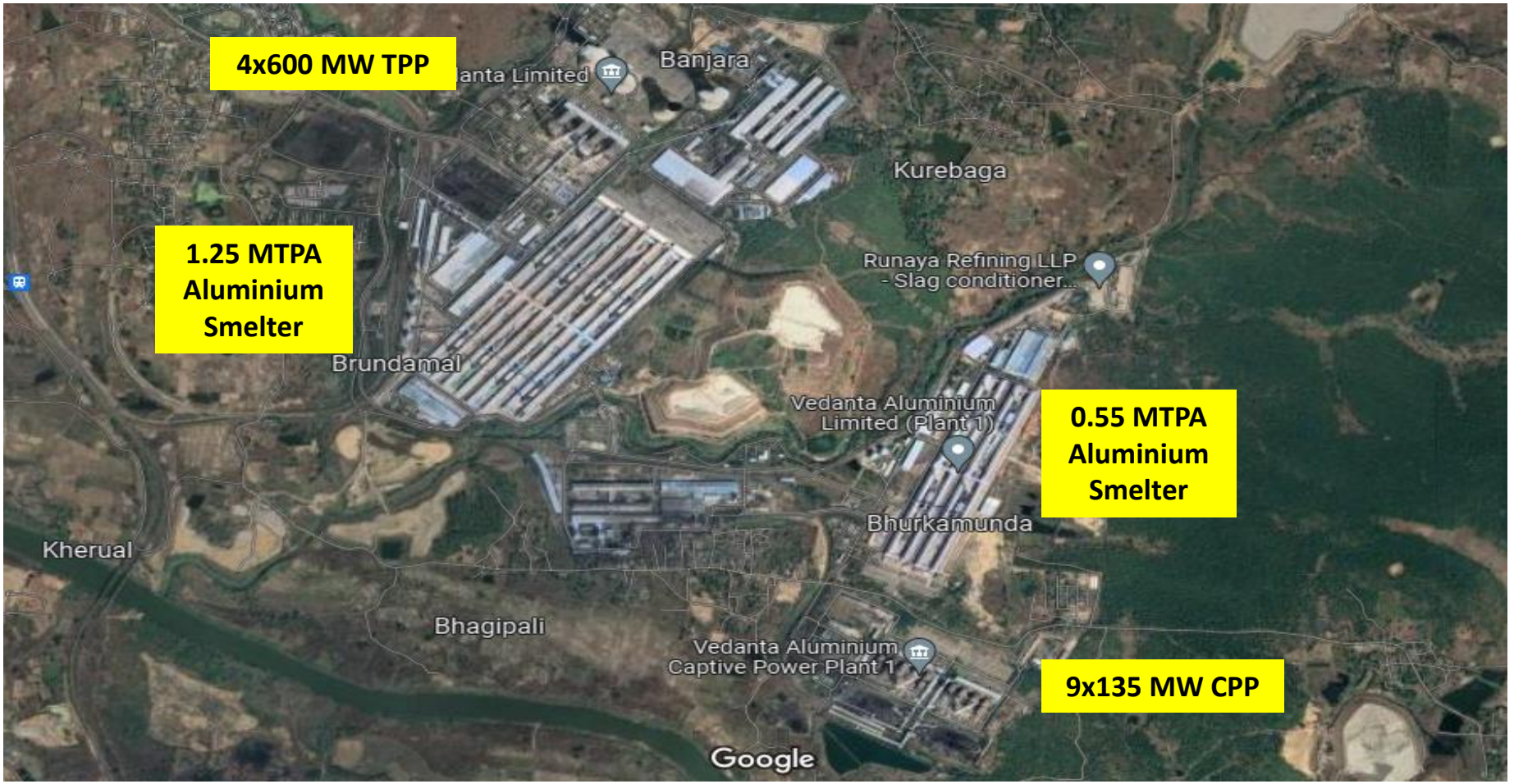
Purpose & Values

Core Purpose

"Vedanta is a globally diversified natural resources company with low-cost operations. We empower our people to drive excellence and innovation to create value for our stakeholders. We demonstrate world-class standards of governance, safety, sustainability & social responsibility"



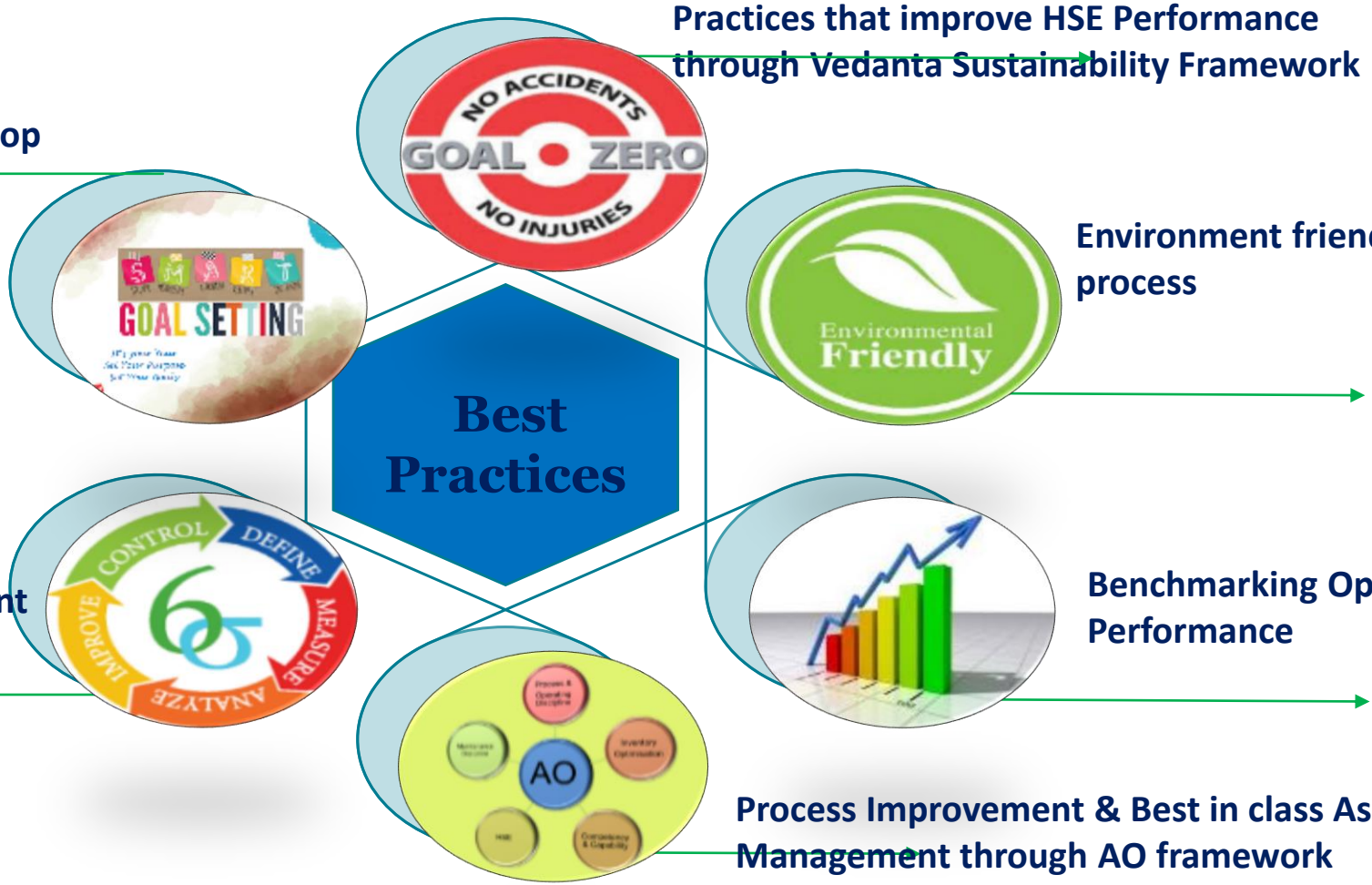
Vedanta Jharsuguda, Aluminium & Smelter Complex



Operational Best Practices

Practices that improve HSE Performance through Vedanta Sustainability Framework

Goal Setting & BP Workshop



Environment friendly process

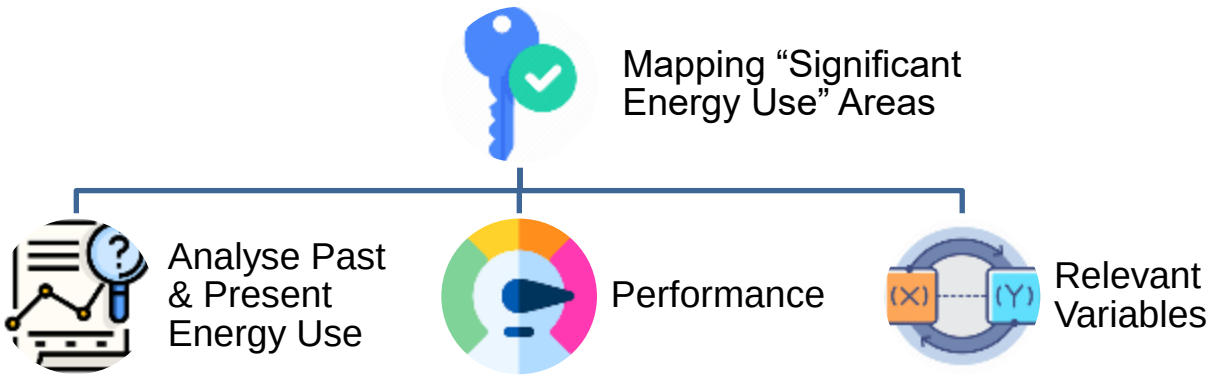
Employee Engagement through TQM

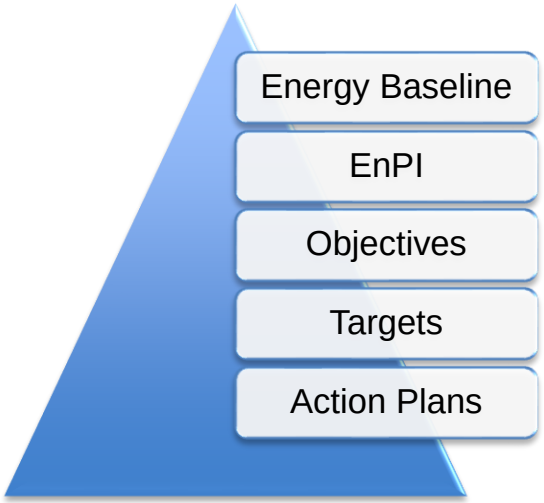
Benchmarking Operational Performance

Process Improvement & Best in class Asset Management through AO framework

Energy Management

- certified with ISO 50001:2018





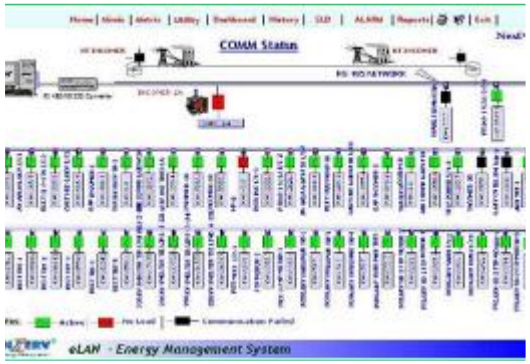
- Energy review frequency

BAIN & COMPANY

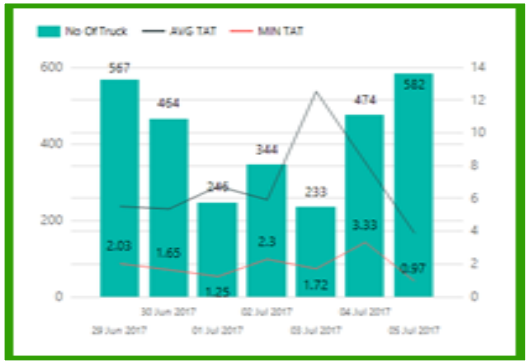
Management Consultant

Designation	Daily	Weekly	Forth nightly	Monthly
Head O&M	√	√	√	√
Plant Head		√	√	√
COO (Power)		√	√	√
CEO			√	√
Group CEO				√

Energy Reporting & IT Enablement

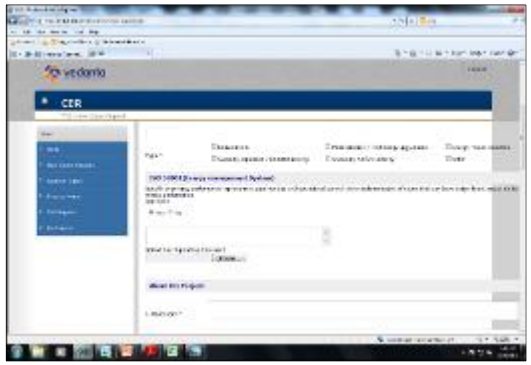


Integrated Energy Meters reports

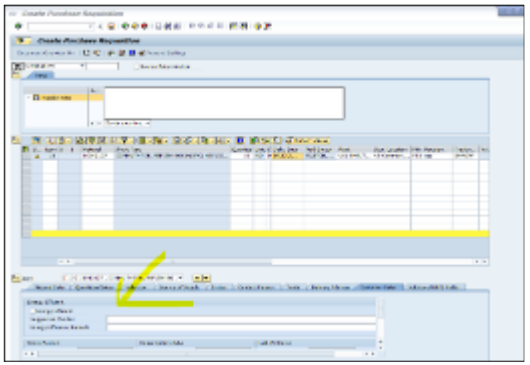


MES

- SEC Report to Plant Head
- Section Wise Report to Energy Managers
- Daily reports to HODs



E-CER (Capex) Energy Impact Assessment



Energy Efficient Procurement

Upgrading towards Industry 4.0

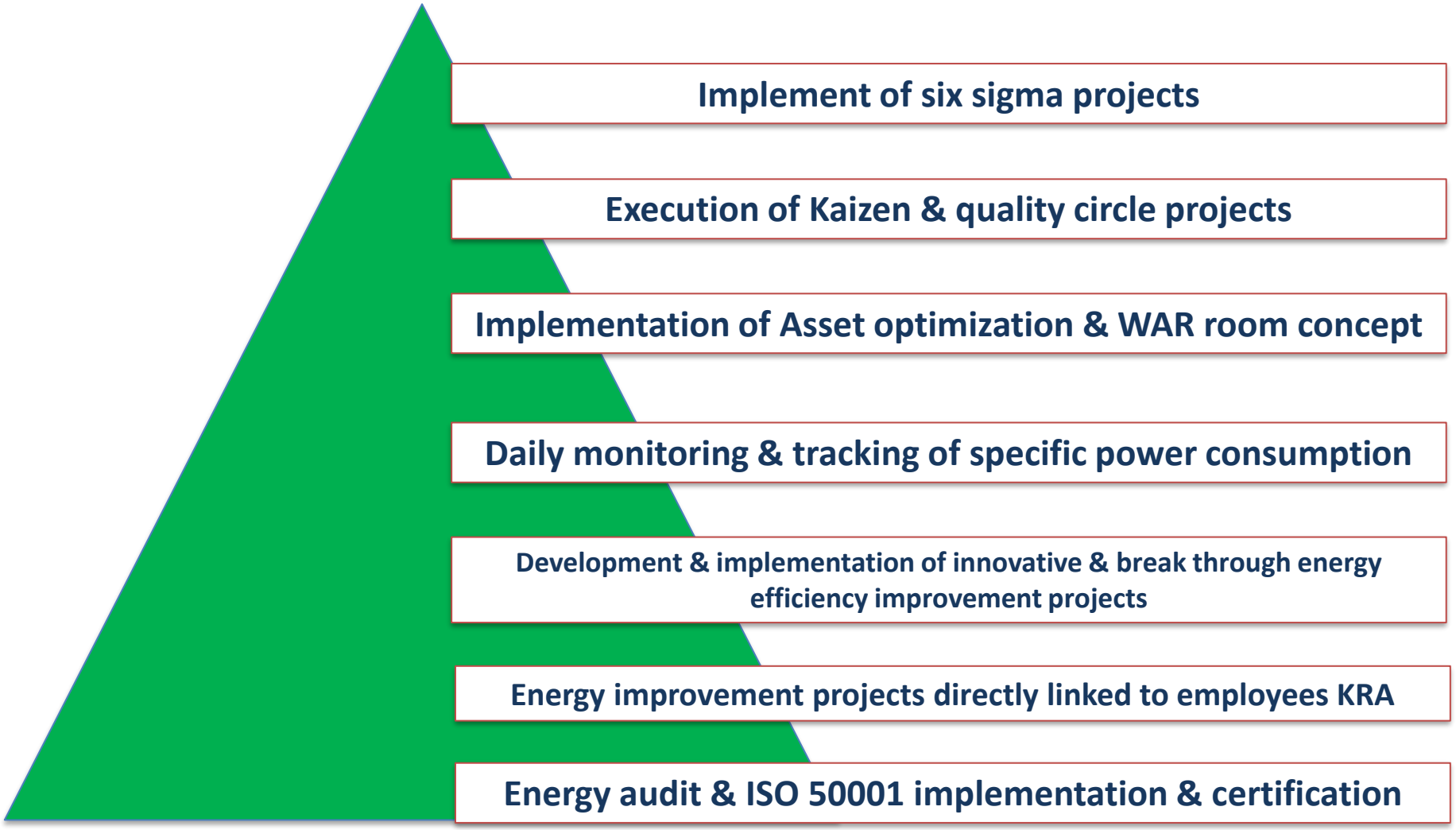
Awareness

- Energy discussion in daily War-room
- Energy awareness in Tool Box Talk
- Awards & Recognition for Energy initiatives
- Campaigns likes leakages arrest are organized with VL employees & service partners.
- Competition related to Encon, environment etc. are organized among VL employees & service partners

Awards/Recognition

Instant Recognition	Audit Scoring Based	For VL Employees	Based on Audit scores
Shabash Card	Kaizen Rolling Trophy	Employee of the Month	Quality Circle Rolling Trophy

Focus on Encon efforts- 2018-21



Operational excellence through digital initiative

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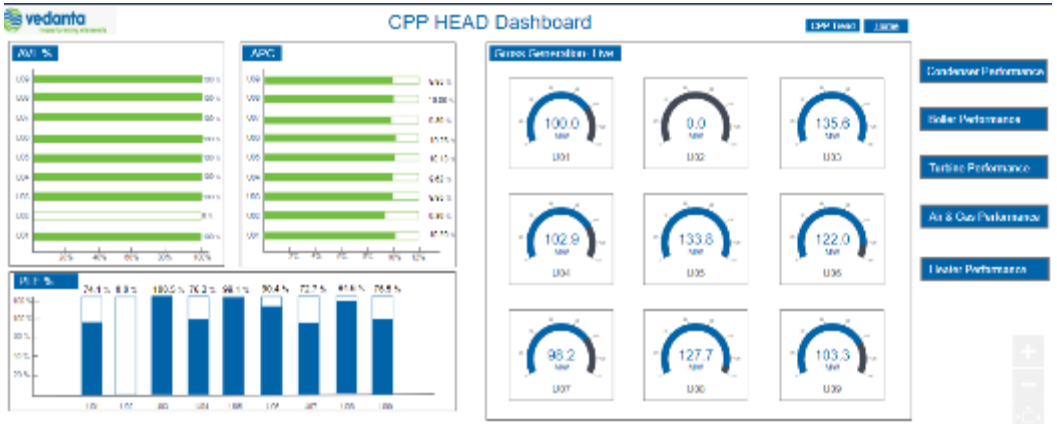
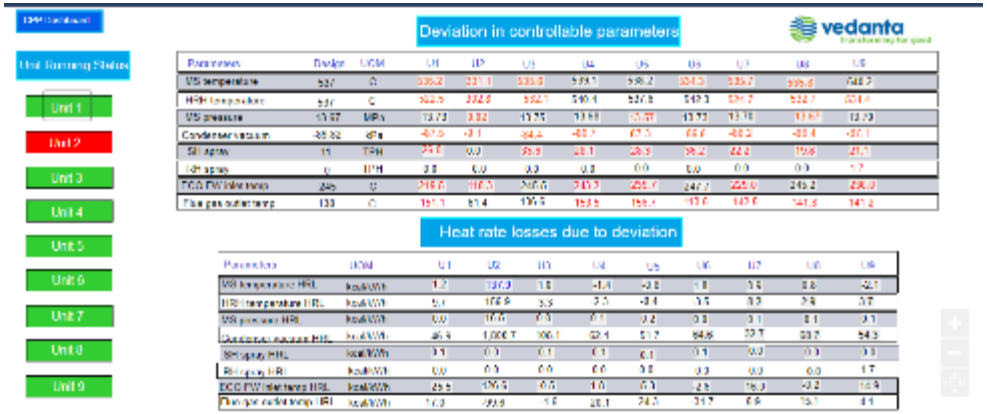
Abstract :-

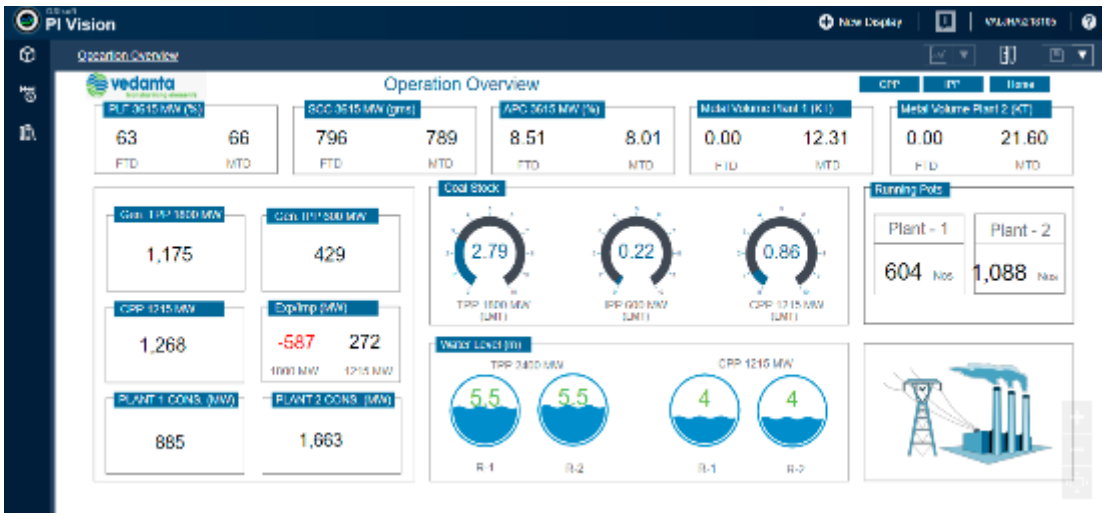
- implemented energy monitoring system though OSI- PI System is a suite of software applications that allows for **collecting , historicizing, finding, analyzing, delivering and visualizing data**.
- The PI System unlocks operational insights and new possibilities. The PI System enables digital transformation through trusted, high-quality operations data. Collect, enhance, and deliver data in real time in any location. Empower engineers and operators. Accelerate the work of **analytics & energy monitoring on real time basis**



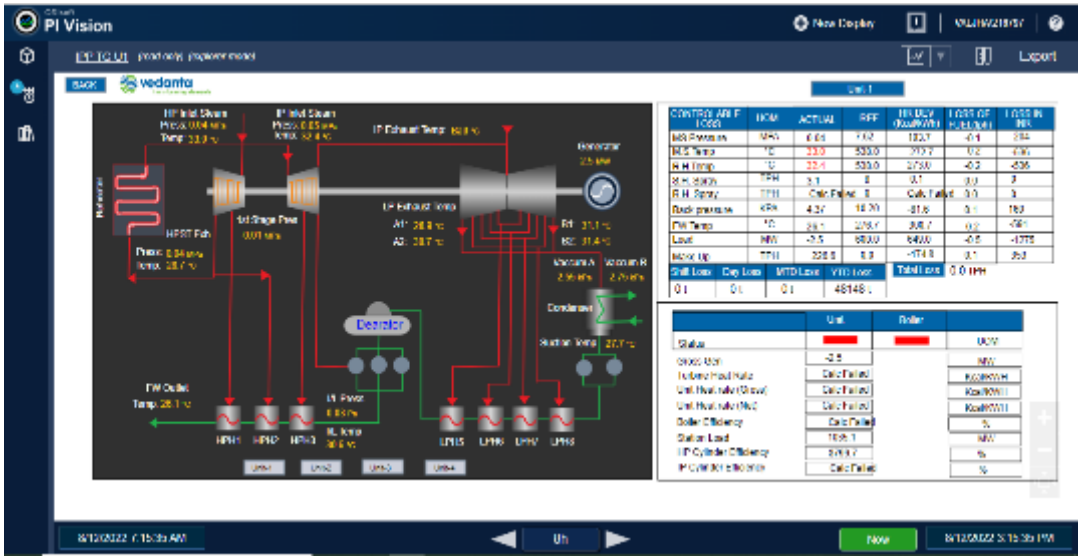


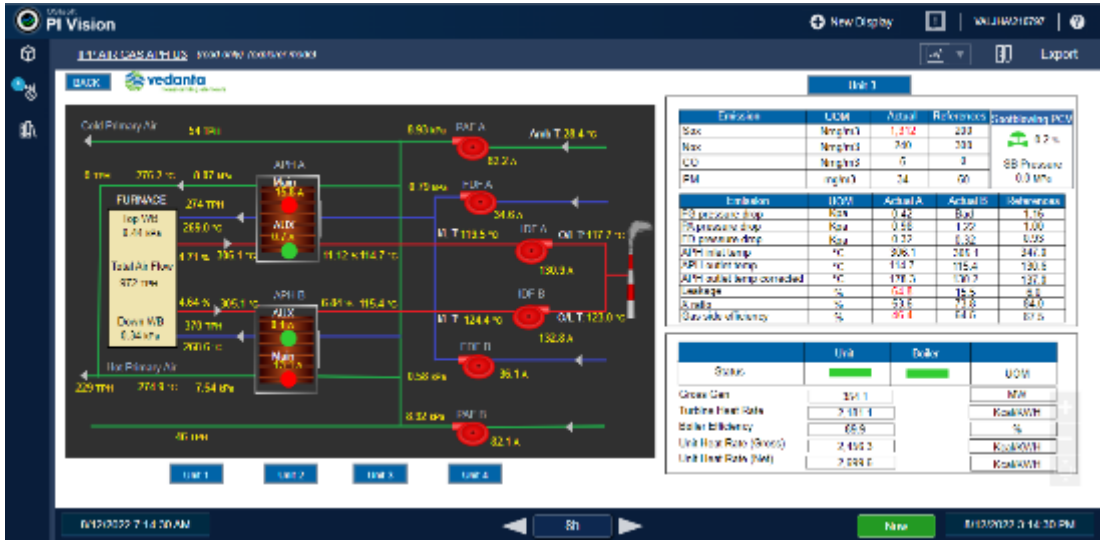
Thermal saving = 22 kcal/kwh
Total saving = 59 lakhs INR/Annum

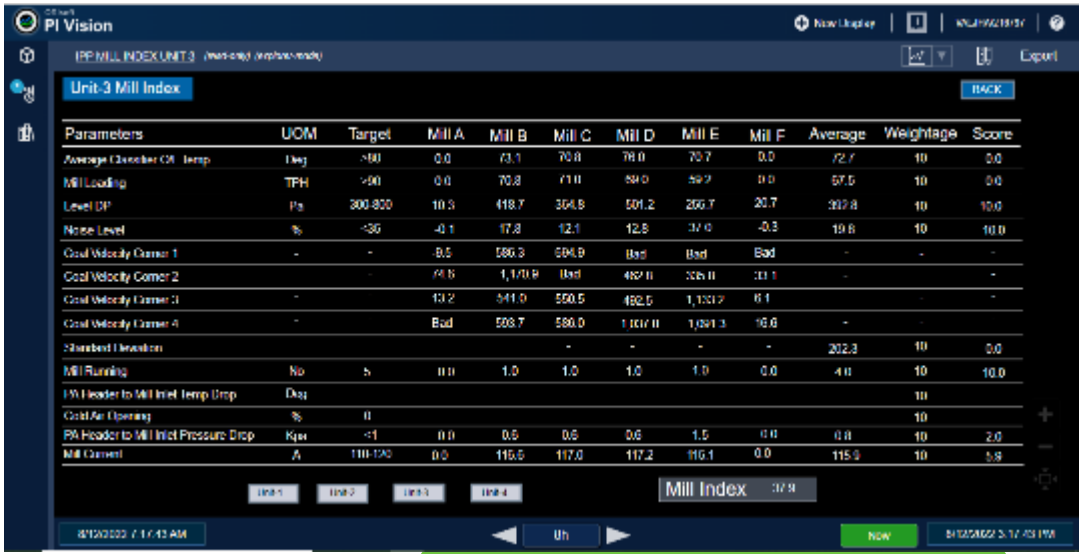
Osi Pi Screen



Osi Pi Screen







Compressed air pressure reduction

Reduction of HP Compressed air pressure from 6.6 to 6.4 kg/cm2 & LP from 2.88 to 2.86 kg/cm2

Abstract:-

Reduction in energy consumption achieved by reducing set pressure of HP Compressors from 6.6 kg/cm2 to 6.4 kg/cm2 gradually without affecting plant operations. Load reduction of 305 kw achieved in Jan 2018 owing to the same. Similarly, owing to reduction of LP Compressed air set pressure from 2.88 to 2.86 kg/cm2,load reduced by 25 kw.

LP Compressors

HP Compressors

Electrical saving = 25 kwh
Total saving = 41 lakhs INR/Month

APH leakage reduction by sector plate upgradation

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OBJECTIVE AND GOAL STATEMENT

"APH Sector plate Modification"

Modification of air preheater sector plate assembly to close frame adjustable type sector plate.

BASELINE

The levelling of sector plate cannot be done within the recommended limit 1.0mm because of open frame nonadjustable type assembly of sector plate & also the gap between the seal & sector plate is more than recommended.

TARGET

To modify the existing open frame nonadjustable type assembly to close frame type with adjustable rod for levelling of sector plate & reducing the gap between the seal & sector plate

Energy Saving = 300 KwH
Total savings-55 Lakh/Month

U6 COH Performance Report							
SI No	System	Parameter	UoM	Design	Pre OH	Post OH	Improvement
1	Boiler	Boiler Efficiency	%	85.66%	87.20%	88.50%	1.20%
2	APH Performance	Air Leakage	%	8.87%	14%	6%	8%
		Gas side efficiency	%	62%	54.00%	62.50%	8.50%
		FGET	°C	138	168	138	30

Vacuum improvement by CT nozzle modification:-

Abstract:-

We were concerned of cooling tower deck overflow, for that we modified cooling tower nozzle ,diameter has been increased from 38 mm to 43 mm resulting decrease the riser bypass flow & gain in vacuum by 0.15 Kpa resulting Energy savings by 13 Kcal/Kwh.

Energy Saving = 13 Kcal/Annum
Total savings-14 Lakh INR/Month

HP cylinder efficieccy improvement by HIP carrier refinning

Challange:-

Low HP cylinder efficiency was concern,72% against 81%

Solution:-

Low HIP carrier refining by during COH improves cylinder efficiency from 72 to 78%.

Thermal Savings of **20 Kcal/Kwh**

Total saving- 21 Lakh/Month

Process Improvement initiatives

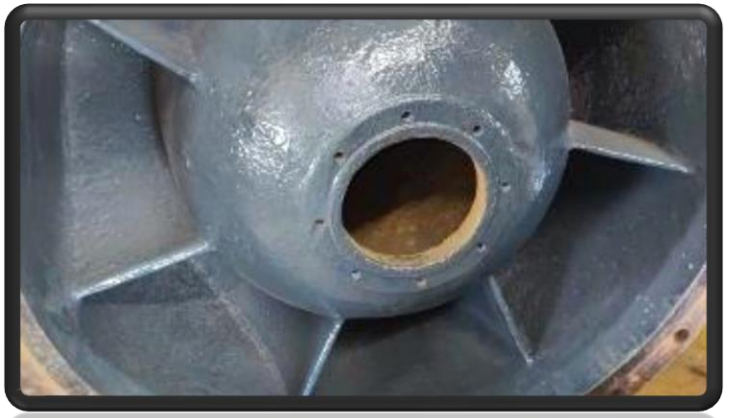
- Replacement of LT motors with lower capacity motor to increase the motor loading

  - ✓ 2 CT fan Motors were replaced with 110 KW (down from 132 kW)
    - ❖ Energy saving of 6 kW/motor
  - ✓ 2 Seal air fan motors were replaced with132 KW which was removed from CT fan motor instead of 160 KW motors
    - ❖ Energy saving of 8 kW/motor
  - ✓ Such 10 motor were taken for replacement in Station

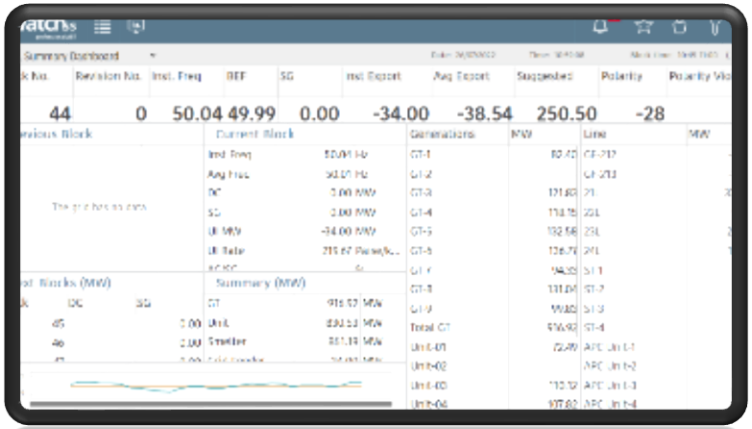
Electrical Savings of **20 Kwh**
Total saving-44 Lakh/Annum

Improvement projects

HIP carrier refining for cylinder efficiency improvement



CWP impeller coating



ABT secure meter installation for bulk energy data tracking

Auxillary power reduction through engineering control

Improvement projects

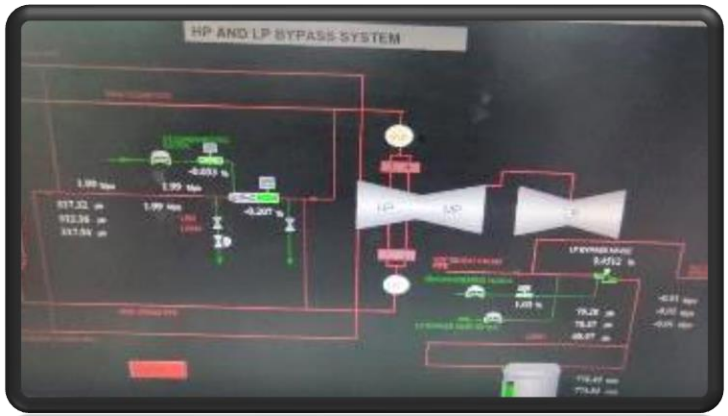
Boiler penthouse cleaning & air sealing

Fan power reduction by APH seal replacement

Vacuum improvement by CT cell bitumen coating

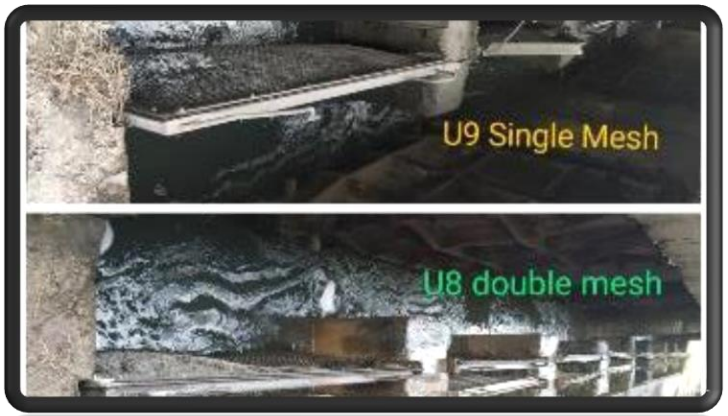
Boiler efficiency improvement by reducing radiation losses

Improvement projects



Loss reduction through automation(HP LP bypass system)

Thermal saving-34 Kcal/Kwh- Total saving- 47 Lakh/Annum

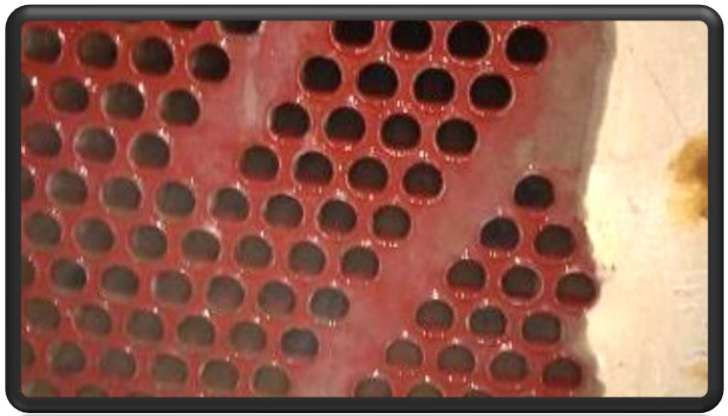


Double layer bucket strainer installation for vacuum improvement

Vacuum improvement by CT fills replacement

Radiation loss reduction by padded insulation installation in Turbine

Improvement projects



Condenser waterbox epoxy coating

Flue gas temperature reduction by APH basket replacement

Auxillary power reduction by mill roller replacement

Ceramic coating at coal pipes

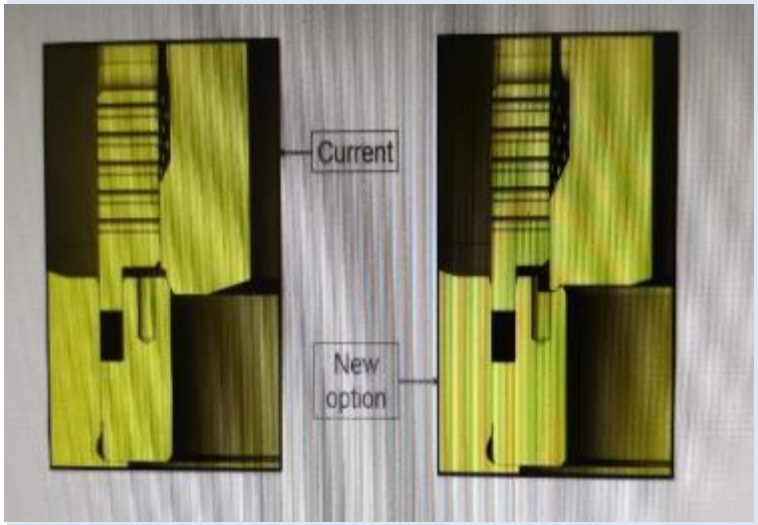
Turbine Area Improvements

LP bypass CV upgradation

Presence of wet steam which leads to wet steam erosion. Passing of this valve results in:
1. Low generation
2. Delayed start-up of the units

Upgradation of this LPBP Control valve avoided direct erosion from the wet steam and initial damage to the plug sealing surface and improve the leakage situation and prolong the lifetime of the valve permanently

SAVINGS 15.44 Cr

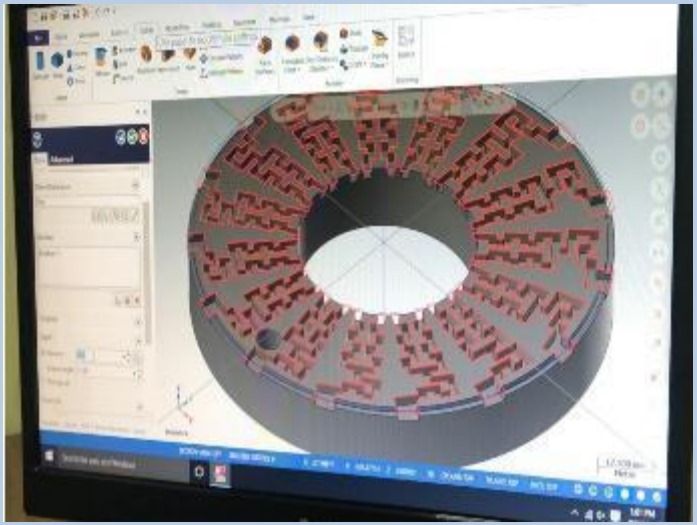


BFP RC control valve upgradation

Old cage is changed to a new Drag design for the same set off operational parameters

Material upgraded from SS 316 to SS 410
Cage is modified from 03 nos. stages to "18 stages Hi-Tier technology DRAG designed cage " for better high temp. & pressure feedwater flow with zero cage erosion & velocity control from 95 m/s to 3.7 m/s approx.

SAVINGS 11.8 Cr



Booster Pump Bearing Temp Reduction

By the increase of BP bearing temperature, it leads to failure of bearings and mechanical seal of booster pump causing high spares consumption and also tripping of booster pump

Results & Analysis
Provision for extra 1 no. of Cooling Coil- 16 mm dia.

SAVINGS 5.1 Lacs

Vacuum Pump Suction Header Modification

SAVINGS 20.16 Cr

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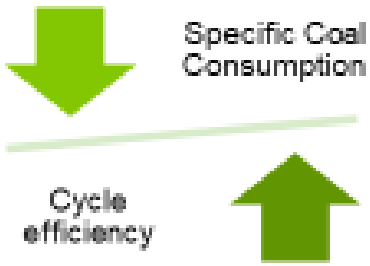
Vacuum pump suction line modification has been carried out in all units. so now one vacuum pump is dedicated to each condenser and solenoid operated valve is fixed in between the vacuum pumps for feasibility in operations if any vacuum pumps trips/preventive maintenance is scheduled.

Performance Analysis - Unit #1 Vacuum pump HP & LP suction separation

Date	Conditions	Vacuum pump charged with		Load (MW)		Vacuum (in kPa)				Station SCC Gain (gms/kwh)
		LP side	HP side	Before	After	LP side	HP side	Average	Gain	
27-07-2020	Condition 1st	A+B+C (Normal condition)		500	500	-84.3	-83.8	-84.1		4.0
	Condition 2nd	A+B	C			-89	-84.2	-86.6	2.55	
	Condition 3rd	A	B+C			-88.6	-84.5	-86.6	2.50	



Benefits :

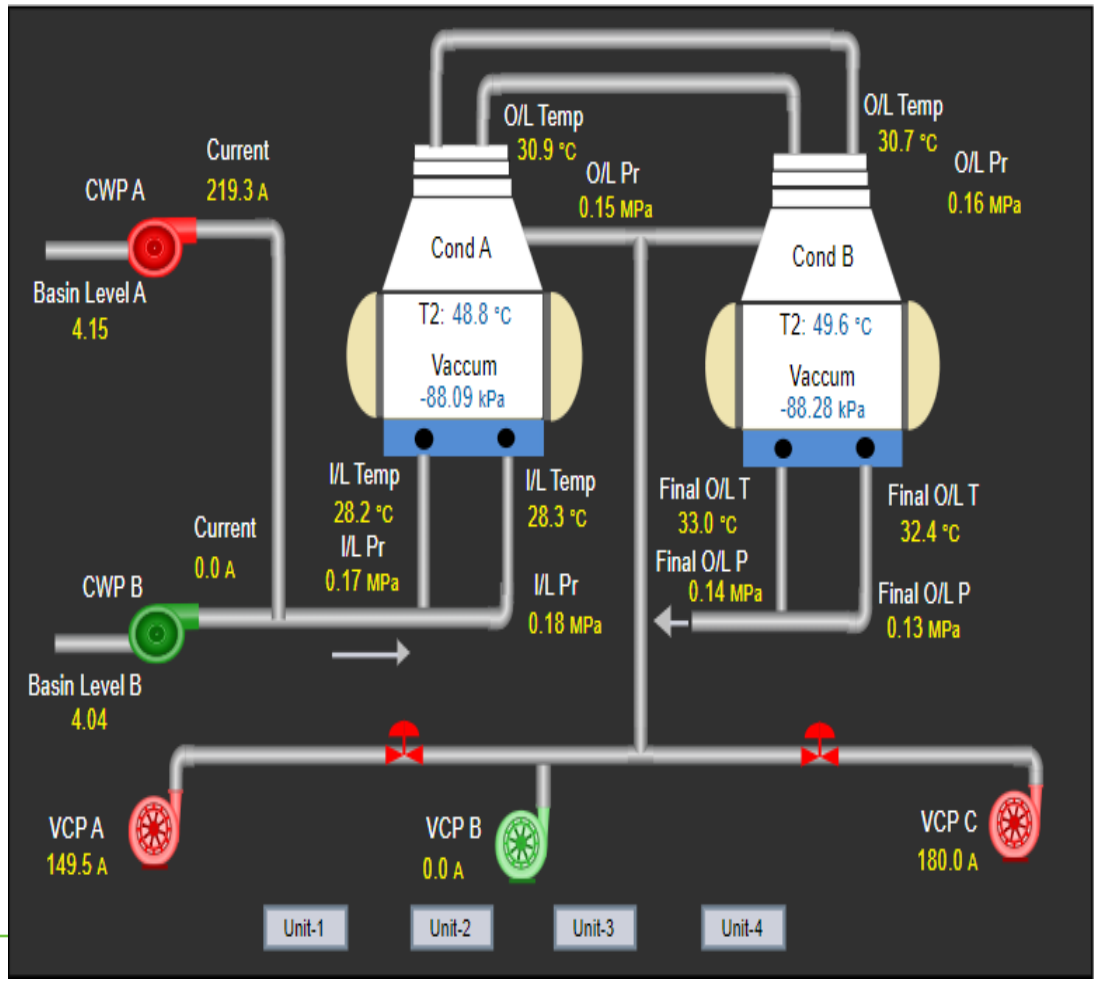
- **~ 4200 tons coal saving per month for 1800 MW**
- **Vacuum pumps operation flexibility sustained**
- **Horizontal deployment for other units**

CWP A Low-speed conversion
Connection Changed from Star to Delta

CW Pump	Before Current (Amps)	After Current (Amps)	Savings (MWh)
1A	282	221	0.92
2A	281	229	0.79
3A	286	224	0.91
4A	300	221	1.21

Total Savings Capability in MW 3.83

Total Savings capability in APC 0.2%



Coal Handling Plant

SAVINGS 43.2 Lacs

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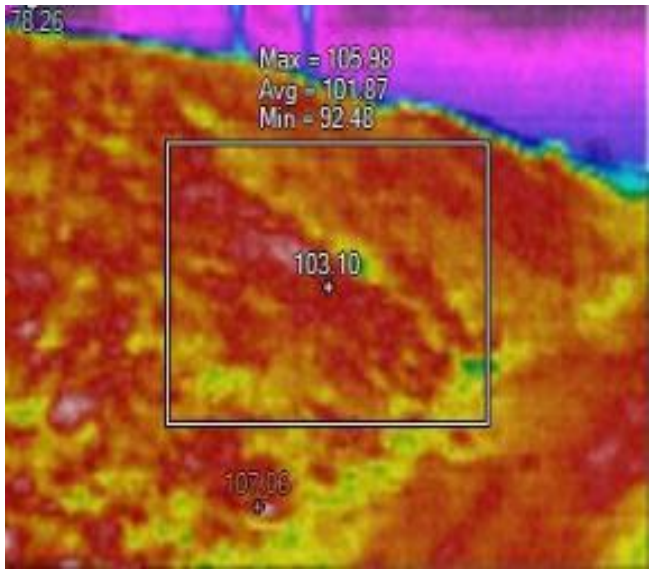
Frequent ignition at Coal heaps

Loss of Calorific Value (GCV)

Chemical and Water consumption of fire fighting line for quenching of smoke

For Stacking of 90KMT Heap Dozer running hour was 10 Hrs/ day for Dozing and Chaining/Compaction of coal



Boiler Area Improvements

PENTHOUSE AIR SEALING

1. High HP vacuum machine used for removal of ash from penthouse, done within 15 days
2. Complete air seal installation in penthouse roof
3. Spray reduction to significant level
4. Eliminated Ash (furnace to penthouse) & air ingress (outside to penthouse).

Vendor : Air seal

Product : Adhesive compound

ELECTROHYDRAULIC BRAKE IN FAN

1. Successful design & commissioning of electrohydraulic brake assembly in ID fan to ensure zero energy in the system

2. high risk reverse rotation hazard in ID fan has been eliminated by the successful commissioning of the brake assembly

Vendor : GM Engineers

Product : Ring Span

MILL GIRTHGEAR SAF MODIFICATION

SAF assembly shifted to Feeder floor from existing 6.9mtr with additional pipe assembly.

1) Effective sealing of Girthgear
2) No frequent failures due to filter chocking, motor tripping, dust accumulation that was faced at previous location.
3) Ease of maintenance of SAF at feeder floor.

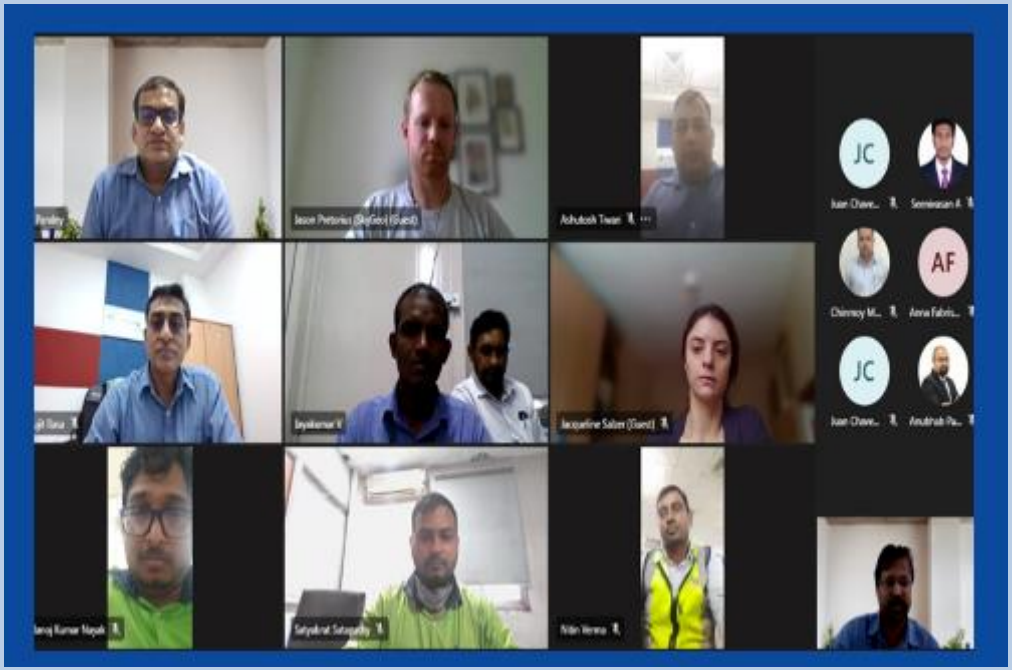
Ash Management

ADVANCED LIGHTNING DETECTION SYSTEM

Installed an advanced lightning detection & protection system in ash dyke to boost safety of employees working in the area. It comes with a protection radius of 110 m and can detect storm activity from 40 km away and can send alerts 3-5 minutes in advance so that employees working in the vicinity can move to safe place.

GO-LIVE INSAR ASH DYKE STABILITY MONITORING

Launched ash dyke monitoring using InSAR, Interferometric synthetic aperture radar technology. This will aid in all weather monitoring of ash ponds monitoring of ash ponds providing site overview, time lapse reporting, statistical data generation along with a range of critical inspection applications. Further, the algorithm feed will facilitate condition analysis of dykes, thereby accelerating decision making for the teams



Instrumentation Improvements

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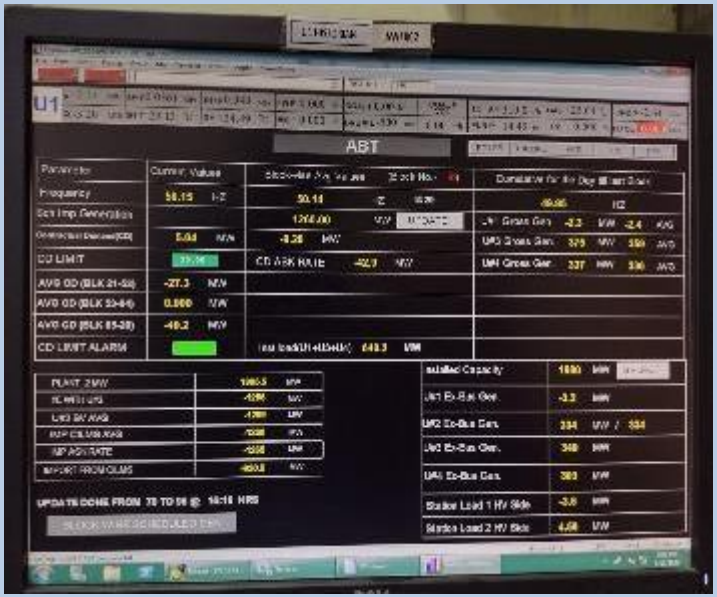
Configuration of Real time parameter monitoring system for Compressor in DCS.
Human machine interface is connected to DCS for online monitoring and analysis

Configuration of Real time Contract Demand monitoring system to control the drawl of power from WESCO
Configuration helps us to keep watch on every time block giving benefit in penalty imposed due to extra drawl



Advancement of control system in Auger and Stacker cum Reclaimer by developing in house SCADA
Early identification & Reduced maintenance time due to alarms configured by team.

Renewable Portfolio

FY	2018-19	2019-20	2020-21	2021-22
RPO Target	768	654	648	741
RPO Achieved	545	407	487	2975

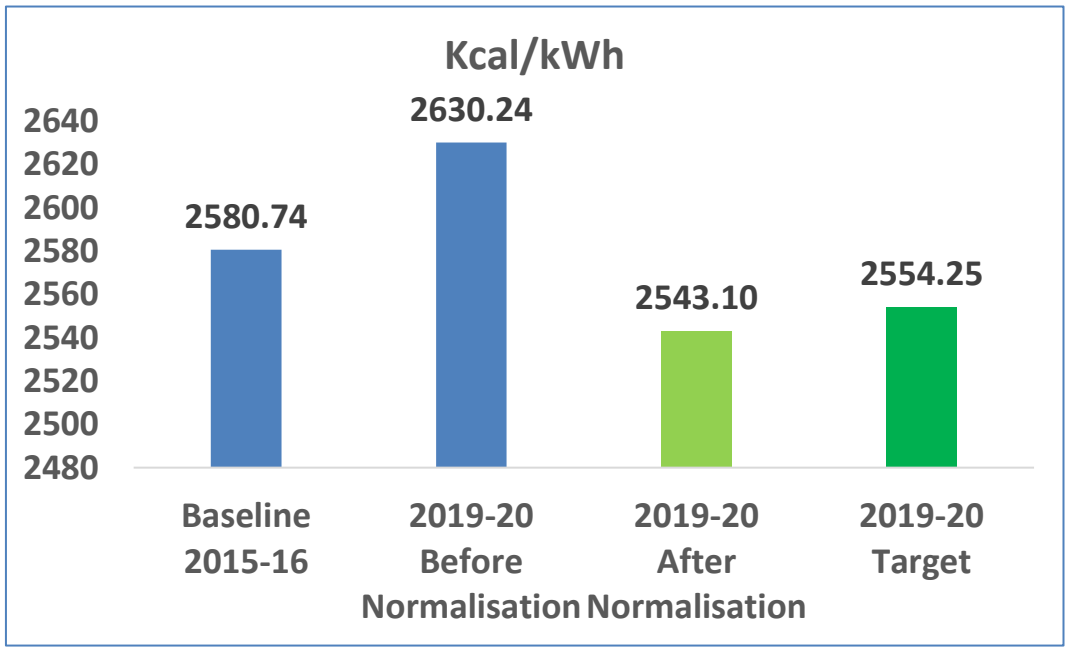
150 MW solar power plant planned at Gudigaon,Jharsuguda. Scheduled to come up by FY 24

Floating solar plant planned to be set up in reservoir by FY 24

PAT Performance

PAT Cycle-3 Performance

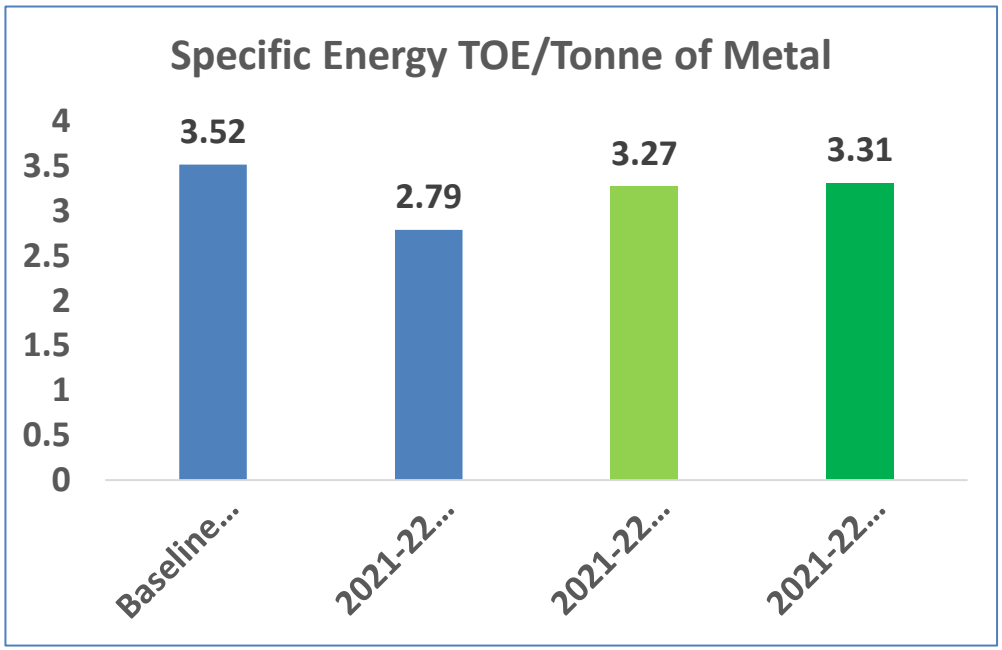
Unit 2 IPP



- **M&V Audit done**
- **3438 Energy saving certificates are realized for 11.15 kcal/kwh**
- **over achievement.**

PAT Cycle-5 Performance

The CPP units 1,3,4 along with aluminium smelter defined as direct customer to BEE



- **Baseline audit of PAT is completed on 7th March 2019. Baseline- 3.52TOE/Tonne of equivalent product.**
- **On 25th March 2019 BEE gave a target of 3.31TOE/Tonne of equivalent product for FY21-22.**
- **13943 Energy saving certificates are realized for 0.0397 TOE/MT over achievement.**

Co2 Emission

Year	Scope 1 Emission (tCO2e)	Scope 2 Emission (tCO2e)	Scope 3 Emission (tCO2e)	Total Emission (tCO2e)
FY 20-21	22893187	802665	377712	24073564
FY 20-21	24437097	510833	323339	25271269
FY-21-22	23895350	1956916	5005928	30858194

Year	Sp. GHG (TCo2e/MT)
FY'20	17.65
FY'21	17.46
FY'22	15.33

Environment Initiative

Battery Operated Forklift

Initiative Description: Deployed 23 Lithium-battery powered electric forklifts Substantially longer life than conventional lead-acid batteries.
Reduction in diesel consumption by over 2.5 lakh liters annually thereby ensuring GHG reduction of approx. 690 TCO2/yr.

Electric Tanker Pilot Project

Initiative Description:
To decarbonize its vehicle fleet, Electric tanker vehicle for transportation of alumina flagged off. It will reduce diesel consumption by 18000 Liters annually/vehicle thereby reducing carbon emissions by ~50 TCO2e per annum.

Lithium-ion Electric Bikes

Initiative Description: Initiative Description: Transformation of petrol-fueled bikes to Electric Bikes. These 4 e-bikes are completely emission-less and will be used by security team for patrolling in plant and township. It will reduce petrol consumption by 2800 Liters annually thereby reducing carbon emissions by ~4 TCO2e per annum.

Environment Initiative

Fixed Mist Canon in Coal Yard

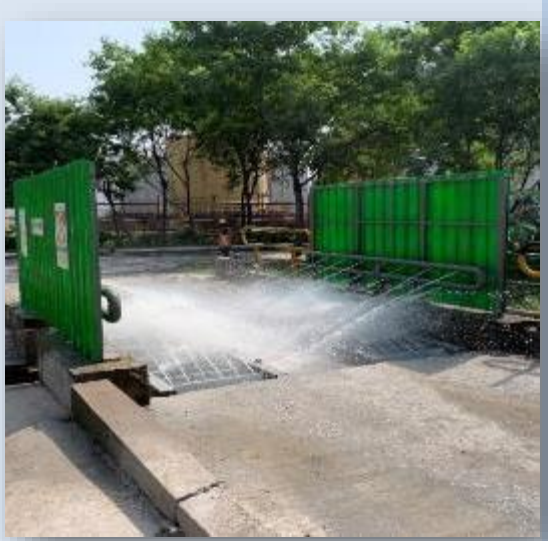
Initiative Description:
Installation of Fixed type mist canon at Coal Handling Plant of 2400 MW TPP resulting in significant improvement in air quality of CHP as well as surrounding areas.

Mobile Mist Cannon

Initiative Description:
Deployment of mobile mist cannons (6000 Liters/vehicle) on the plant roads to reduce fugitive emission from vehicles during transportation.

Wheel Wash System at Main Gate

Initiative Description:
Installation of wheel wash system at Main gate to reduce fugitive emission from vehicles during transportation of ash and coal vehicles



500 m3 ETP at TPP

Initiative Description:
Effluent Treatment Plant (ETP) of 500 m3/hr with RO facility installed for treatment of wastewater and regeneration water from DM Plant.

Way forward

EPRI

Two programs taken on board

- Boiler tube failure reduction
- Heat Rate improvement

Capacity Enhancement

- Upgrading capacity of plant by 160 MW.
- Upgrading 600 MW unit to 640 MW for continuous operation.
- OEM and many other foreign parties partnered for same.

ESG

- VLJ fulfilled its Solar/Non-Solar RPO Obligation & became RPO Free Unit
- Traded 73,375 Nos.(ESCERTS) and contributed in earnings of Rs. 1.82 Cr
- SOFA installation for Nox control
- Committed –Net zero carbon by 2050

Training

- Establishment of Vedanta Skill Assessment & Development Institute
- Partnered with TATA Power for development of institute

Digitalization

- Partnership with Maximl for Digital Shutdown management under the ambit of Project Shikhar
- Coal truck movement online tracking to optimize TAT inside plant
- Partnered with schneider for advance performance control

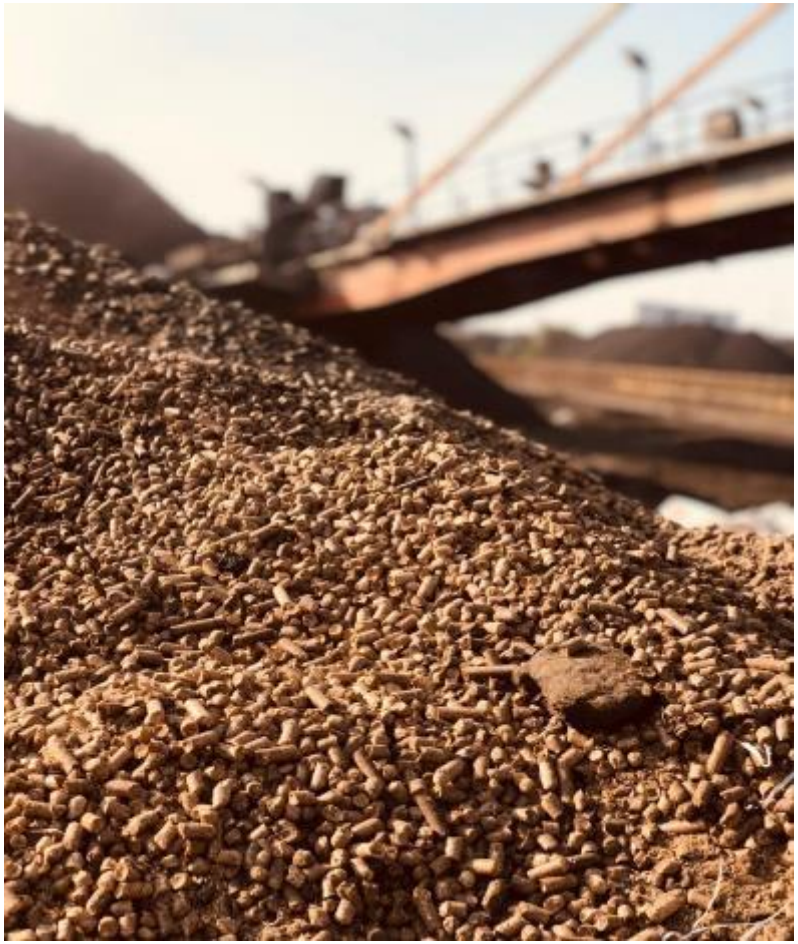
Asset Performance Management

- Partnered with Intertek for project APM, asset performance management
- Aware platform implementation for cloud based performance analysis & assessment
- Aware RT implementation for real time alerts and performance monitoring

Renewable Power – Biomass Co-Firing

200 tons of biomass co-fired in CPP 1215 MW units for the first time in Dec 2019 to check technical feasibility by taking reference from NTPC Dadri. Biomass Co-firing in one of our ESG projects to reduce GHG emission & also Ministry of Power mandates a 5% blend of biomass pellet on annual basis by Oct 22.

Way Forward:- Biomass pellets for 400 T/Month (65 tons received & fired) and 1800 T/month (supply will start from the august end) for CPP 1215 MW as the trial has already been completed.



Digitalization

Vedanta Jharsuguda deploys 3D TRASAR technology for water monitoring

Vedanta Jharsuguda introduced 3D TRASAR technology to monitor critical water parameters at its power plants. The technology will aid in 24X7 data monitoring, automatic data collection, display & storage as well as report generation. Besides ensuring availability of insights for real-time decision making, it will also help in optimizing water usage at our operations.

The technology was inaugurated by Mr. Sunil Kumar Satya (CEO – Power, Aluminium Business) in the presence of Mr. Ashutosh Dwivedi (COO - Power), Mr. Vijay Ingole (Head - TPP), Mr. Abhisek Chakrabarti (CDIO), and Mr. Rajat Jain (Lead – Digital). The on-ground team members include Mr. Sendhil R Kumar, Mr. Rupak Sarkar, and Mr. Hare Krishna Mohanty.

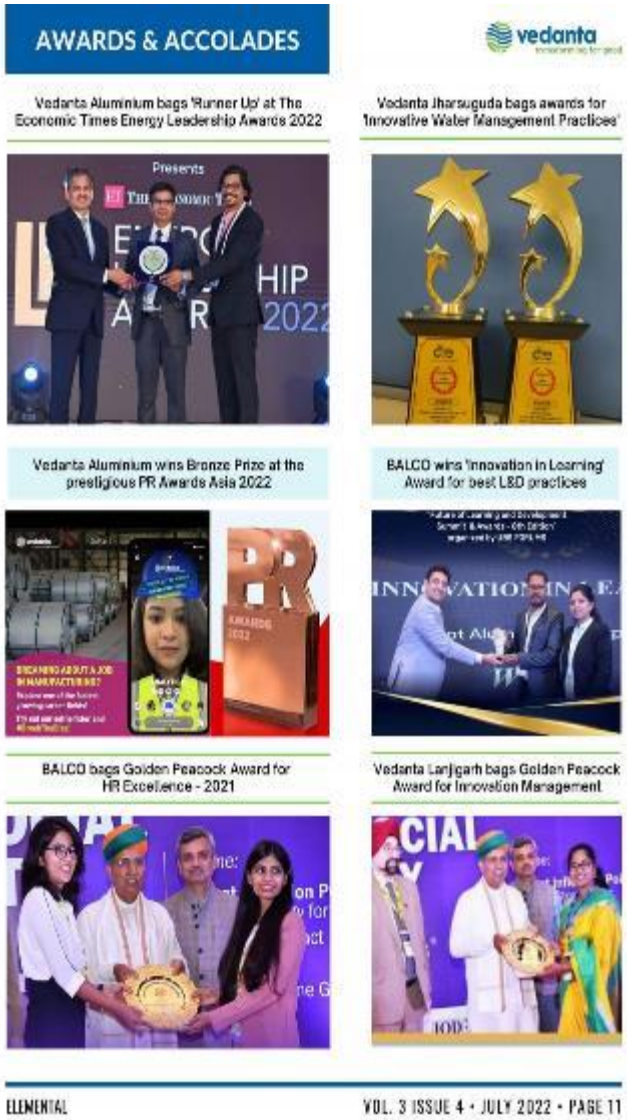
Launch of Digital Logbook

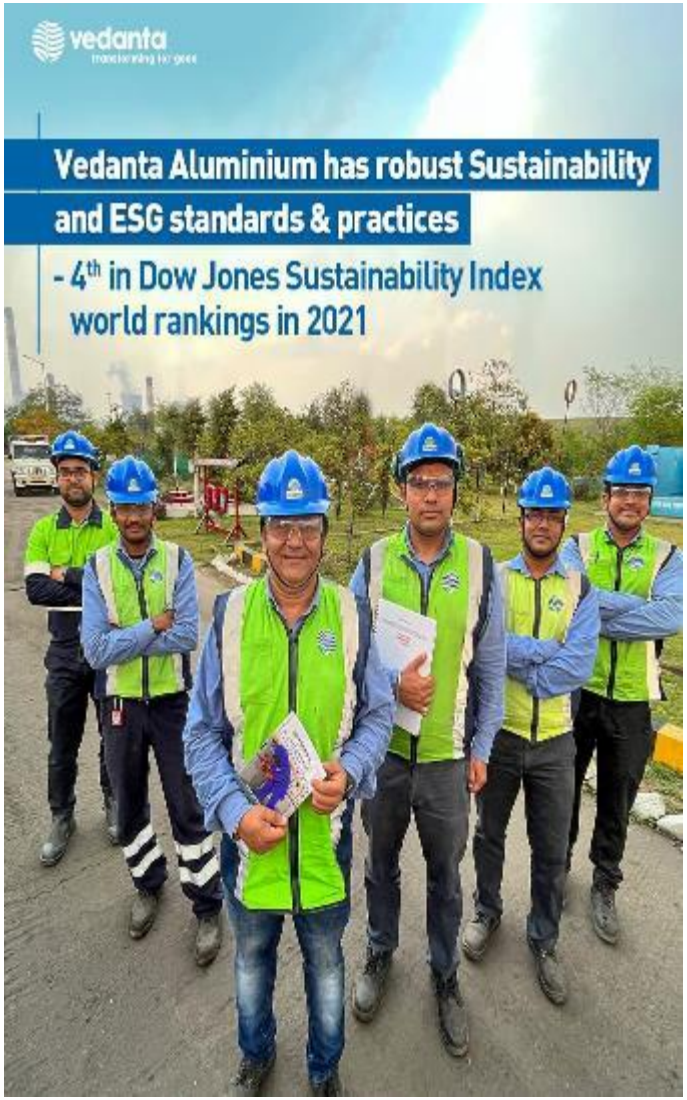
Vedanta Jharsuguda has developed a digital logbook to facilitate auto-creation of defect notifications and geo-fencing of equipment. The SAP-integrated mobile application will introduce a new system of online approval mechanism through the application, along with other features like reduction of non-valuable assets, availability of field readings for failure prediction, health analysis of equipment, and monitoring of field operators' effectiveness.

The E-Logbook was launched by Mr. Ashutosh Dwivedi (COO – Power) and Mr. Abhisek Chakrabarti (Chief Digital and Information Officer - Aluminium Business), who commended the efforts of the Asset Optimization, Operations and Digital teams.

The initiative was driven by **Kalyan Veeraneni, Rupak Sarkar, Sendhil R Kumar, Gayatri Mohanty, and Rajat Jain**.

AWARD & ACCOLADES





Corporate social responsibility

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COMMUNITY DEVELOPMENT

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Lanjigarh's farming community provided with high-quality seeds for growing vegetables

More than 1000 farming households in Lanjigarh were provided with assorted high-quality seeds of vegetables Lady finger, Brinjal, Tomato, Ridge Gourd, Cauliflower, Beans, etc. by us, in partnership with the Odisha Horticulture Department. The increase in agricultural yield is expected to have the two-fold benefit of increasing household income and ensuring better nutrition for the families.

Valediction ceremony for students of skill training program

A valediction ceremony was held for the graduating batch of students under Vedanta Lanjigarh's Skill Training Program, who were enrolled in the housekeeping trade. All trainees have now been upgraded from unskilled category to semi-skilled category, certified by FICCI, and recruited by some of India's top hospitality companies.

5000 students receive bags and stationery for starting school post COVID

In order to encourage students at government schools to return to schools after the pandemic, the bauxite team of Vedanta Aluminium distributed schoolbags and stationery items to more than 5000 Students from 55 Govt Schools in Lanjigarh Block. The initiative is an important step forward in motivating the students in the region to attend school regularly, thereby increasing overall attendance in the schools and enhancing education levels.

Employees volunteer to dig community pond for villagers

Our team at BALCO dug a pond in the Parsakhola village and dedicated it to the community. With ongoing monsoons, the pond will harvest rainwater and store it to help the residents of the village meet their household and agricultural needs. It will also contribute towards improving the region's water table in a gradual manner and maintain the ecological balance.

GREENIFYING THE PLANET

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COMMUNITY DEVELOPMENT

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Employees donate books for children on World Reading Day

On World Reading Day, our employee volunteers conducted interactive reading sessions at various Nand Ghars across Jharsuguda to promote the habit of reading among children. Our employees also donated books for the creation of mini-libraries at our Nand Ghars. The World Reading Day is celebrated globally and is an opportunity to inculcate reading as a regular practice among children and adults alike.

Vedanta Volleyball Tournament at Koraput sees 16 teams battle for glory

We facilitated a community volleyball tournament at Kakriguma, Koraput, which saw participation of 16 talented teams from across the district. The tournament saw community leaders, district administration and local public come together with our Bauxite division team for encouraging sporting culture among the region's youth.

Cancer screening camp in Koraput garners huge footfall

We organised a Cancer Screening Camp at the District Headquarters Hospital in Jeypore, Koraput, in partnership with BALCO Medical Centre (BMC). Hundreds of people from Koraput and nearby districts, including the patients of district hospital visited the camp for consultations. Potential patients were referred to BMC for further consultations and hassle-free treatment under several govt schemes.

World No-Tobacco Day: anti-smoking campaign to raise awareness

On World No Tobacco Day, our Lanjigarh team conducted an awareness program for local communities in line with the theme 'Tobacco is killing us and our planet'. The campaign saw community leaders from medical, social, and political fields come together to sensitize the public on the subject. A village-level rally saw school children and community members join to spread awareness on ill effects of smoking.

Digitization, Innovation & Operational excellence

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DIGITAL & INNOVATION

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Video analytics solution at Coal Handling Plant (CHP)

Vedanta Jharsuguda has launched a video analytics solution for assessing truck movement within the Coal Handling Plant (CHP) at in our 0.5 MTPA plant area. The solution will enable supervisors in the CHP control room to track the exact movement of trucks in the tippler and parking area, monitoring the vehicle's idle time and facilitating proactive decision making.

Thermo-gravimetric Analyzer (TGA) for proximate analysis of coal

We have deployed Thermogravimetric Analyzer (TGA), an advanced automation solution for proximate analysis of coal samples. It will introduce several advanced technologies such as Sulphur Analyzer and GPS tracking of sampling vehicles.

App-based Process Audit Score-Cards for paperless audit and reporting

Process audit scores signify process healthiness and are essential to asset optimization. Upon identifying the opportunity to make it paperless through digitalization and reduce time consumed in reporting, our Process and Digital teams created a mobile and web application for daily audit report entry, automated logic-based reports, automatic emails for real-time tracking, automated root cause analysis vizualization, and more.

Asset Performance Management (APM) for Power Plants

Vedanta Jharsuguda has deployed Asset Performance Management to manage all critical power plant assets in the boiler, turbine and generator area. APM embraces data capture, integration, visualization, and analytics tied together for improving the reliability and availability of physical assets. Its main functional pillars are Health, Reliability, Strategy, Integrity and Safety which can be used independently or together to provide a comprehensive approach to asset and O&M management.

WE ARE 'GREAT PLACE TO WORK' CERTIFIED!

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EXCELLENT ENERGY EFFICIENT UNIT – SINCE 2013

ENCON PROJECTS-2022-23

2022-23

- Green power(RE)
- Installation of VFD Drives
- Addition of New CT Cells
- Recommendation of Energy Audit
- Solar & LED Lighting
- Vapour Absorption Chiller
- Energy efficient Motor replacement
- CT fills replacement

Celebrating Diversity & Inclusion with PRIDE

Thank You...