ENERGY CONSERVATION & MANAGEMENT
CENTRAL WORKSHOP
SOUTHERN RAILWAY, PONMALAI,TRICHY ,TAMILNADU

SHYAMADHAR RAM

Chief Workshop Manager

P. MOHAMED JUBAIR

Dy.CME/DSL/GOC &
Environmental Officer

Company Profile

2022-23

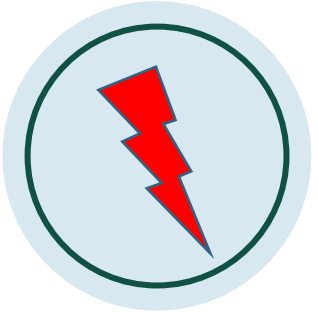
285 WAGONS

1 STEAM LOCO

1301 COACHES

56 DIESEL LOCOS

4106 EMPLOYEES



MAXIMUM ENERGY DEMAND 2400 KVA

Major Process Equipment

BAKING OVEN

DIESEL FIRED FURNACE

AIR COMPRESSORS

WELDING PLANTS

MULTISTATION HORIZONTAL DRILLING & BORING MACHINES

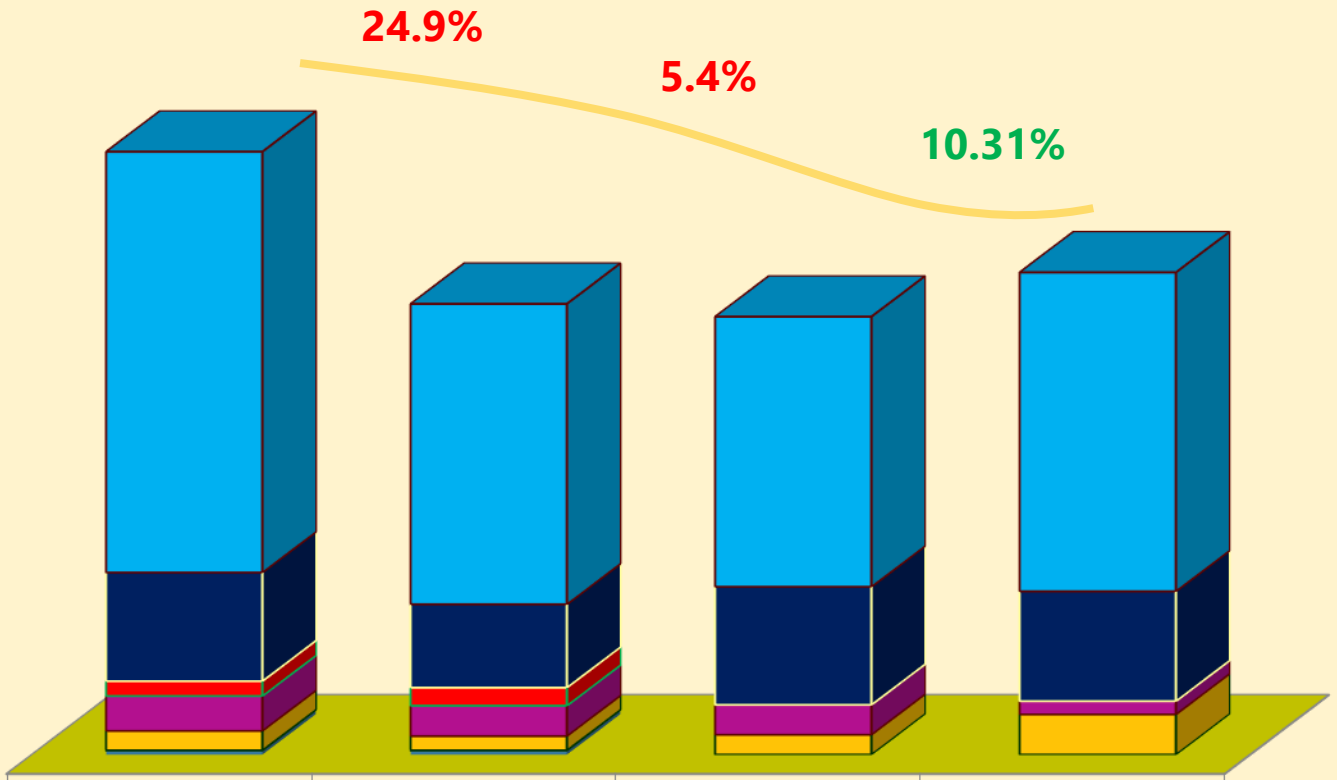
CNC PLASMA MACHINES

ACETYLENE CUTTING

Withdrawn from Oct-22

LPG/CBG CUTTING

TOE Of Various Energy Sources



	2019-20	2020-21	2021-22	2022-23
ELECTRCITY	402	287	258	304.68
HSD OIL	103.8	79.64	112.8	105
FURNANCE OIL	14.25	17.29	0	0
ACETYLENE	33.3	29	28.57	12.64
CUTTING GAS	18.55	13.61	19.08	38.5
COKE	4.2	4.2	0	0

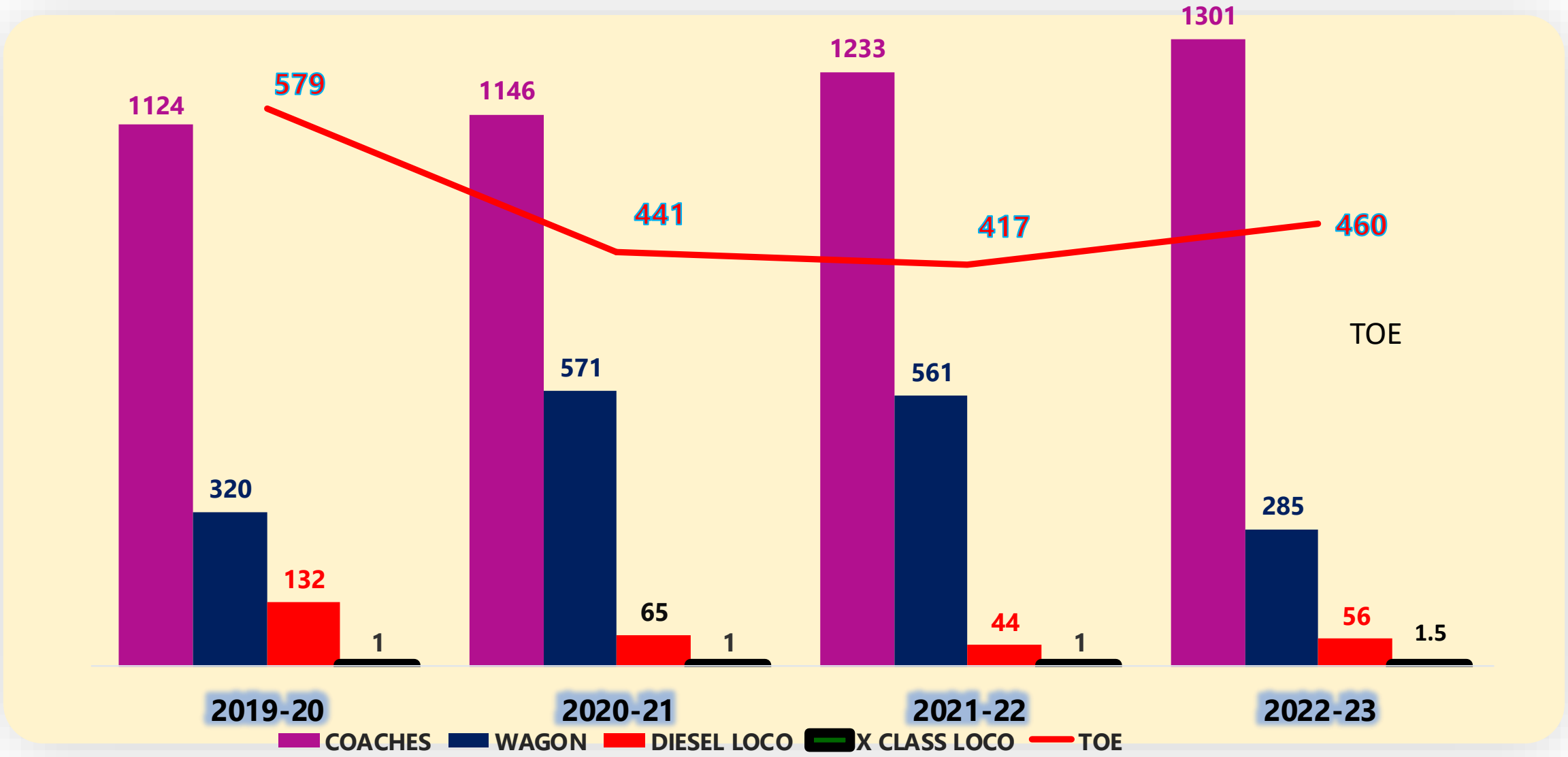
2019 - 20
579 TOE

2020-21
441 TOE

2021-22
417 TOE

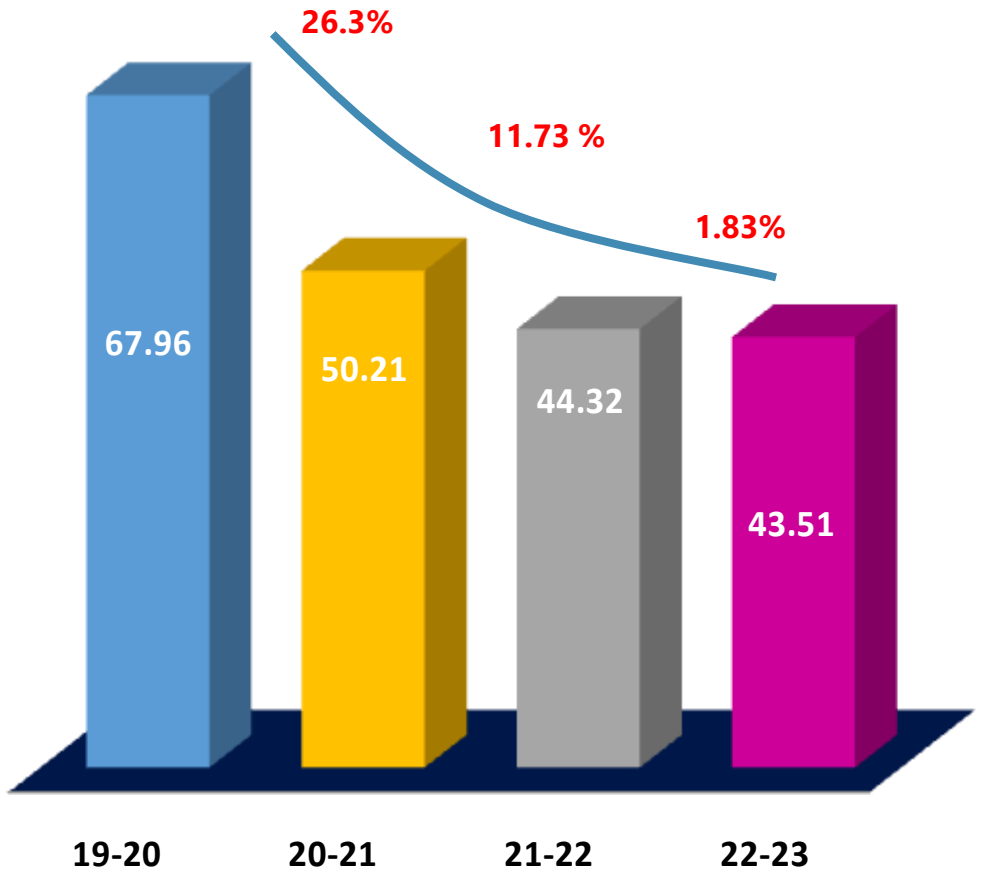
2022-23
460 TOE

Out Turn Vs Energy Consumption Trend - Last 3 Yrs



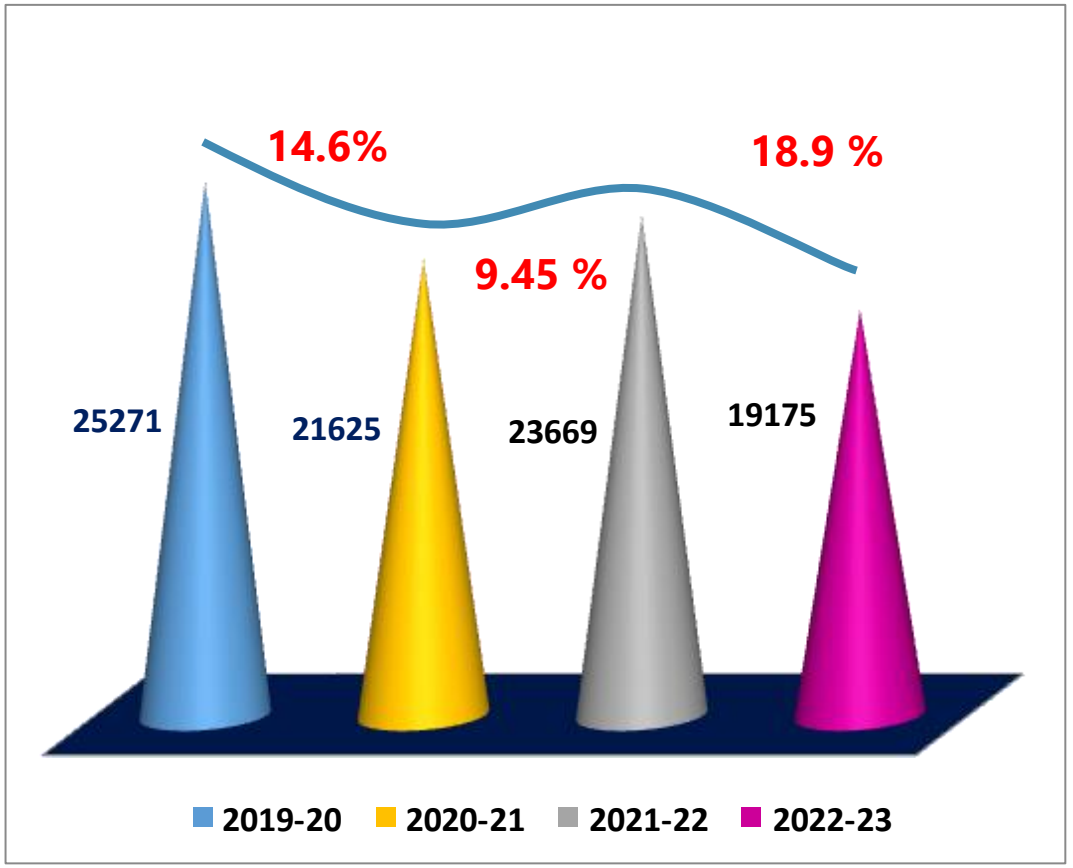
Specific Electrical Energy Consumption - Kwh/Tonne

Electrical Energy (SEC) Trend



- Installation of APFC Panels in 03 substations
- Reduction of CMD from 2700 to 2400 KVA.
- Replacement of 3 Nos of 300 CFM Expressor compressor with screw compressor
- Replacement of 154 Nos of conventional welding plants with IGBT based welding plants
- Replacement of 2 Nos of Conventional Resistance type Charger / Discharger with Regenerative type battery chargers
- Provision of Energy meters for 120 Energy Intensive machines & installation of IOT based Energy Management system for Microlevel monitoring
- Replacement of 450 Nos of Conventional ceiling fans with BLDC ceiling fans.
- Replacement of 48 Nos of conventional Air circulators with BLDC Air circulators
- Installation of 548 Nos of Wind driven roof mounted Ventilators.
- Withdrawal of 26 Nos of inefficient oil/Diode based Welding plant and 2 Nos of oven from service.
- Installation of 25T EOT cranes with VFD control (2nos)
- Installation of IoT based water management system

Specific Thermal Energy Consumption - Kcal/Tonne



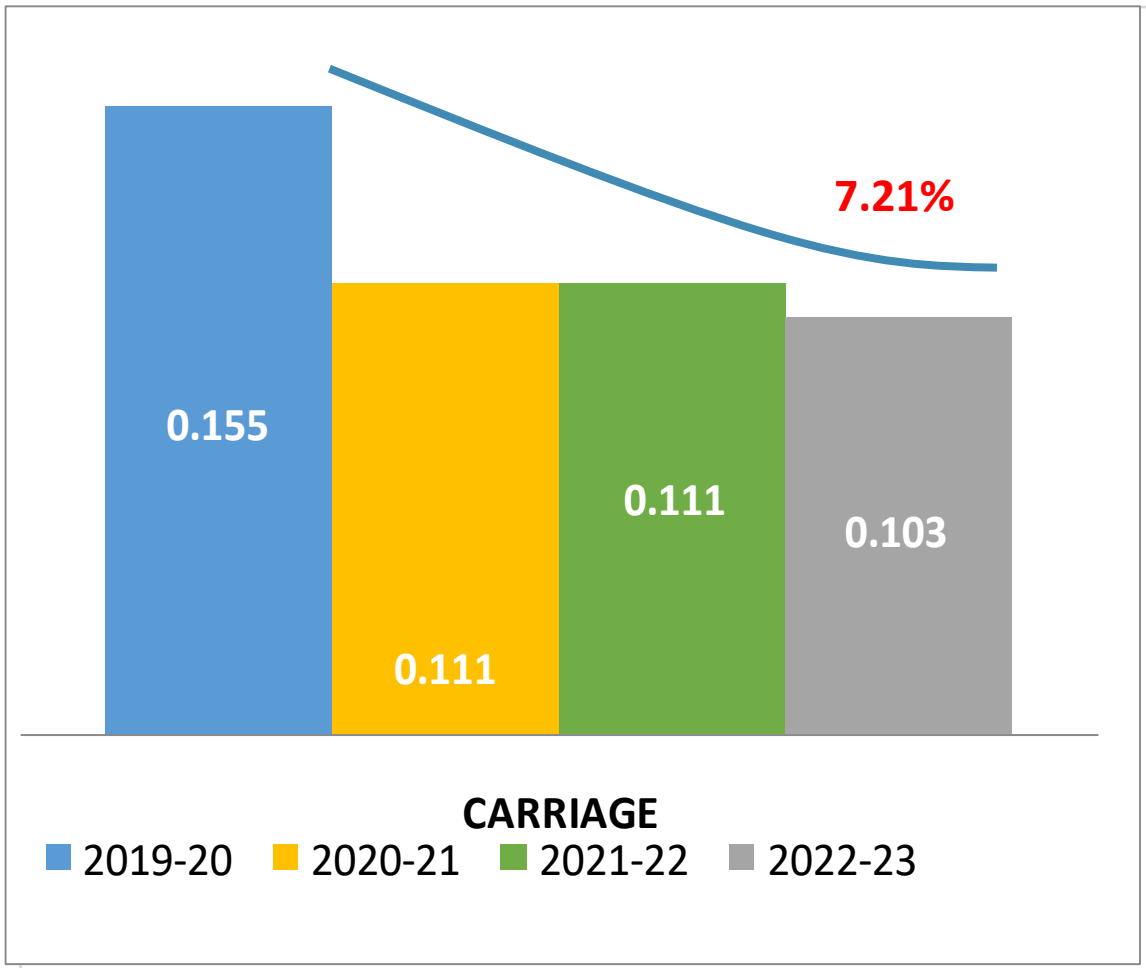
*Conversion of 1 NMGHS coach is equivalent to POH of 3.9 ICF coaches

Projects implemented for Thermal Energy conservation

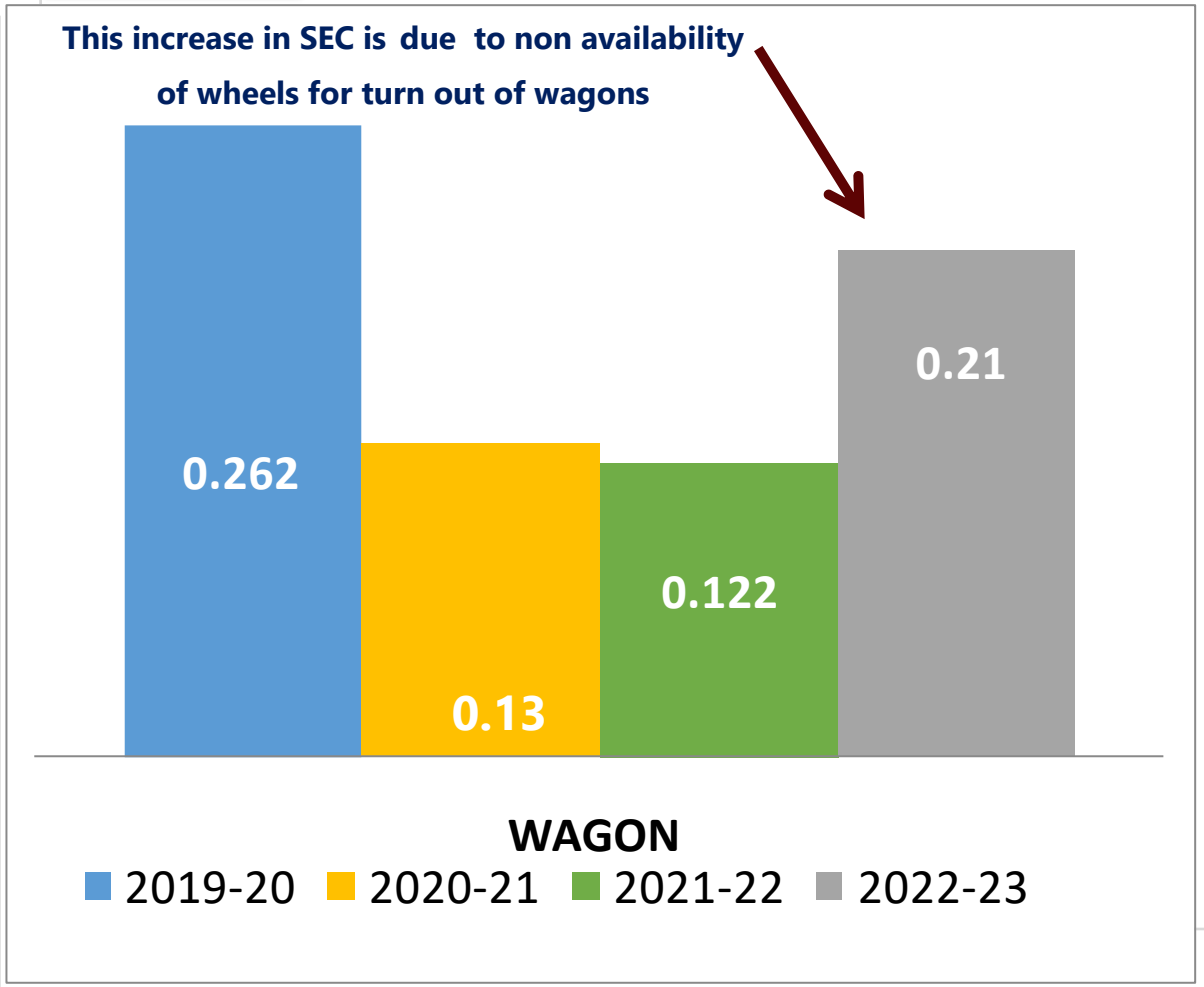
- Conversion of furnace oil fired furnace to HSD oil furnace
- Installation of 2 Nos. of Oxy - hydrogen fuel gas Generators for Metal cutting in place of Acetylene
- Solar Concentrator based Hot Water system.
- Introduction of CBG fuel to replace the Oxy-Acetylene fuel for metal cutting (216 cu.metres procured in FY 2022-23)
- Replacement of Diesel operated fork lift with Battery operated fork lift.
- Installation of Dynamic wheel balancing machine
- 100% withdrawl of acetylene from metal cutting
- Conversion of Coal / furnace oil fired boiler into HSD oil fired boiler for X class loco manufacturing

Specific Energy Consumption Of All Major Products

SEC- CARRIAGE (TOE/COACH)

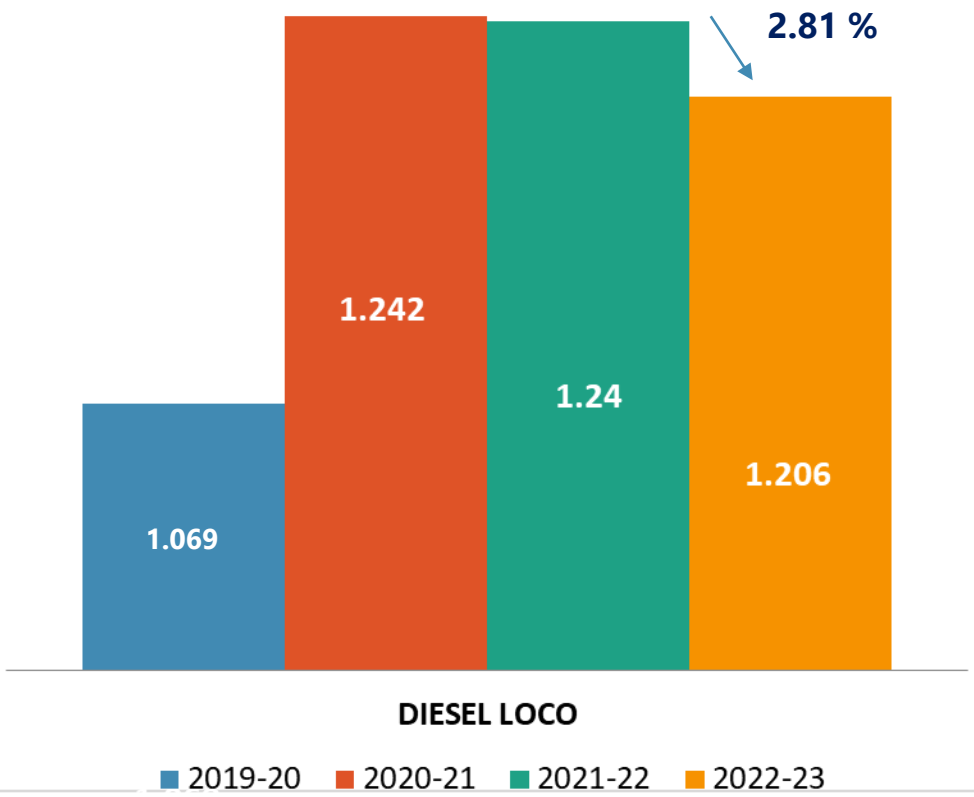


SEC-WAGON (TOE/WAGON)

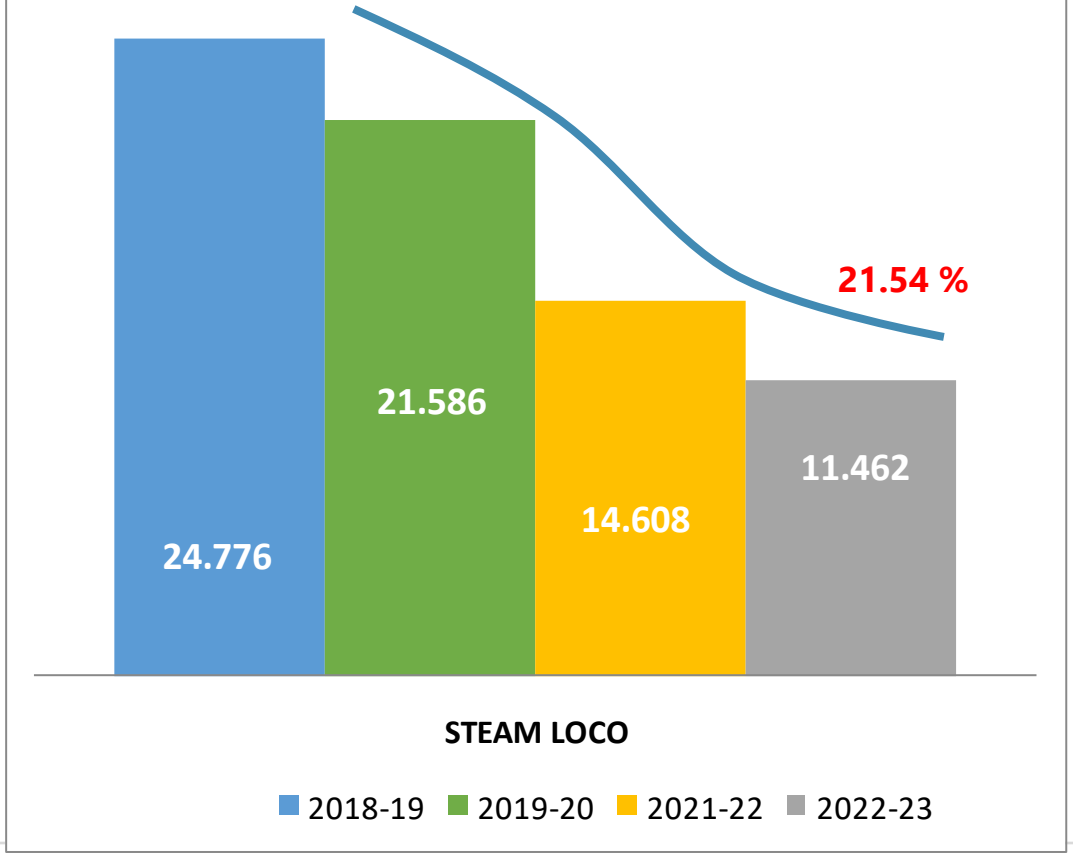


Specific Energy Consumption Of All Major Products

SEC- LOCO (TOE/DIESEL LOCO)



SEC- X CLASS LOCO (TOE/X CLASS LOCO)



Major Encon Projects Planned - 2023-24

Sl. No	PROJECT	ENERGY SAVINGS	INVESTMENT Rs. IN LAKHS	PILLARS OF GREENCO
1	REPLACEMENT OF LPG WITH CBG AS A FUEL FOR METAL CUTTING	7.89 M.kCal	5.28	Carbon neutral &safe fuel
2	REDUCTION OF CMD FROM 2400 KVA TO 2100 KVA	0	0	CMD has been reduced from 2400 kVA to 2100 kVA with effect from 28.07.2023 which will result in cost savings of 1.782 Million Rupees per year (completed)
3	INSTALLATION OF VFD BASED CRANES (9 Nos.) OF VARIOUS CAPACITIES	4,050 kWh	30.82	Improving Process Efficiency
4	REPLACEMENT OF CONVENTIONAL FANS BY BLDC FANS (360 Nos.)	32,400 kWh	9.00	Improving Energy Efficiency
5	REPLACEMENT OF CONVENTIONAL AIR CIRCULATORS BY BLDC AIR CIRCULATORS (60 Nos.)	32,351 kWh	9.00	Process improvement
6	INSTALLATION OF IGBT CONTROLLED BAKING OVEN OF CAPACITY 25 kW (2 Nos)	5,940 kWh	30.81	Improving Energy Efficiency
7	INSTALLATION OF 600 kWp SOLAR PANEL	8,80,000 kWh	353.6	Harnessing of solar power
8	REPLACEMENT OF 300 CFM COMPRESSOR WITH 120 CFM COMPRESSOR	27,900 kWh	0	Improving Energy Efficiency
9	INTRODUCTION OF SONIC INDUSTRIAL IMAGER FOR BETTER DETECTION OF COMPRESSED AIR LEAKAGES	70,848 kWh	11.68	Improving Energy Efficiency

Total Electrical Saving : 10,53,489 kWh **Total Investment : 450.19 LAKHS**

Total Thermal saving : 7.89 M kCal

Consolidated Details of Projects Implemented For last 3 Yrs

YEAR	NO. OF ENERGY SAVING PROJECTS	INVESTMENTS (INR MILLIONS)	ELECTRICAL SAVINGS (MILLION KWH)	THERMAL SAVINGS (MILLION KCal)	SAVIMGS (INR MILLION)	IMPACT ON SEC (ELECTRICAL, THERMAL)
2020 - 21	5	28.697	1.0063	-	8.785	ELECTRICAL
2021-22	11	17.306	1.148	6.98	11.257	ELECTRICAL & THERMAL
2022-23	10	25.91	0.131	7.89	7.808	ELECTRICAL & THERMAL
TOTAL	26	71.91	2.2853	14.87	27.85	ELECTRICAL & THERMAL

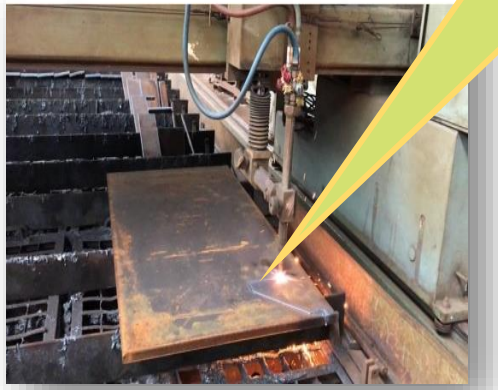
Innovative Projects Implemented -2022-23

Usage of Environmental friendly Upgraded Compressed Bio Gas for manual and machine profile cutting of carbon steel plates for replacing Acetylene and BMCG in GOC Workshops.

Cascade of CBG cylinders

Manual Gas cutting using CBG with existing Oxy-fuel torch with no modification for manual cutting of carbon steel plates ranging from10 to 25 mm sizes at Wagon component shop.

Gas cutting using CBG in the existing profile cutting machine with no modification.



First of its kind in INDIA to use upgraded CBG for carbon steel metal cutting.

Innovative Projects Implemented -2022-23

Demonstration for usage of Carbon Neutral Upgraded Compressed Bio Gas for Wheel disc cutting and canteen cooking applications in GOC Workshops.

Cutting of wheel discs using CBG with no modification in cutting torch

During the FY 2022-23, 216 cu.mts of CBG was procure d which has resulted in the financial savings of 1.08 Lakhs

Usage of CBG in canteen burners for cooking instead of LPG

Key Benefits of using CBG in replacing Acetylene and Bharat Metal cutting Gas are:

- **Carbon Neutral Fuel (3 times lesser Carbon foot print that Bharat Metal Cutting Gas and 4 times lesser than Acetylene)**
- **Cost of Acetylene is Rs. 588 per Cubic metre whereas Cost of CBG is Rs.88/– per Cubic Metre.**
- **Very safe fuel compared to Acetylene gas**
- **Very narrow range of flammability index 4.4 – 16.5 as against 2.5 – 80 for Acetylene**
- **100% usage with zero residual gas while sending for refilling**
- **100% Greener supply chain due to transportation of cascades in CBG fired vehicle.**

Innovative Projects Implemented -2023-24

Replacement of 300CFM compressor with 120CFM in wagon pit-line

Savings calculations

Old capacity used: 300 CFM

Replaced by: 120 CFM

Savings in CFM: 180 CFM

Equivalent capacity of AC motor if 180 CFM compressor used: 45hp

Equivalent kW rating : 33 kW

Operating hours: 3 hours per day i.e: savings of 99 kWh/day

Total savings per annum: 27900 kWh per year

Financial savings: Rs.2,43,288 per year

Innovative Projects Implemented -2023-24

Introduction of Sonic industrial imager for better detection of compressed air leakages

Savings calculations

Installed capacity of air compressors at GOC Workshop: 787.2 kW

Energy consumption of installed air compressors in a year: 4,72,320 kWh (units)

Energy consumption cost of these compressors: Rs.42,50,880

Assessed leakage load (%): 15%

Cost of leakage loss per year: Rs.6,37,632

Savings by use of Sonic industrial imager for air leakage detection and arresting: Rs.6,37,632 per year

Innovative Projects Implemented– 2022-23

Afforestation measures- BEEMA BAMBOO Plantation

Planting of 7560 saplings of BEEMA BAMBOO was done during 2022-23 by CWM /GOC, Officers, supervisors and staff in GOC Workshop.

Target for the year 2023-24 is 10000 Nos of Bheema bamboo Saplings

- Each plant releases **35 % more oxygen** than an equivalent stand of trees.
- Due to 7560 plants, **684 T of CO_2** is absorbed every year.

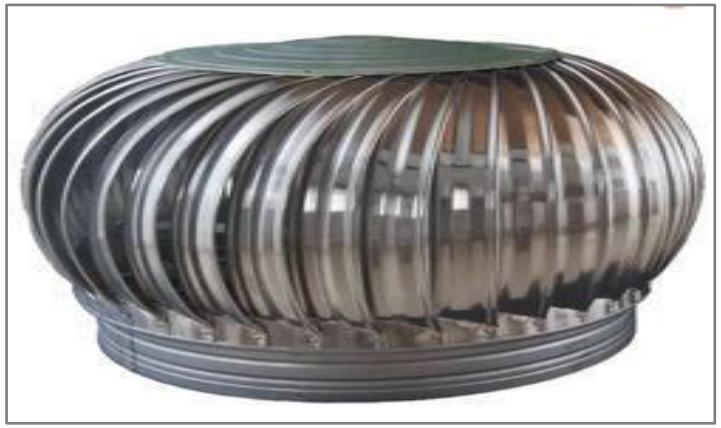
Status: 100 % survival and good growth ensured

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 2020 - 21	Solar PV	Renewable	Onsite	121 KW	0.1045914	3.14
FY 2021 - 22	Solar PV	Renewable	Onsite	121 KW	0.151819	5.07
	Solar thermal concentrator	Renewable	Onsite	5000 Liters of Hot water per day	0.0456	1.52
FY 2022 - 23	Solar PV	Renewable	Onsite	121 KW	0.158833	4.48

Utilisation Of Renewable Energy Sources



Translucent roofing sheets have been provided in sheds on need basis

Roof Mounted Ventilators installed at GOC Workshop:
697 Nos. up to 2020-21
448 Nos during 2021-22
100 Nos during 2022-23

Estimated Annual Energy Saving :
2,73,397 KWh

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
2019-20	7500	750	399
2020-21	5000	500	266
2021-22	6500	650	346
2022-23	7500	750	399

Waste Utilization & Management

Briquetting of fallen leaves

	2019-20	2020-21	2021-22	2022-23
Qty of waste as fuel used (MT/year)	3	2	4	4
GCV of fuel (Kcal/Kg)	3346			
Heat value (Million Kcal/year)	10	7	13	13

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

	2019-20	2020-21	2021-2022	2022-23
Qty of waste as fuel used (MT/year)	1.6	0	1.7	1.7
GCV of fuel (Kcal/Kg)	5750			
Heat value (Million Kcal/year)	6	0	6	6

GHG Inventorisation

GHG emission contribution in MT of CO2 equivalent				
YEAR	**Scope 1 Emission**	**Scope 2 Emission**	**Scope 3 Emission**	**Total Emission**
2022-23	45.35	6.13	-	54.48
2021-22	35.79	5.69	-	41.48
2020-21	41.17	5.54	-	46.72
2019-20	55.73	6.47	-	62.20

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

1. Adopting smart technologies(IoT based energy Management system, IGBT based welding plants & Ovens, VFD based Cranes etc.) resulting in reduction of purchased electricity.
2. Switching over to carbon Neutral fuel for process applications like gas cutting & Furnace Operations.
3. Harnessing Renewable Energy(600 KW PV Solar panel) for reducing Purchased Electricity.
4. substituting waste for reducing carbon foot print.
5. Planting 10000 Nos of saplings of Bheema bamboo during the year 2023-24

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.

v) reusing recyclable resources.

Date: 03-12-2021

Dy.Chief Materials Manager

उप मुख्य सामग्री प्रबंधक
DY. CHIEF MATERIALS MANAGER
दक्षिण रेलवे / SOUTHERN RAILWAY

Green supply chain policy

Green Procurement guidelines

Encourage the vendors to

a) follow environmentally sound practices in manufacturing.
b) supply and increase the availability of environment friendly materials duly following RoHS directives by MOEF.
c) avoid the usage of single use plastic for packing purpose.
d) reduce waste generation, specific energy and water consumption
e) Designing of product to have less hazardous substance at end of life time.
f) Allowing the customers to visit the worksites and evaluate the green initiatives taken at their sites.
g) Recycle and reduce the material consumption.
h) Adopting eco friendly packaging materials.
i) adopting proper conservation methods in storage of materials.
j) Commitment to review the objectives for continual improvement towards greener environment and to comply with all the applicable legal requirements.

Transport Policy

I). The trucks/vehicles less than 15 years old only to be used for transporting materials to the Workshop.
II) All the trucks/vehicles transporting the materials to the Workshop, must carry valid Pollution Under Control certificate and valid insurance policy.
III) All the trucks/vehicles transporting hazardous materials to the Workshop, must carry the product Material Safety Data Sheet (MSDS) and valid Chemical Abstracts .Service (CAS) number.
IV) All new heavy vehicles to be fitted with speed governors
V) RTA norms should be must be followed for driver's competence.
VI) The transporter must ensure that any pilferage/leakage to be avoided during the transit of the material.

All over the Indian Railways, the procurement procedures are followed as per the directives/guidelines issued by the Railway Board from time to time and also as per the instructions of the vendor approving agencies/Production Units. Hence, for the same material, the suppliers may not be the same for every procurement activity.

However, the procurement officials will encourage all the suppliers to support the green initiatives taken by Central Workshop to improve the environment.

Date: 03-12-2021

DY. CHIEF MATERIALS MANAGER
दक्षिण रेलवे / SOUTHERN RAILWAY

Green Procurement guidelines

Vendor meet conducted on 18.07.2023 along with CII

Green Supply Chain Management

Initiatives taken in supply chain to reduce Energy consumption

Supplier / vendor audits for >50% of the critical suppliers / vendors

Sl	Vendor Name	Products supplied	audits conducted
1	SIECHEM TECHNOLOGIES PRIVATE LIMITED-PONDICHERRY	Wires & Cables	1
2	AMARA RAJA BATTERIES LTD	Batteries	1
3	EXIDE INDUSTRIES LIMITED	Batteries	1
4	FAIVELEY TRANSPORT RAIL TECHNOLOGIES INDIA LIMITED-HOSUR	Brake control equipment, Pantograph	1
5	MEDHA SERVO DRIVES PRIVATE LIMITED-HYDERABAD	Electronic products	1
6	MYSORE THERMO ELECTRIC PVT LIMITED-BANGALORE	Batteries	1
7	NANDI ELECTRIC COMPANY-BANGALORE	HRC fuses,Terminals	1
8	POLYMER PRODUCTS OF INDIA-BANGALORE	Rubber products	1
9	VIBGYOR PAINTS AND CHEMICALS M.M.NAGAR -CHENNAI	Paints	1
	Total		9

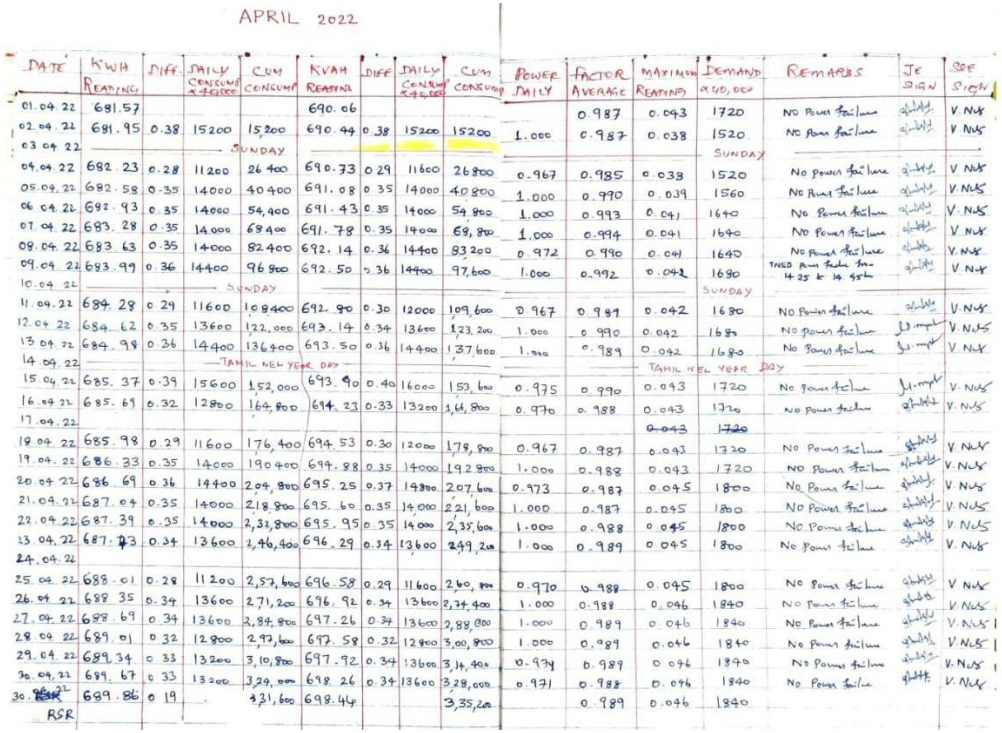
Plan for Expansion of Green Supply Chain

- **Conducting Vendor meets Periodically to encourage the vendors around Trichy so as to supply the materials which are being supplied by vendors from far away places in order to minimize the fuel consumption during transit.**
- **Evaluation of Vendors periodically to make them Energy Efficient.**

Team work, Employee Involvement & Monitoring

Daily monitoring of energy consumption of energy intensive machines through IOT.

Daily Energy consumption of GOC Workshop is monitored at Power House and shops contributing for the increase in the Energy consumption will be advised on monthly basis.



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

Team work, Employee Involvement & Monitoring

WEEKLY PERFOMANCE REVIEW MEETING CHAIRED BY CWM/GOC

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

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

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

OFFICERS (25 Nos.)

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

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

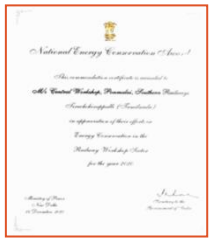
% INVESTMENT OF ENERGY SAVING PROJECTS ON TOTAL TURNOVER OF THE COMPANY : 0.452

Learning from CII Energy award or any other Award Program

- BEST PRACTICES FOLLOWED BY OTHER INDUSTRIES FOR ENRGY CONSERVATION
- ZERO VALUE SCRAP DISPOSAL TO CEMENT INDUSTRIES
- VRF BASED AC PLANTS
- IOT BASED COMPRESSOR MONITORING
- SOLAR THERMAL PARABOLIC CONCENTRATOR
- BLDC CEILING FAN /AIR CIRCULATOR

Any other relevant Information

ACCOLADES OF GOC WORKSHOP



CERTIFICATE OF MERIT FOR THE YEAR 2020 FROM BEE

CII AWARDS

EXCELLENT ENERGY EFFICIENT UNIT 2017 , 2020,2021&2022 ENERGY EFFICIENT UNIT 2018 & 2019

RECEIVED ENERGY LEADER SHIELD AWARD FROM CII IN 2022

Thank you