GMR KAMALANGA ENERGY LTD

8th Edition National award for Environmental Best Practices 2021

Presenting by :
1. Balakrushna Boodida, Associate Mgr - OS&E
2. Pravind Shah, Manager - EHS

A journey towards Operational Excellence

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GMR AT A GLANCE

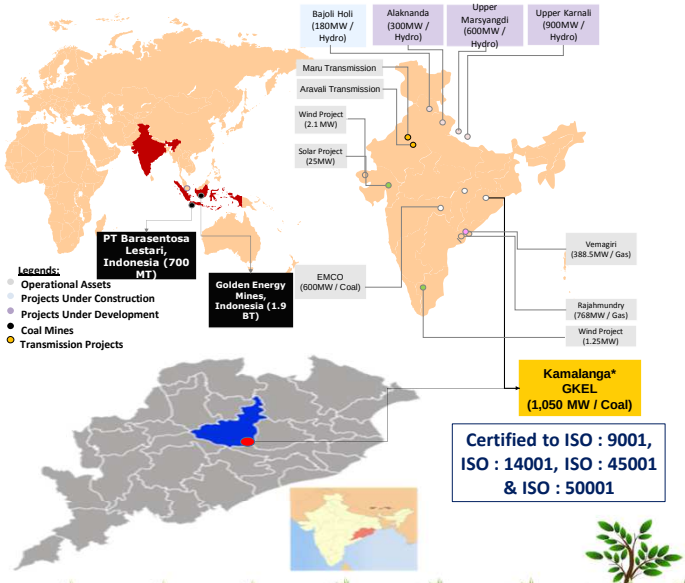
- Delhi Intl. Airport (PAX Cap. 70 mn, India's Largest)
- Hyderabad Intl. Airport (PAX Cap. 15 mn, 1st PPP in India)
- Mopa Intl. Airport (Greenfield Airport- Under construction)
- Bhogapuram Intl. Airport (Greenfield Airport- Under Master Planning)
- Macetan Cebu Intl. Airport (Philippines) (PAX Cap. 16 mn, 2nd Busiest in Philippines)

Special Investment Region – 3,300 acres at Hosur, Krishnagiri, Tamilnadu

Port based Special Investment Region, - 10,500 acres at Kakinada, Andhra Pradesh

- Assets under Operation: 2760 MW
- Assets Under Implementation: 2557 MW
- Transmission Lines in Operation: 350 km, 2 Assets
- Coal Mines: Reserves of 2748 mn tons, 4 Assets in India & Indonesia

- Assets in Operation (Annuity): 284 kms, 4 Assets
- Assets in Operation (Toll): 446 kms, 5 Assets



Certified to ISO : 9001, ISO : 14001, ISO : 45001 & ISO : 50001

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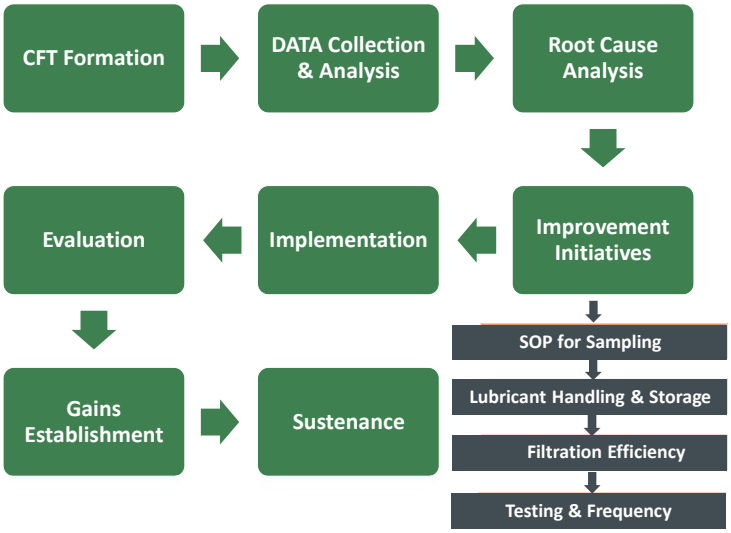
TITLE OF THE PROJECT : "Reduction in lube oil consumption for resource conservation"

PFD



Details of the Project:

Lube oil is a mineral/Synthetic oil and consumption of lube oil results in Universal Resources depletion. Strategic objective taken for maintenance department to reduce 25% of lube oil consumption by 2021. CFT formed to brainstorm on oil consumption reduction opportunity. Followings factors are assessed –

- ❖ Elimination of contamination by RCA.
- ❖ Quality assessment and condition based replacement.
- ❖ Improvement in filtration methodology
- ❖ Improvement in oil storing and handling.
- ❖ Life cycle cost assessment of lubricants

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TRIGGER POINT:

MOOG Valve Failure in Hydraulic System

Root Cause Analysis

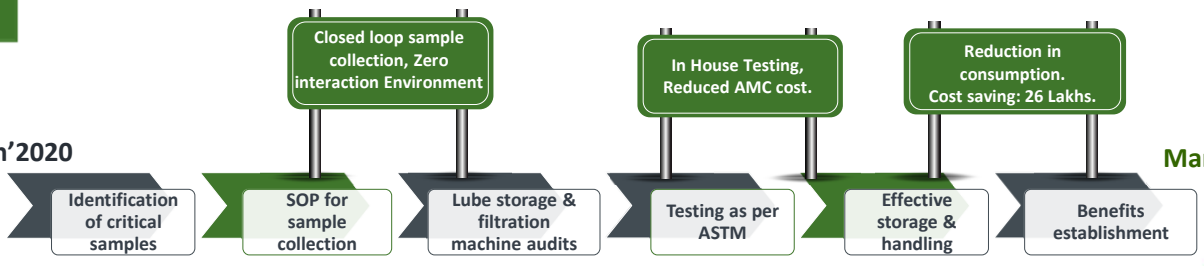
Hyd Oil NAS quality Improvement

"ABIRAL"

CFT Formation with an Objective of "Lube oil quality Improvement & Reduction in Consumption" driven from Top management and execution by respective department's

Uniqueness Of the project:

- ❖ Guide lines from International Council for Machinery Lubrication(ICML) & ISO 55001.
- ❖ Contamination elimination through best practices.
- ❖ Right & effective filtration Systems.
- ❖ Lube storage & handling as per NLGI standards.
- ❖ Implementation of Lubrication Identification System(LIS).
- ❖ 5'S driven Activities.



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APPROACH & ASSESSMENT:

RCA

- Trend Analysis
- Identification of Causes for Contamination
- Causes of frequent leakages.
- Analysis on lubricant rationalization

CBM

- Periodical audits with recommendations
- Viscosity, TAN, Moisture, NAS monitoring
- WPA (Wear Particle Analysis)
- Testing Frequency
- Testing based on physical Appearance

METHOD

- Effective SOP for sampling
- Right filtration techniques
- Customised filtration.
- Periodical audits of ELC & LVDH machines and upkeep
- Condition based oil replacement instead of Running Hours basis.
- SAP notification against Marginal

STORAGE

- Centralise Lubricant Storage
- Awareness session on Handling
- .Dispensing as per real time requirement
- .Lubricant Identification System(LIS).

Informatory Note: The National Oceanic and Atmospheric Administration (NOAA) estimates more than 2653,000 KL of petroleum products enter the environment each year

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CHALLENGES Vs ACTIONS

Technical

- Oil compatibility studies.
- Non standard sample collection.
- Consolidation of Test Results.

Administrative

- Non standard oil top up containers.
- Sub storage yards
- Lack of effective lube hardware .

Maintenance

- ELC machines Upkeep
- ELC/LVDH machine spares
- OEM support

- Identification & validation of list samples from Dept.
- Oil Testing Schedule in SAP & Grade wise critical equipment finalized.
- Effective SOP Prepared for Sampling.
- Filtration machines audit with Proper check list.
- Awareness to service providers & Lubricant handling team provided.
- Training on Oil Sample collection & analysis by supplier arranged.
- Hand Vacuum Pump , bottles & pipe for sample collection procured.
- Critical Machinery Results Analysis.
- Grade wise lubricants consolidation.
- Rationalization of lubricant oils.
- Colour coded oil transporting containers procurement.

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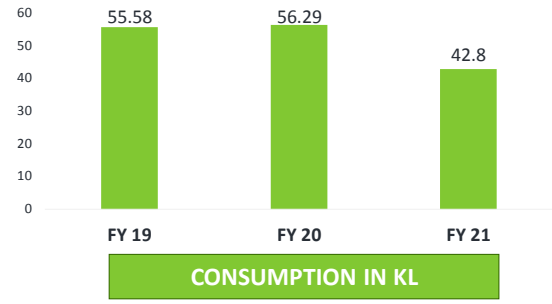
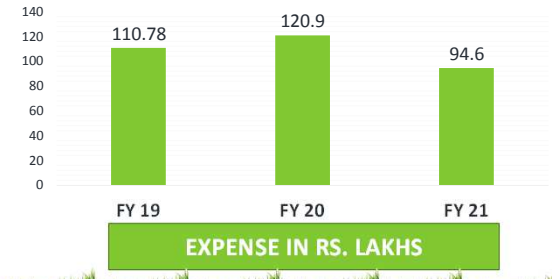
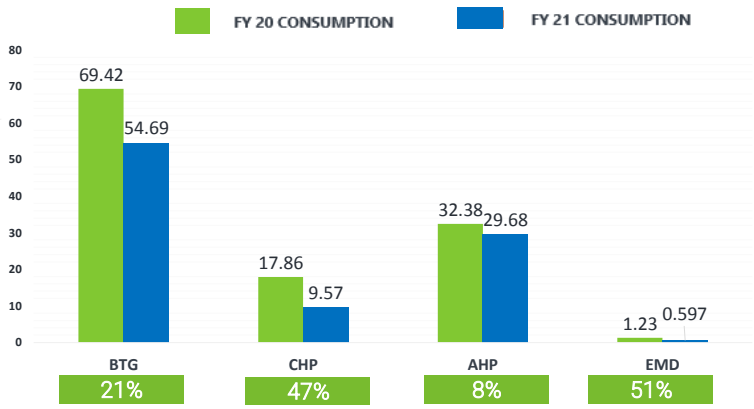
TANGIBLE BENEFITS: **Consumption reduced by 13.49 KL (24%) with 26 Lakhs cost benefit**







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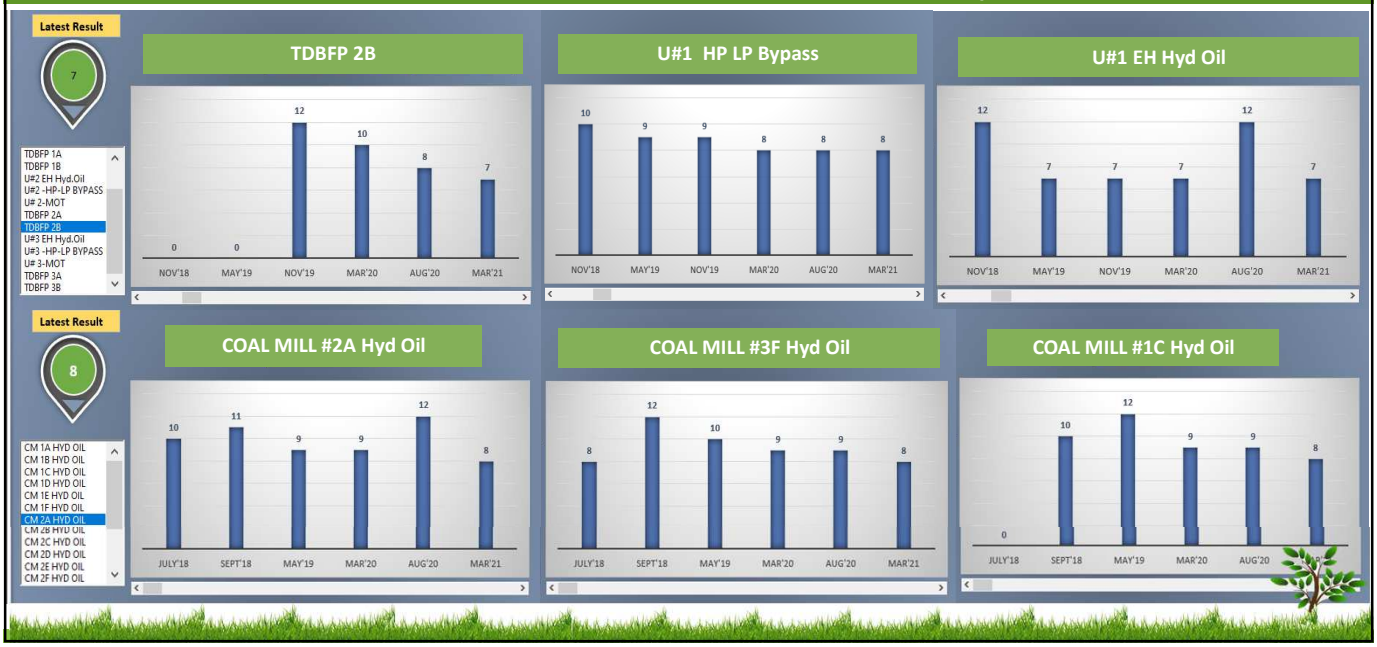
TANGIBLE BENEFITS: **Lube oil cleanliness increased(NAS 12 to NAS 7 as per NAS 1638)**



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INTANGIBLE BENEFITS:

1. Easy handling of lubricants with less efforts.
2. No direct contact with lubricants.
3. 13.49 KL worth natural resources depletion reduced.
4. Spill free area by arresting leakages.
5. Soil Contamination prevented.

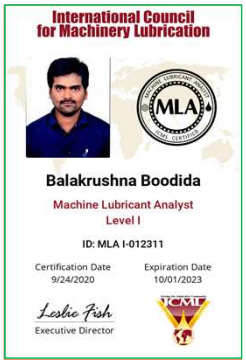
01

People/Society benefits

1. SPOT award for zero leakages zones.
2. Successfully registered GKEL name on ICML platform.

02

Moral/Motivation



03

Skill Upgradation

1. Cross contamination chances made to zero.
2. Grade wise consumption trends.
3. 5"s adherence to storage yards.
4. Reduction in waste/used oil generation.
5. Reduction in carbon emissions.

04

Development

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IMPROVEMENT INITIATIVES :

TURBINE 28%

- Intalled customised 4 stage oil filtration skid for HP-LP bypass oil (FYRQUEL EHC+) circuit.
- Process improvement in ELC Filtration helped reduce Turbine oil (Mobil DTE 732) cons. by 2.9 KL.
- Pall Sentry Acid Removal System installed in U#2 EH oil circuit. EH oil Cosnsumption reduced from 0.92 KL to 0.23 KL.

BOILER 28%

- Introduced condition based replacement for Coal Mill Gear Box Oil (Shell Omala S2G 460).
- Oil quality deterioration observed in 15K to 16K running hours in line with OEM life of 15K.
- Coal dust ingression arrested. Desiccant breathers installed.
- Process improvement through effective filtration made to maintain lubricant characteristics.
- Periodic oil sample testing and ELC machine health assessment through checklist.
- Running Hours increased to 28K-30K and oil consumption reduction from 3.97 KL to 2.92 KL

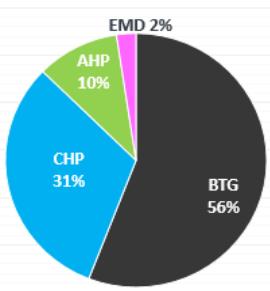
CHP 31%

- ELC filtration machines periodic audits and filter paper replacement.
- Wagon tippler and stacker Hyd pack fully protected from dust and breathers installed.
- Fugitive dust emission controlled near luffing stacker hydraulic packs.
- Coal dust leakages arrested to avoid foreign dust ingression.

AHP 10%

- Replacement of Compressor Oil by OEM (GD-AEON 46) with Shell Oil (Corena S4 R 46)
- Oil life increased from 6000 hrs to 8000 hrs. Cost of Shell Oil cheaper by 212 Rs/Litre

Financial contribution percentage



It is having potential to replicate in any industry where multiple grades of lubricants are handled. Since the concept is very simple and requires some suitable low cost arrangements and process standardisation & can be implemented in all sectors like power, steel, cement & paper etc.

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BEST PRACTICES:

Sample Collection

Lube storage Shed

Oil Transport Containers

Desiccant Breathers

TECHNOLOGY ADOPTED :

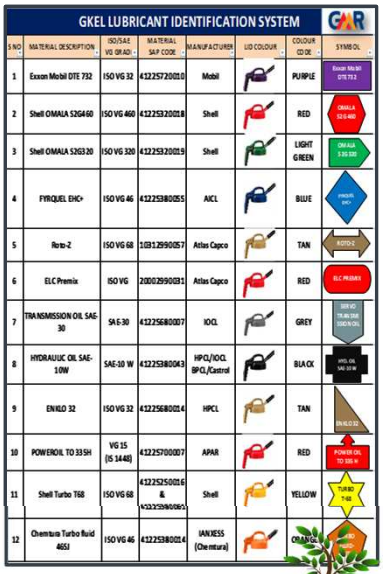
4 stage filtration

Acid removal system

ELC audits

Cylinder Boot

Online NAS Monitoring



GKEL LUBRICANT IDENTIFICATION SYSTEM

S NO	MATERIAL DESCRIPTION	ISO/SAE VG GRADE	MATERIAL SAP CODE	MANUFACTURER	LID COLOUR	COLOUR CODE	SYMBOL
1	Exxon Mobil DTE 732	ISO VG 32	4122572001	Mobil		PURPLE	
2	Shell OMALA S2G460	ISO VG 460	4122532001	Shell		RED	
3	Shell OMALA S2G320	ISO VG 320	4122532001	Shell		LIGHT GREEN	
4	FYRQUEL EHC+	ISO VG 46	4122538005	AICL		BLUE	
5	Roto-Z	ISO VG 68	1G312990057	Atlas Copco		TAN	
6	ELC Premix	ISO VG	2000299001	Atlas Copco		RED	
7	TRANSMISSION OIL SAE-30	SAE-30	4122568007	IOCL		GREY	
8	HYDRAULIC OIL SAE-10W	SAE-10 W	4122538004	HPCL/IOCL BPCL/Castrol		BLACK	
9	ENKLO 32	ISO VG 32	4122568001	HPCL		TAN	
10	POWEROIL TO 335H	VG 15 (IS 1448)	4122570000	APAR		RED	
11	Shell Turbo T68	ISO VG 68	4122525001 & 4122539001	Shell		YELLOW	
12	Chemtura Turbo fluid 4651	ISO VG 46	4122538001	LANXESS (Chemtura)		ORANGE	

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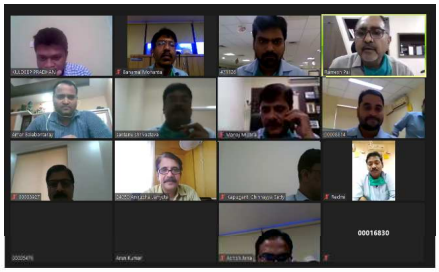
KNOWLEDGE SHARING PLATFORMS: (INTERNAL AND EXTERNAL)



Content of the work shop/KSS:

- Implementation of Lubrication programme development
- Best oil storage & dispensing practices through Master lubrication room.
- OFI in lubrication management at GKEL
- Internal Vs External Lab results explored .
- Discussed outcomes of CFT points
- Best practises in lube handling & storage

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PRIORITY PLANS AND ACTIVITIES:

S.No	Description of the Task	Category	Responsibility	Resources
1	Implementation & construction of "Central Lubricant Storage" at central store as per NLGI Std.	Storage & Handling	H-Stores/H-Civil/ /All Depts.	Room construction completed. Oil can's PO released. Other Tools yet to be reviewed.
2	Procurements of Tools for Lubricant Storage room like drum pumps, with colour identification for store			
3	Trail to be taken by Replacing ENKLO 100 with ENKLO 68 at one non critical equipment.	Rationalisation of Lubricants	H-AHP &H-CHP	Waiting for opportunity take trail
4	Trail to be taken by Replacing Shell Omala S2G150 with Shell Omala S2G220 at one non critical equipment.		H-MMD	
5	Trail to be taken by Replacing CAT DEO C14 15W40 with engine oil 15W40		H-CHP	
6	Procurement of Desiccant Breathers for all Storage oil drums.	Reliability Improvement	All Depts.	Budget allocated/vendor identification in progress
7	Procurement of BS &W sight glasses for all gear boxes		All Depts.	
8	Procurement of Condition Monitoring POD for all critical Mill Gear Boxes and TG area application		H-MMD	
9	Installation of Single Point Lubricators in critical applications like crusher bearings		H-CHP	SIP raised/ in progress

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Way forward:

01
Condition Monitoring POD

02
Master lubricant room

03
Transport container and stand

04
Bottom Sedimentation Bowl

05
Lubrication TAGS

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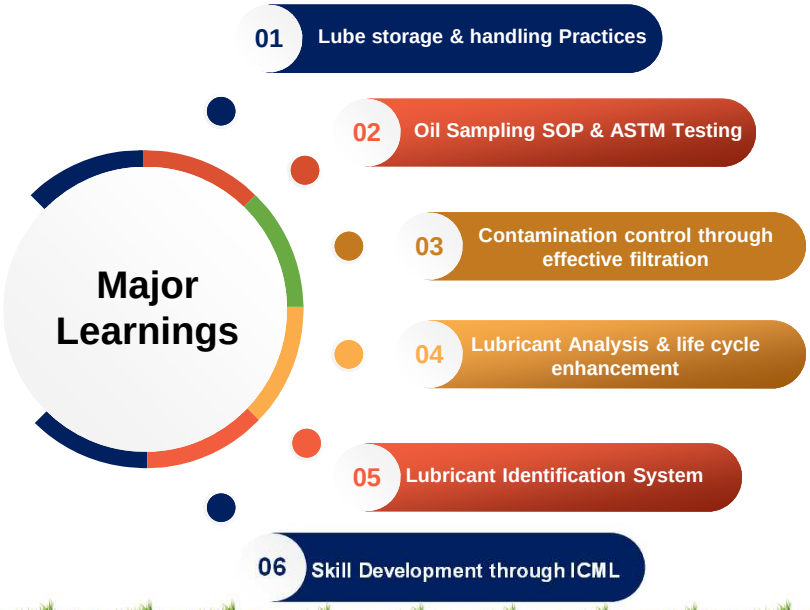
MAJOR LEARNINGS:



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ENVIRONMENTAL PERFORMANANCE EVALUATION (EPE)

MPI - ENVIRONMENTAL COST/EXPENDITURES (Rs in Lakhs)

Sl	Environmental Cost	Capital Investment till Mar' 21	Recurring Expenses		
			2018-19	2019-20	2020-21
1	Water Pollution	5956.27	20.93	4.81	10.94
2	Air Pollution	25321.9	623.18	115.03	340.09
3	Waste Management	7511.79	2211.25	3013.69	5592.96
4	Green Belt Development	508.76	108.49	134.86	117.39
5	Environment Monitoring	36.11	30.29	35.83	37.90
6	Plant Housekeeping & Water sprinkling on Plant Roads	-	115.47	87.77	127.15
7	Env. Studies /Consultancy Charges	-	5.39	7.94	3.41
8	Statutory Fee (CTO/CTE/PLI etc.)	-	33.25	34.22	33.33
9	Env. Awareness -'WED, WWD, Earth Day etc.	-	1.28	3.74	4.00
	Total (Amount in Lakh Rs.) =	39334.83	3149.53	3437.89	6267.16

OPERATIONAL/ENVIRONMENTAL PERFORMANCE INDICATOR (OPI /EPI)

Sl	Parameters	2018-19	2019-20	2020-21
1	Plant Load Factor (PLF in %)	72.7	63.59	77.12
2	Coal Consumption (kg/kWh)	0.72	0.73	0.73
3	Oil Consumption (LDO) in ml/kWh	0.21	0.16	0.1
4	Electricity Consumption (Aux. Power in %)	6.83	7.34	6.68
5	Total Energy Used/unit of product (in MJ/kWh)	10.47	10.44	10.42
6	Sp. GHG Emission -Scope-1,2&3 ($^tCO_2$/MWh)	0.952	0.953	0.947
7	Sp. PM emission (g/kWh)	0.280	0.168	0.081
8	Sp. SO_2 emission (g/kWh)	7.105	6.657	2.744
9	Sp. NOx Emission (g/kWh)	1.807	1.626	0.648
10	Sp. Hg Emission (g/kWh)	0.00016	0.00012	0.00004
11	Sp. Water Consumption (m^3/MWh)	2.59	2.58	2.28
12	Sp. Waste water Generation (m^3/MWh)	0.087	0.067	0.056

Note:-

1. Waste water is being reused after suitable treatment and maintained Zero Liquide Discharge.
2. 14 KL lube oil conservation have positive impact on CO_2 emission reduction potential of 367 MT.

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ENVIRONMENTAL PERFORMANANCE EVALUATION (EPE)

ENVIRONMENTAL CONDITION - AIR QUALITY INDEX & GREENBELT

Year wise tree plantation detail	
Years	Nos.
FY 2012-13	17000
FY 2013-14	25000
FY 2014-15	43000
FY 2015-16	83728
FY 2016-17	50157
FY 2017-18	46441
FY 2018-19	43633
FY 2019-20	25227
FY 2020-21	7213
Total Plantation	3,88,797

Mass Plantation -
2016 : 2500 saplings in 1380 seconds
2017 : 5000 saplings in 1200 seconds
2018 : 7000 saplings in 1980 seconds
2019 : 8000 saplings in 1965 seconds

Sapling Distribution –
We have distributed/planted 23015 Saplings (Forest & Fruit) in the community.




Area	Year/ Station	2018-19	2019-20	2020-21
CORE ZONE	AQMS-1	65	60	60
	AQMS-2	67	61	58
	AQMS-3	70	61	64
	AVERAGE	68	61	61
BUFFER ZONE	AQMS-1	47	55	52
	AQMS-2	43	47	50
	AQMS-3	50	50	50
	AQMS-4	44	47	48
	AVERAGE	46	50	50

AQI SCALE CPCB			
Good (0–50)	Satisfactory (51–100)	Moderate (101–200)	
Poor (201–300)	Very Poor (301–400)	Severe (>401)	

3.89 Lakh Plantation contribute carbon offset of 7698.2 $tCO_2^{eq.}$ annually

BEST PRACTICES – PLANTATION 357 Ac. & LAND SCAPE 35 Ac. ORGANIC FARMING 2 Ac. IN TOWNSHIP

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LEADERS SPEAK

"Be a Performance Warrior to achieve the organisational Goals & Objectives"

- Shri Ramesh R Pai
Chief Operating Officer

LEADERS SPEAK

"Quality Enhancement is the key factor for O&M Cost reduction"

- Shri Manoj Mishra
Head-O&M

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