ENERGY CONSERVATION & MANAGEMENT

CENTRAL WORKSHOP, SOUTHERN RAILWAY, PONMALAI,TRICHY,TAMILNADU

SHYAMADHAR RAM
Chief Workshop Manager

SACHIN KUMAR
Senior Electrical Engineer & Energy Manager

COMPANY PROFILE

(2020-21)

571 WAGONS

1 STEAM LOCO

1146 COACHES

65 DIESEL LOCOS

4070 EMPLOYEES

MAXIMUM ENERGY DEMAND 2400KVA

MAJOR PROCESS EQUIPMENTS

BAKING OVEN

DIESEL FIRED FURNACE

AIR COMPRESSORS

WELDING PLANTS

MULTISTATION HORIZONTAL DRILLING & BORING MACHINES

CNC PLASMA MACHINES

ACETYLENE CUTTING

LPG CUTTING

IMPACT OF COVID 19

- **No impact on overall outturn due to COVID**

Annual Production /POH Outturn of 1783 achieved against the Target of 1493 fixed by HQ & Railway Board

Apart from making up loss of outturn due to Covid lockdown, this workshop has given 19.42% extra outturn

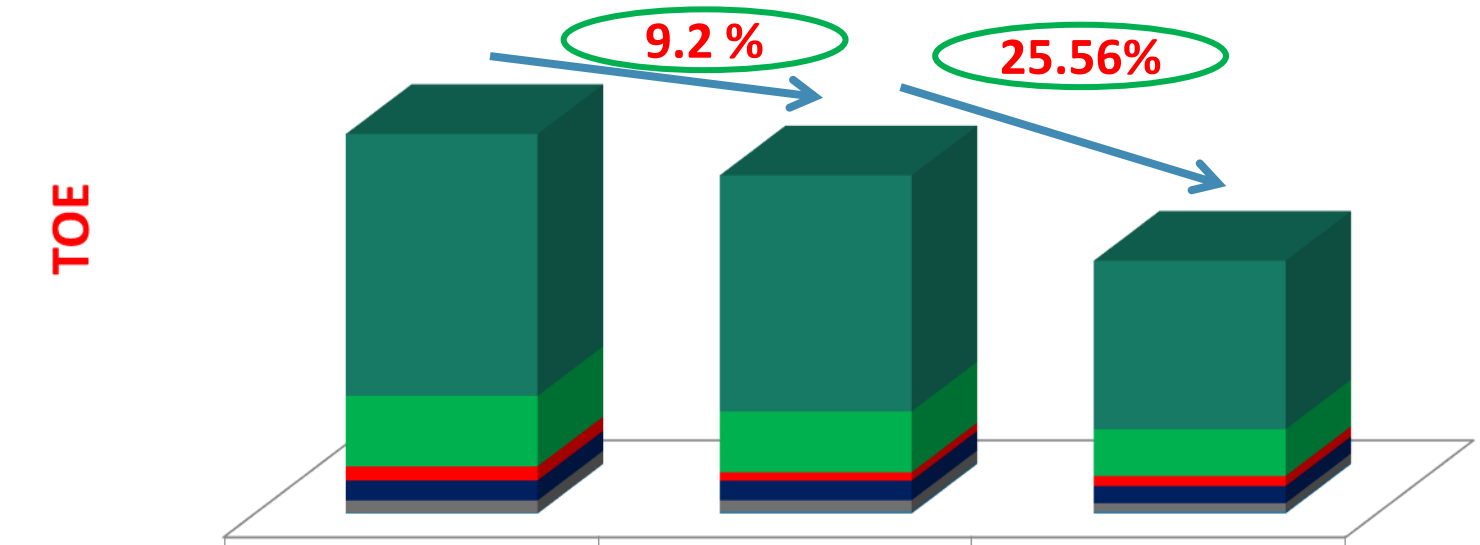
- **Impact on Specific Energy Consumption (2020 – 21) :**

SEC (MToE/Ton of Product) decreased by 25.6 % when compared with 2019 - 20

- **Measures taken to address the challenges (2020 – 21) :**

- Reviewing the Outturn Performance on weekly basis to refix the intermittent Targets
- Redeployment of Work force to the needy areas
- Reducing the Energy Consumption by micro level monitoring during Performance Review Meeting
- Conducting Interactive Sessions at Shop Floor by CWM for creating awareness about COVID – 19 to ensure availability of Work force.

TOE OF VARIOUS ENERGY SOURCES



	2018-19	2019-20	2020-21
ELECTRCITY	446	402	287
HSD OIL	119.9	103.8	79.64
FURNANCE OIL	24.01	14.25	17.29
ACETYLENE	34.1	33.3	29
CUTTING GAS	20.33	18.55	13.61
COKE	2.1	4.2	4.2

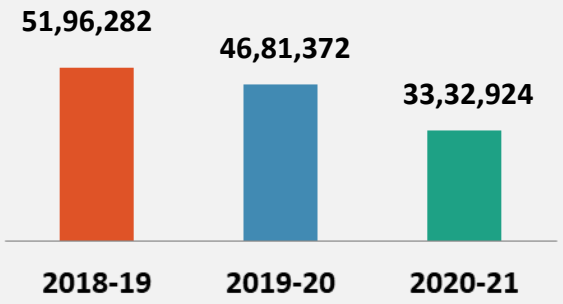
2018 - 19
638 TOE

2019-20
579 TOE

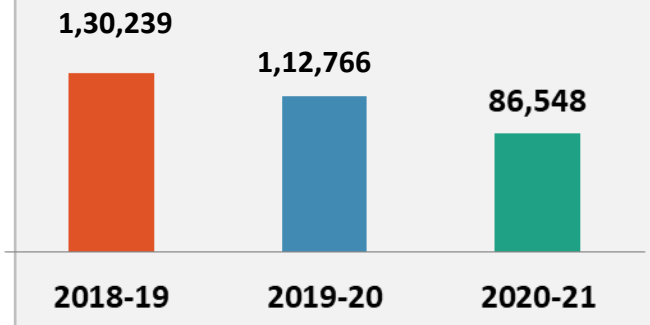
2020-21
431 TOE

CONSUMPTION TREND OF ENERGY SOURCES- LAST 3 YRS

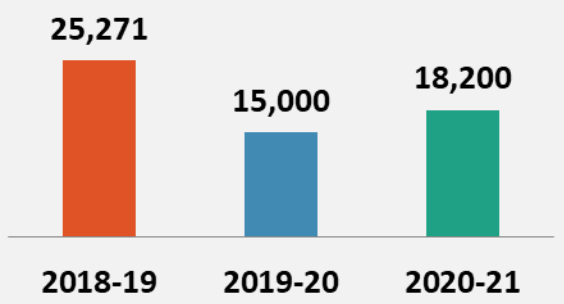
ELECTRICITY IN KWH



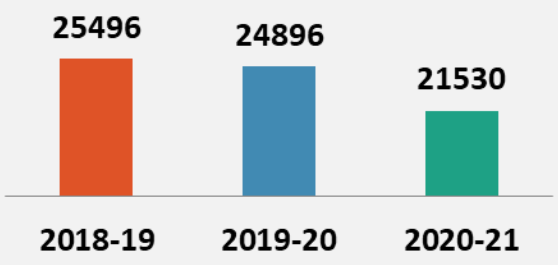
HSD IN LITRES



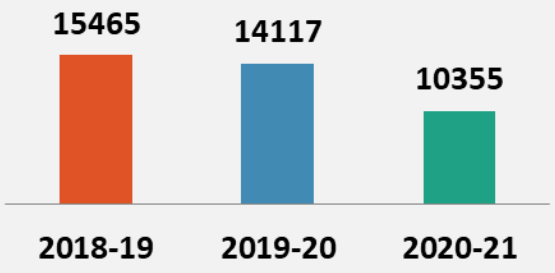
FURNANCE OIL IN LITRES



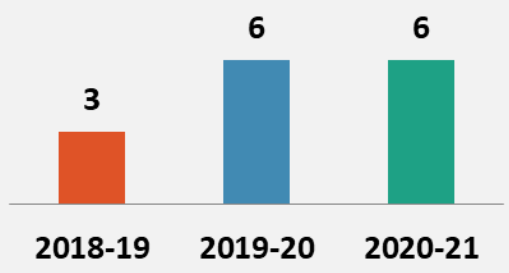
ACETYLENE IN CUBIC METRE



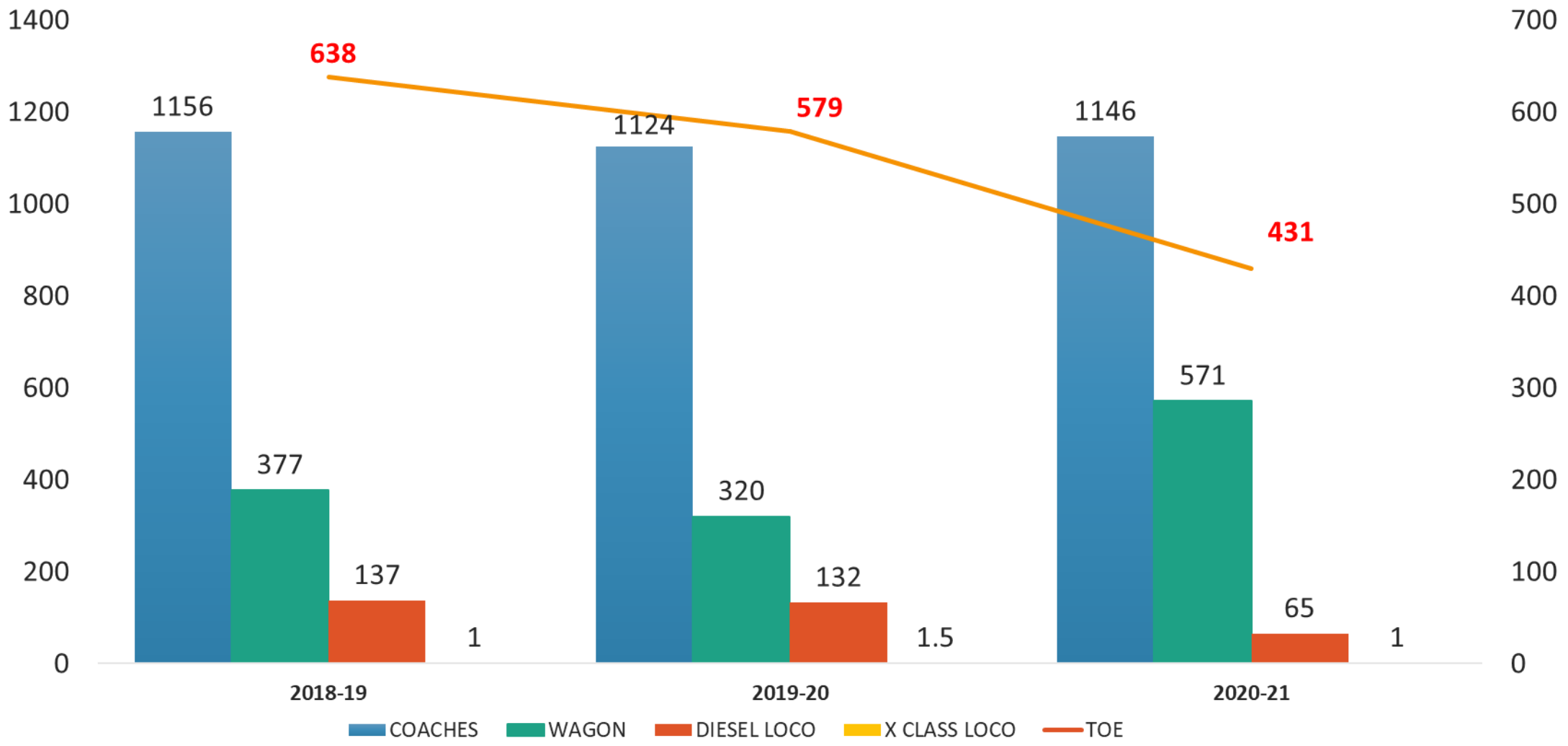
CUTTING GAS IN KGS



COKE IN TONNES

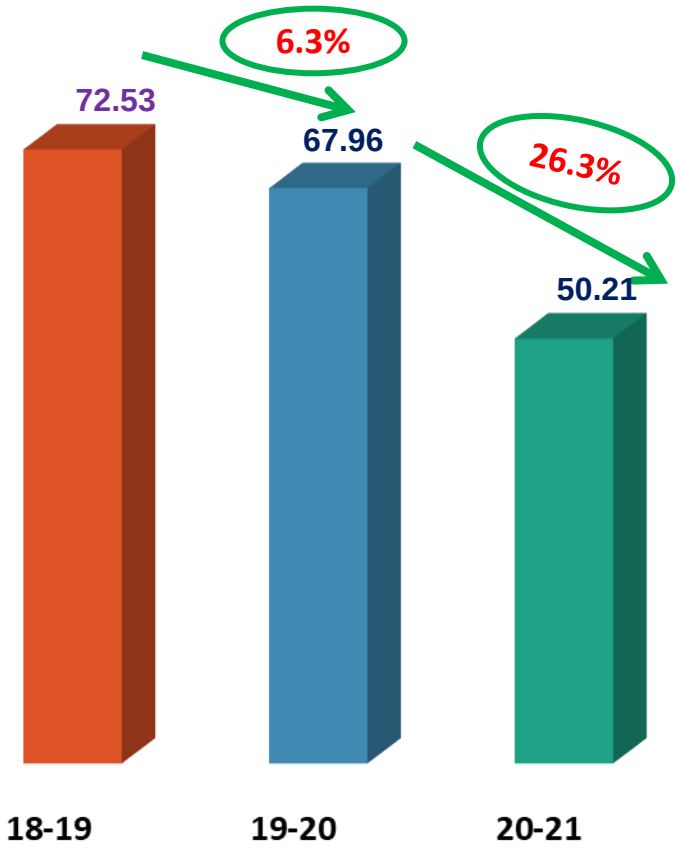


OUT TURN Vs ENERGY CONSUMPTION TREND LAST 3 YRS



SPECIFIC ELECTRICAL ENERGY CONSUMPTION - KWH/TONNE

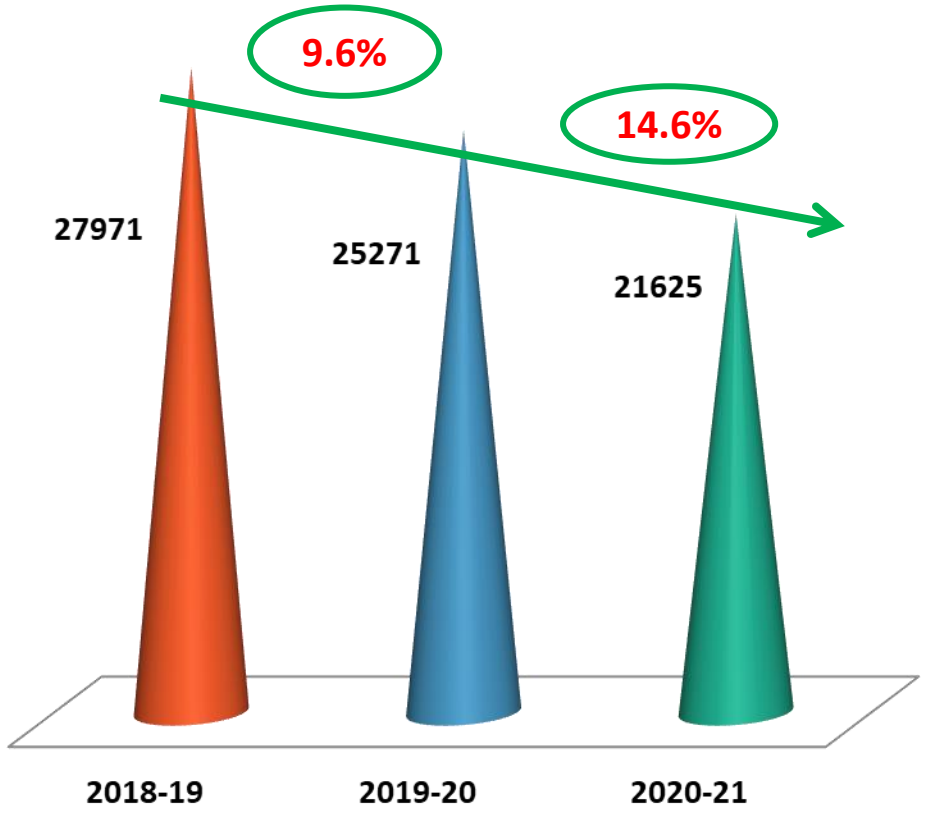
Reduction in Electrical energy (SEC) is owing to



- Decentralization of 06 compressors
- Replacement of 11 reciprocating compressors with screw compressors
- Replacement of 171 conventional welding plants into IGBT based welding plants
- Introduction of 100 % LED light fittings
- Withdrawal of 12 ton centralized AC plant
- Adopted 29 Tons of VRF AC plants for officer chambers.
- Switching off distribution transformers during off-peak periods, Saturdays & Sundays
- Provision of APFC in 06 substations
- Using Renewable Energy – 121 KW solar plants
- Provision of 290 Nos. of BLDC fans

SPECIFIC THERMAL ENERGY CONSUMPTION - KCAL/TONNE

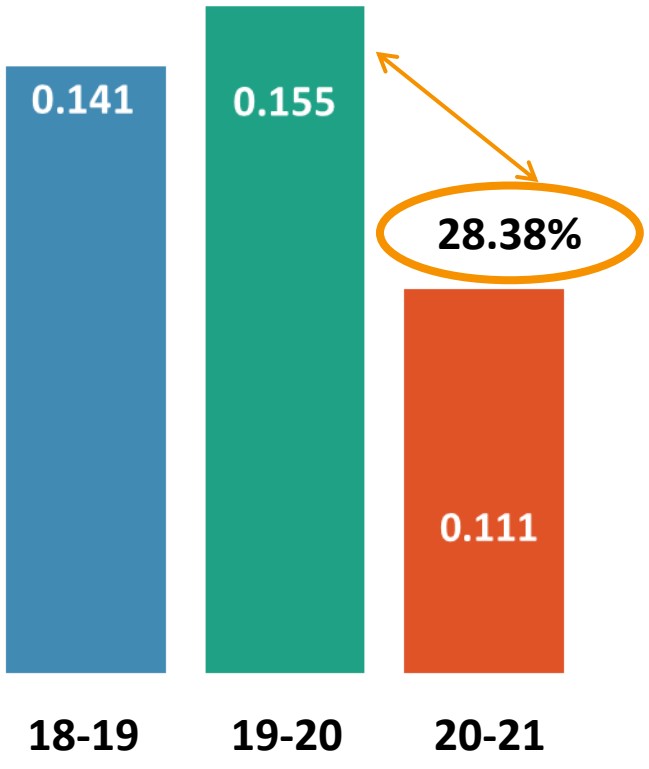
Reduction in thermal energy (SEC) is achieved by



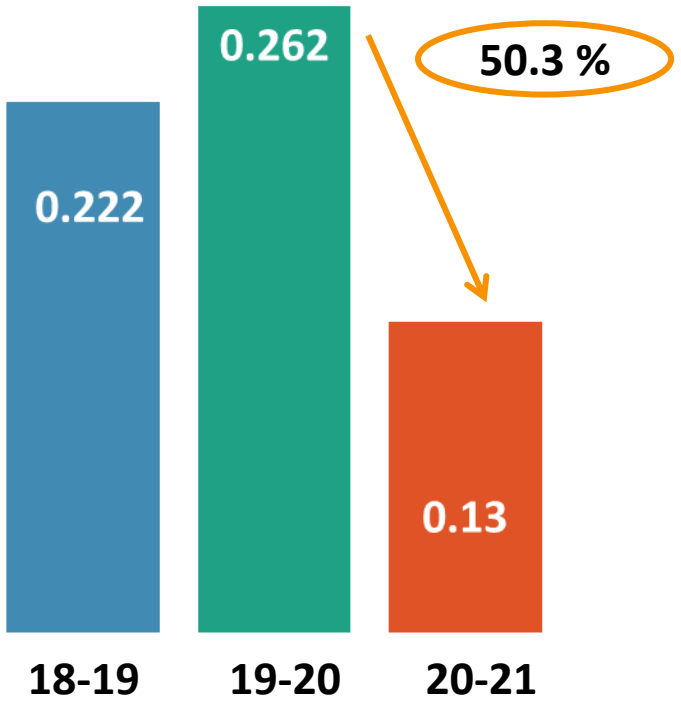
- Usage of chemical cleaning agents in place of thermal energy sources like HSD and LPG
- Outsourcing of utility vehicles.
- Replacement of diesel operated fork lift with battery operated fork lift.
- Plasma cutting in place of oxy- acetylene cutting.

SPECIFIC ENERGY CONSUMPTION OF ALL MAJOR PRODUCTS

SEC- CARRIAGE -TOE/COACH

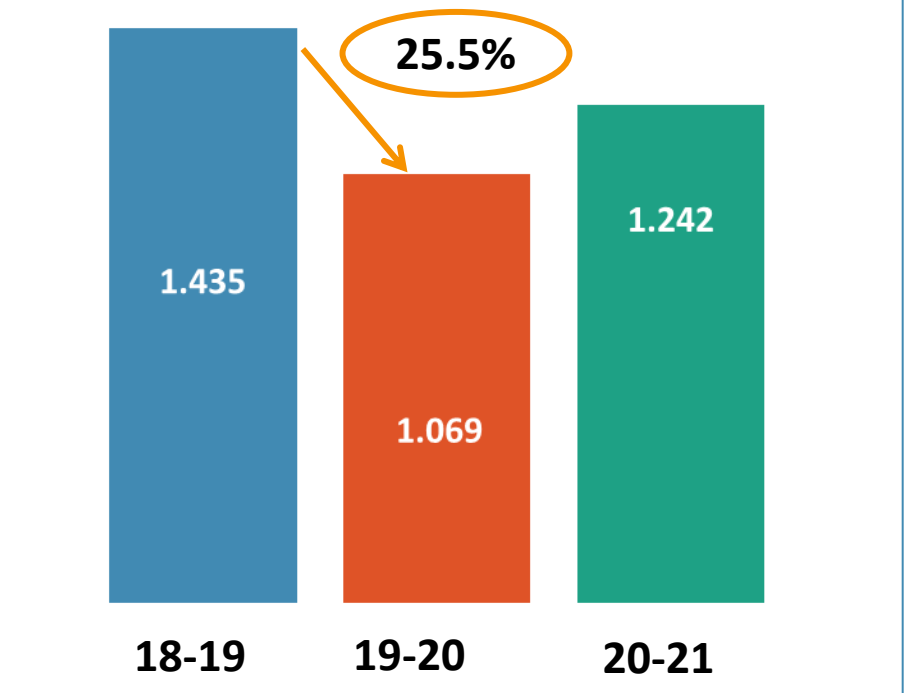


SEC-WAGON-TOE/WAGON

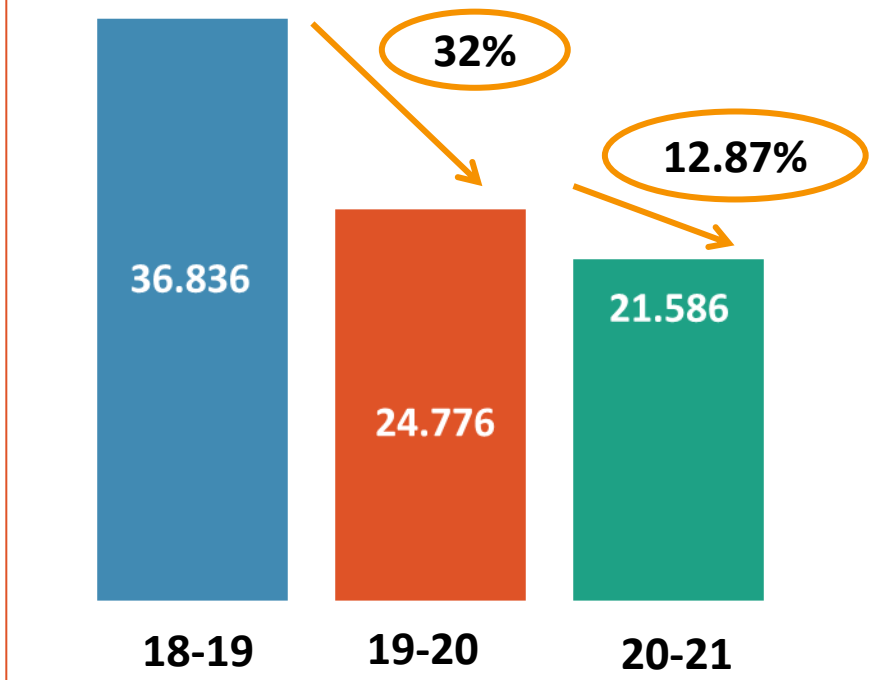


SPECIFIC ENERGY CONSUMPTION OF ALL MAJOR PRODUCTS

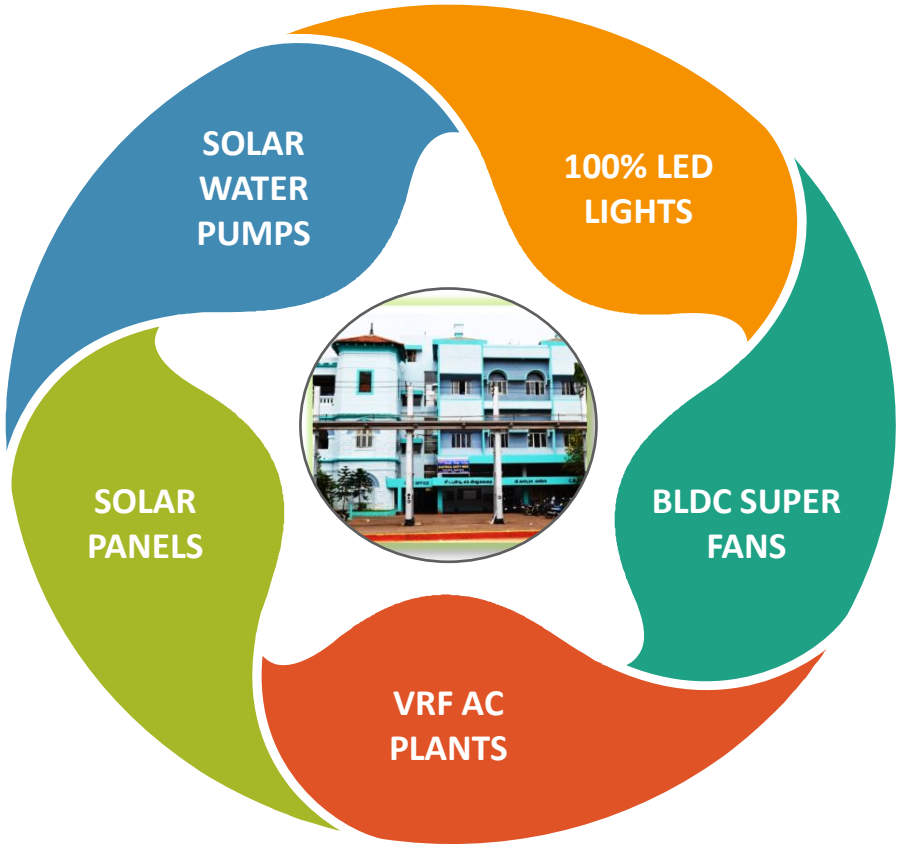
SEC-DIESEL LOCO-TOE/ LOCO



SEC-STEAM LOCO-TOE/LOCO

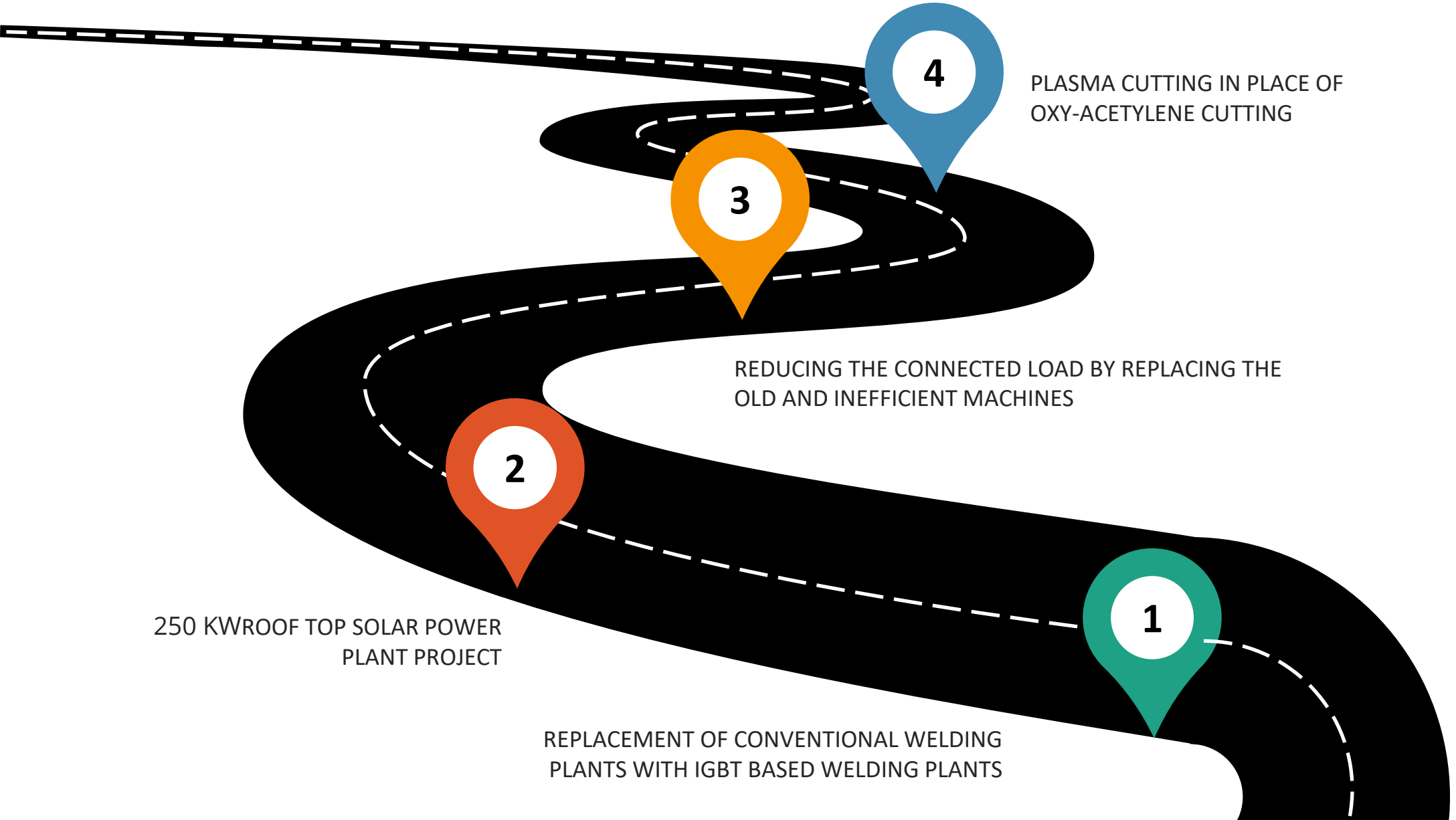


NATIONAL BENCHMARKING - 5 STAR RATED ADMIN BULIDING



EPI required for 5 star rating:
<45 kWh/Sq. m/year
EPI achieved:
32.11 kWh/Sq. m/year

ROAD MAP 2021-22



PROJECTS IMPLEMENTED 2018-19

S.No	PROJECT	ENERGY SAVINGS	INVESTMENT Rs. IN LAKHS	PILLARS OF GREENCO
1	APFC PANEL	-	8.25	MONITORING & AUTOMATIC PF CORRECTION IN 02 SUBSTATIONS
2	ARC VALIDATOR FOR WELDING PLANTS	-	8.3	TO VALIDATE WELDING PLANTS
3	REPLACEMENT OF EXPRESSOR COMPRESSORS WITH SCREW COMPRESSORS (08 Nos OF 120 CFM.)	1,08,000 KWh	24.8	PROCESS IMPROVEMENT PAY BACK: 33 MONTHS
4	CLOUD BASED ONLINE MONITORING SYSTEM	-	2.08	FOR MONITORING OF ENERGY FOR 04 SUBSTATIONS
5	PROVISION OF ENERGY METERS FOR 80 MACHINES	-	1.92	FOR MICRO LEVEL MONITORING OF ENERGY
6	BLDC FANS (100 Nos.)	9,000 KWH	2.37	ENERGY EFFICIENT PAY BACK: 37 MONTHS
7	IGBT WELDING PLANTS (54 Nos.)	6,22,440 KWH	130	ENERGY EFFICIENT PAY BACK: 30 MONTHS
8	VRF BASED AC PLANT (29 TR)	35,496 KWH	6.4	ENERGY EFFICIENT PAY BACK: 25 MONTHS

TOTAL SAVINGS : 7,74,936 KWH

TOTAL INVESTMENTS : 184.12 LAKHS

PROJECTS IMPLEMENTED 2019-20

S.No	PROJECT	ENERGY SAVINGS	INVESTMENT Rs. IN LAKHS	PILLARS OF GREENCO
1	APFC PANEL	-	6.43	MONITORING & AUTOMATIC PF CORRECTION IN 3 SUBSTATIONS
2	REPLACEMENT OF EXPRESSOR COMPRESSORS WITH SCREW COMPRESSORS (03Nos of 300 CFM.)	90,450 KWH	14.4	PROCESS IMPROVEMENT PAYBACK:22 MONTHS
3	IGBT WELDING PLANTS (38 Nos.)	4,38,013 KWH	91.4	ENERGY EFFICIENT PAYBACK:30MONTHS
4	CLOUD BASED ENERGY MONITORING SYSTEM IN SUBSTATIONS AND ENERGY INTENSIVE MACHINES	-	2.58	ONLINE MONITORING
5	BLDC FANS (100 Nos.)	9,000 KWH	2.37	ENERGY EFFICIENT PAY BACK: 37MONTHS
6	PROVISION OF ENERGY METERS FOR 30 MACHINES	-	0.72	FOR MICRO LEVEL MONITORING OF ENERGY
7	REPLACEMENT OF 3 TON DIESEL OPERATED FORKLIFT WITH BATTERY OPERATED FORKLIFT	1440 LITRES OF DIESEL	11.3	GREEN INITIATIVE
8	INTRODUCTION OF ALTERNATIVE CLEANING PROCESS	990 KGS OF LPG	-	

TOTAL SAVINGS: 5,37,463 KWH OF ELECTRICITY
1440 LITRES OF DIESEL
990 KGS OF LPG

TOTAL INVESTMENT : 129.20 LAKHS

PROJECTS IMPLEMENTED 2020-21

S.No	PROJECT	ENERGY SAVINGS	INVESTMENT Rs. IN LAKHS	PILLARS OF GREENCO
1	CONVERSION OF FURNACE OIL FIRED FURNACE INTO HSD OIL FURNACE	-	-	TO MITIGATE GHG EMISSION
2	REPLACEMENT OF CONVENTIONAL FANS BY BLDC FANS (90 Nos)	8100 KWH	2.12	PROCESS IMPROVEMENT PAYBACK:22 MONTHS
3	IGBT WELDING PLANTS (79 Nos.)	910605 KWH	263.2	ENERGY EFFICIENT PAYBACK:39.73MONTHS
4	CLOUD BASED ENERGY MONITORING SYSTEM IN SUBSTATIONS AND ENERGY INTENSIVE MACHINES	-	0.25	ONLINE MONITORING

TOTAL SAVINGS : 9,18,705 KWH

TOTAL INVESTMENTS : 265.57 LAKHS

CONSOLIDATED DETAILS OF PROJECTS IMPLEMENTED FOR 3 YRS

YEAR	NO. OF ENERGY SAVING PROJECTS	INVESTMENTS (INR MILLIONS)	ELECTRICAL SAVINGS (MILLION KWH)	THERMAL SAVINGS (MILLION kcal/MTOE)	SAVIMGS (INR MILLION)	IMPACT ON SEC (ELECTRICAL, THERMAL)
2018 - 19	8	18.412	0.775	-	-	ELECTRICAL
2019 - 20	8	11.790	0.537	2.5 TOE	0.173	THERMAL
2020 - 21	4	26.556	0.918	-	-	ELECTRICAL

INNOVATIVE PROJECTS IMPLEMENTED

ENERGY EFFICIENT MODE OF TRANSPORTATION

- HITHERTO COACH BOGIES WERE TRANSPORTED TO/FROM TVC & MDU DIVISIONS FOR IOH AT GOC WORKSHOP IN TRAILERS/LORRIES
- MAXIMUM OF 4 BOGIES CAN BE TRANSPORTED IN A TRAILER
- ENERGY CONSUMPTION FOR TRANSPORTATION OF 60 BOGIES BETWEEN TVC&MDU DIVISIONS AND GOC(FOR BOTH DIRECTIONS) IS 2,28,58,200 KCAL
- DURING COVID 19 LOCKDOWN TO OVERCOME THE NON AVAILABILTY OF TRAILERS AND EXORBITANT COST OF TRANSPORTATION, IT WAS DECIDED TO TRANSPORT THE BOGIES IN RAILWAY WAGONS.

INNOVATIVE PROJECTS IMPLEMENTED

ENERGY EFFICIENT MODE OF TRANSPORTATION

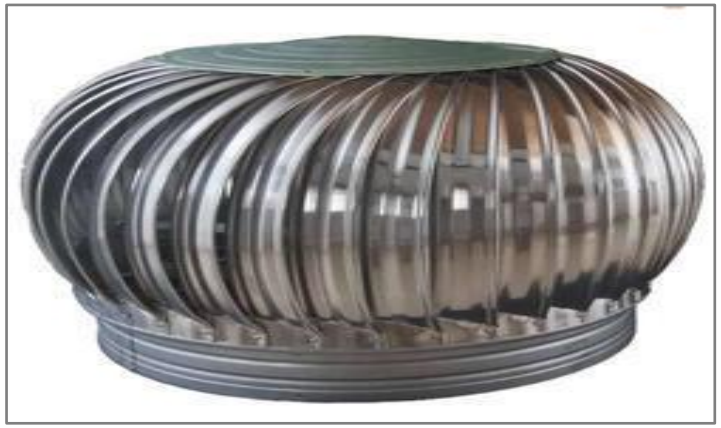
- BOGIES ARE NOW BEING TRANSPORTED IN BRN WAGONS
- EACH WAGON IS CARRYING 6 BOGIES
- BOGIES ARE NOW TRANSPORTED IN SET RAKE OF 10 BRN WAGONS (60 BOGIES). (24 FOR MDU DIVISION & 36 FOR TVC DIVISION)
- ENERGY CONSUMPTION FOR TRANSPORTATION OF 60 BOGIES BETWEEN TVC&MDU DIVISIONS AND GOC(FOR BOTH DIRECTIONS) IS 105,79,800 KCAL

ENERGY SAVINGS IN ALTERNATIVE MODE OF TRANSPORTATION : 46%

UTILISATION OF RENEWABLE ENERGY SOURCES

Renewable Energy Generation, Utilization and % of Overall Energy Consumption						
Year	Technology (Electrical)	Type of Energy	Onsite / Offsite	Installed Capacity (MW)	Generation (Million Kwh)	% of Overall Electrical Energy
FY 2018 - 19	Solar PV	Renewable	Onsite	13 KW	.009557	0.18
Fy 2019 -20	Solar PV	Renewable	Onsite	73 KW	.053943	1.15
FY 2020 - 21	Solar PV	Renewable	Onsite	121 KW	.1045914	3.14

UTILISATION OF RENEWABLE ENERGY SOURCES



Translucent roofing sheets (25%) have been provided in sheds to use natural light.
Annual Equivalent Savings: 36,000 KWh

Roof Mounted Ventilators installed at GOC Workshop: 697 Nos.

→

Estimated Annual Energy Saving : 1,52,997 Kwh/Year

WASTE UTILIZATION & MANAGEMENT

Co-processing of accumulated Zero Value Waste (ZVW) such as Rexine cloth, "V" belt, FRP items, assorted Vynatile sheets, plywood waste, cushion packing material etc., at Cement factories to reduce their coal consumption. All old wastes are now disposed off and the reclaimed area [Approx. 1,00,000 Sqft.] is utilized for afforestation. So far 400 tree saplings have been planted.

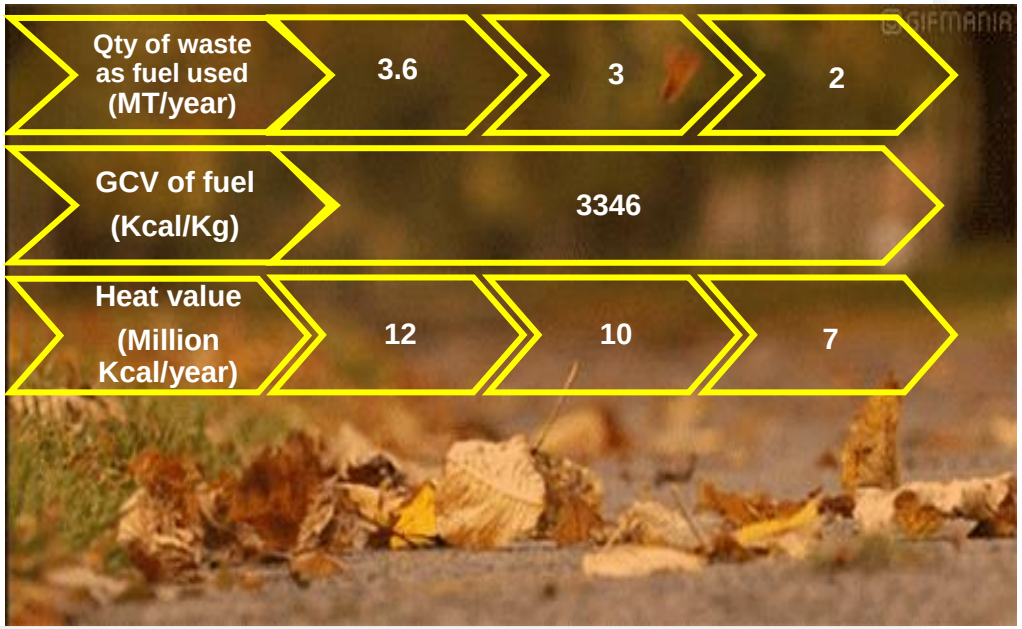
Green House Gas emission reduction-Carbon neutral approach

YEAR	ZERO VALUE WASTE DISPOSED IN MT	REDUCTION OF COAL IN METRIC TONS	REDUCTION OF CO_2 EMISSION IN METRIC TONS
2018-19	6250	625	340
2019-20	7500	750	399
2020-21	5000	500	266

WASTE UTILIZATION & MANAGEMENT

BRIQUETTING OF FALLEN LEAVES

	2018-19	2019-20	2020-21
Qty of waste as fuel used (MT/year)	3.6	3	2
GCV of fuel (Kcal/Kg)	3346		
Heat value (Million Kcal/year)	12	10	7



BIOGAS

Kitchen and paper waste used to generate 5 cubic meter of biogas daily.

	2018-19	2019-20	2020-21
Qty of waste as fuel used (MT/year)	1.6	1.6	0
GCV of fuel (Kcal/Kg)	5750		
Heat value (Million Kcal/year)	6	6	0

GHG INVENTORISATION

GHG emission contribution in MT of CO2 equivalent							
YEAR	Electricity	HSD oil	Furnace oil	Coke	Acetylene gas	Cutting gas (LPG)	Total
2018-19	4197.13	343.83	75.25	10.48	46.55	46.08	**4719.342**
2019-20	3838.45	297.70	41.70	19.02	45.46	42.07	**4284.41**
2020-21	2732.81	228.10	50.59	19.02	39.31	30.85	3047.64

2020-21

No of trees planted: **1344**

Miyawaki: 2Nos (**800** Trees)

Beemabamboo: **200** Nos

28.87 %

Action Plan For Achieving Short term & Long Term CO_2 Emission Reduction Targets :

- **Planting of Miyawaki and Beema Bamboo**
- **Replacement of HSD oil furnaces with LPG furnace**
- **Installation of 250 KW rooftop solar panel**

GREEN SUPPLY CHAIN MANAGEMENT

Green supply chain policy

The Stores Department in Central Workshop, Southern Railway, Ponmalai is committed to protect the environment by striving for Green supply chain mutually with the vendors in the following areas:

i) adhering to environment, health and safety compliance

ii) arranging training and capacity building to create awareness and follow environmental practices.

iii) cultivating plantation and greenery

iv) encouraging saving of energy and water resources

v) reusing recyclable resources

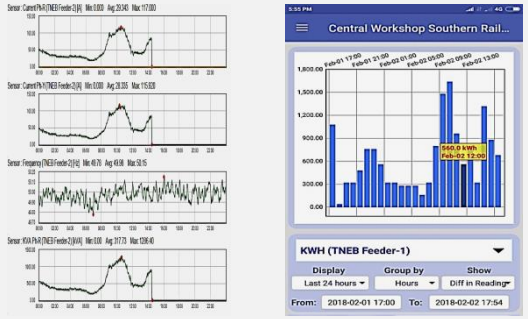
Date: 17-01-18

Dy.Chief Materials Manager
Central Workshop, SRLY
Ponmalai, Trichy

Vendor Meet was conducted on 30.01.2021 at GOC Workshop to encourage the vendors around Trichy so as to supply the materials which are being supplied by vendors from far away places so as to minimize the fuel consumption during transit.

TEAMWORK, EMPLOYEE INVOLVEMENT & MONITORING

MOINTORING



In-house developed IOT based Energy management and condition monitoring system is installed in one substation and 14 machines of Wheelshop for microlevel monitoring

MICRO MONITORING OF MACHINES

120 Nos. of Energy meters are provided in energy intensive machines for micro level monitoring

ENERGY MANAGEMENT TRAINING

EMPLOYEES

100 % employees were given training regarding energy efficiency measures in their respective areas of work

SUPERVISORS (450 Nos.)

All supervisors are trained on Energy Efficiency and Management

25supervisors were trained on Internal Audit of Energy Management System.

OFFICERS (25 Nos.)

Awareness and the requirements of Energy Management System-Trained by outside agency

TEAMWORK, EMPLOYEE INVOLMENT & MONITORING

WEEKLY PERFOMANCE REVIEW MEETING CHAIRED BY CWM/GOC

(CONDUCTED EVERY TUESDAY TO REVIEW THE OUTTURN AND ENERGY PERFORMANCE)

KAIZEN

- PROVISION OF TIMER FOR RESTRICTION OF WORKING HOURS OF COMPRESSORS, OVEN AND BOSCH TANKS
- DEVELOPMENT OF IOT BASED ONLINE ENERGY MONITORING SYSTEM FOR 48 NOS OF ENERGY INTENSIVE MACHINES AT WHEEL SHOP, DSL POH AND WAGON SHOP TO PAVE THE WAY FOR MICRO LEVEL ENERGY MONITORING
- ELIMINATION OF USAGE OF LPG FOR CLEANING OF BATTERY BOXES OF PASSENGER CARRIAGES DURING POH BY INSTALLING A BOSCH TANK

IMPLEMENTATION OF ISO 50001 /GREEN Co / IGBC RATING


INTERCERT

CERTIFICATE OF REGISTRATION

INTERCERT hereby certifies that the Energy Management System of

CENTRAL WORKSHOPS

SOUTHERN RAILWAY, GOLDEN ROCK,
TIRUCHCHIRAPALLI- 620 004, INDIA

Has been successfully assessed as per the requirements of

ISO 50001:2018

For the scope of

PERIODICAL OVERHAULING OF DIESEL LOCOMOTIVES, STEAM LOCOMOTIVES AND COACHES, REPAIRS, RECLAMATION AND MANUFACTURE OF ROLLING STOCK COMPONENTS, MANUFACTURE OF WAGONS AND STEAM LOCOMOTIVES AND SUPPORT ACTIVITIES IN CENTRAL WORKSHOPS, GOLDEN ROCK.

Initial Certification Date : 08-03-2021
Certificate Issue Date : 08.03.2021
Surveillance Validity Date : 07.03.2022
Recertification Date : 07-03-2024

Registration Number: IC-En-2103050

Issued on behalf of InterCert
Head - Certifications

INTERCERT REGISTERED

IAF

IAS

ALLOCATION OF FUNDS FOR ENERGY CONSERVATION PROJECTS

- REVENUE FUND
- MODERNISATION PROGRAMME
- MACHINERY & PLANT PROGRAMME
- ENVIRONMENT RELATED PROJECTS
- WAGON DEPOSIT

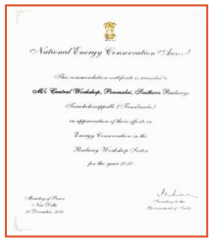
% INVESTMENT OF ENERGY SAVING PROJECTS ON TOTAL TURNOVER OF THE COMPANY : 0.57

LEARNING FROM CII ENERGY AWARD 2020 OR ANY OTHER AWARD PROGRAM

- BEST PRACTICES FOLLOWED BY OTHER INDUSTRIES FOR ENRGY CONSERVATION
- ZEROVALUE SCRAP DISPOSAL TO CEMENT INDUSTRIES
- VRF BASED AC PLANTS
- IOT BASED COMPRESSOR MONITORING

ANY OTHER RELEVANT INFORMATION

ACCOLADES OF GOC WORKSHOP



CERTIFICATE OF MERIT FOR THE YEAR 2020 FROM BEE

CII AWARDS

EXCELLENT ENERGY EFFICIENT UNIT 2017 & 2020

ENERGY EFFICIENT UNIT 2018 & 2019

BEST INNOVATION AWARD FROM RAILWAY BOARD FOR THE YEAR 2019-2020 FROM DIRECTOR/ EFIICIENCY & RESEARCH/ME/ RAILWAY BOARD FOR HAVING DEVELOPED IOT BASED ENERGY MANAGEMNT AND CONDITION MINITORING SYSTEM

Thank you

Energy efficiency for a sustainable future