



## ENERGY CONSERVATION & MANAGEMENT

## CARRIAGE & WAGON WORKSHOP, NORTHERN RAILWAY, KALKA, HARYANA



**SUDHANSU PANWAR**  
Chief Workshop Manager

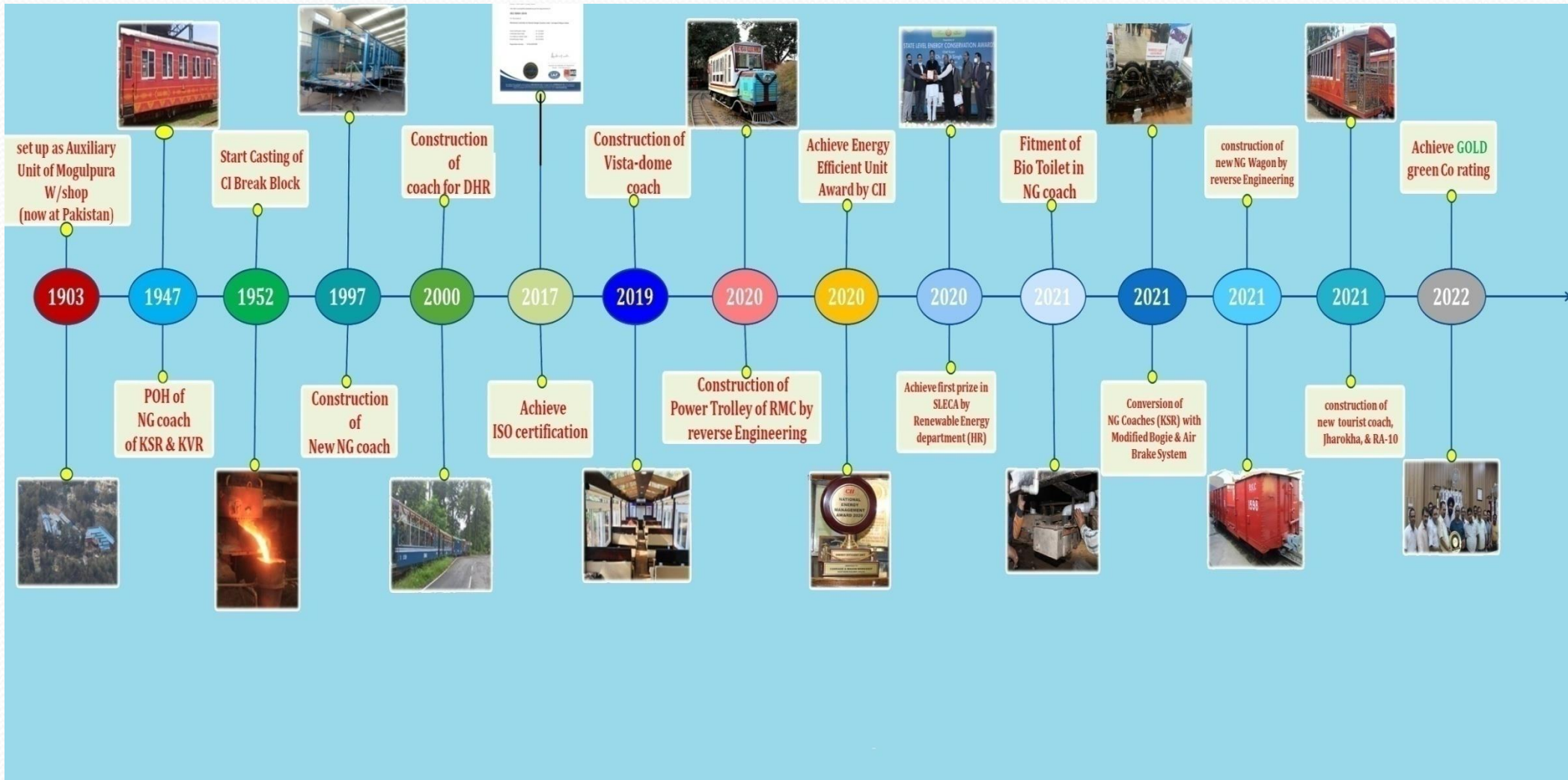
**G C SINGH**  
Dy. Chief Mech. Engineer

**Jyoti Sahu**  
Assistant Workshop Manager





# MILESTONE OF KALKA WORKSHOP





# ACTIVITIES PERFORMED & COMPANY PROFILE



## Metal Casting



NG COACHES



NG COACHES



BREAK BLOCK



Sustaining heritage values of workshop



NG WAGON



NG WAGON



NG BRONZE BEARING



TURNING OF NG WHEEL



Rail Motor Car



WOGIE FOR NG ROLLING STOCK



MISC. ITEMS



MISC. ITEMS LIKE FLAP DOOR, DUSTBIN & OTHER KEY PART

Description	Utility
TOTAL AREA	3.98 Acre
COVERED AREA	2.12 Acre
RAIL TRACK LENGTH	0.76 KM (Inside)
TOTAL M&P	156 Nos.
WORK FORCE	403
BUDGET ALLOTTED	Rs.34.56 Crore
RENEWABLE ENERGY SOURCE	300 Kwp SOLAR PANEL
TOTAL ENERGY CONSUMPTION	120.9 MTOE
MAXIMUM ENERGY DEMAND	900 KVA



# MAJOR ENERGY CONSUMING EQUIPMENT

**CUPOLA FURNACE ,  
Cap : 1.5 ton**



**OIL FIRED  
FURNACE**

**AIR COMPRESSOR  
Cap: 35 CFM**



**WELDING  
SETS**

**CNC WHEEL PROFILE  
CUTTING LATHE  
MACHINE**



**AIR PLASMA  
CUTTING  
MACHINE**

**LATHE MACHINE**



**ACETYLENE &  
BMCG CUTTING**

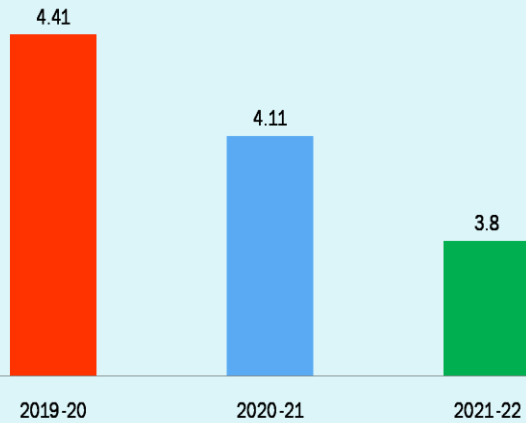




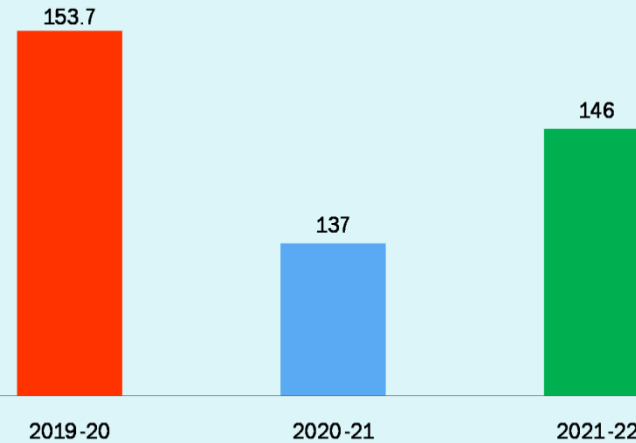
# SOURCE WISE ENERGY CONSUMPTION PATTERN IN 3 YEARS



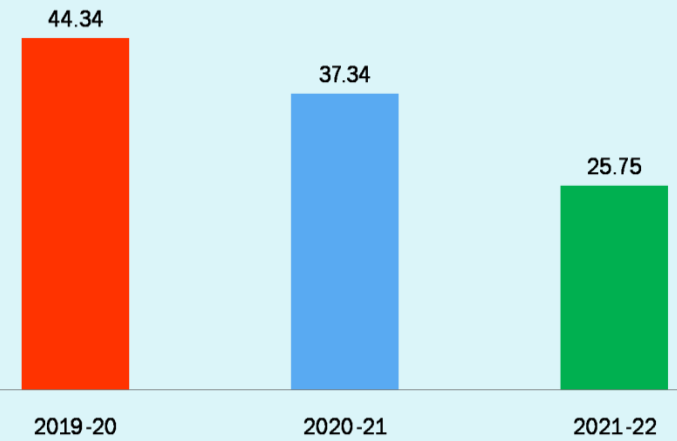
## ELECTRICITY IN LAKH KWH



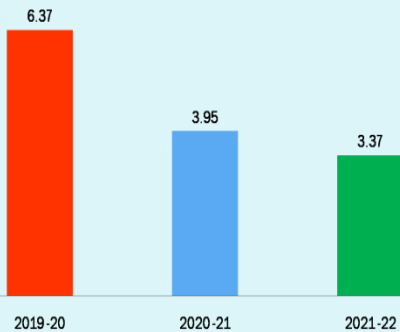
## HARD COKE IN MT



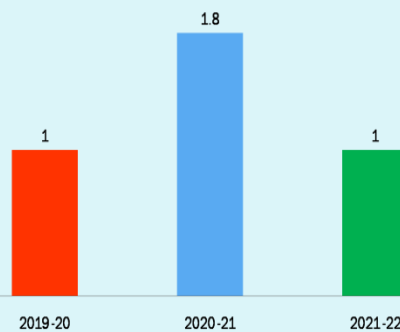
## REFUSED OIL IN MT



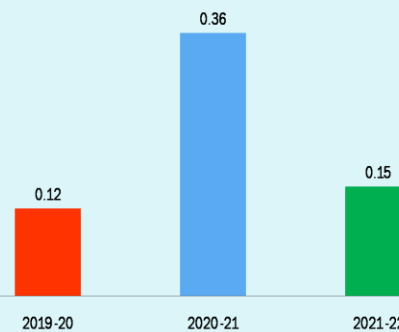
## HSD OIL IN KL



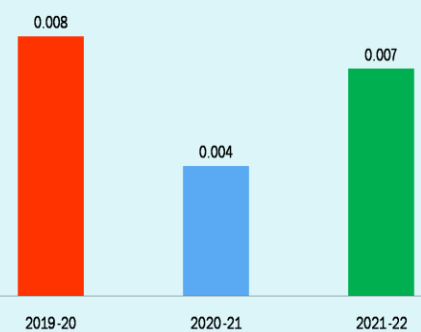
## LDO IN KL



## BMCG IN MT



## DA IN L CuM



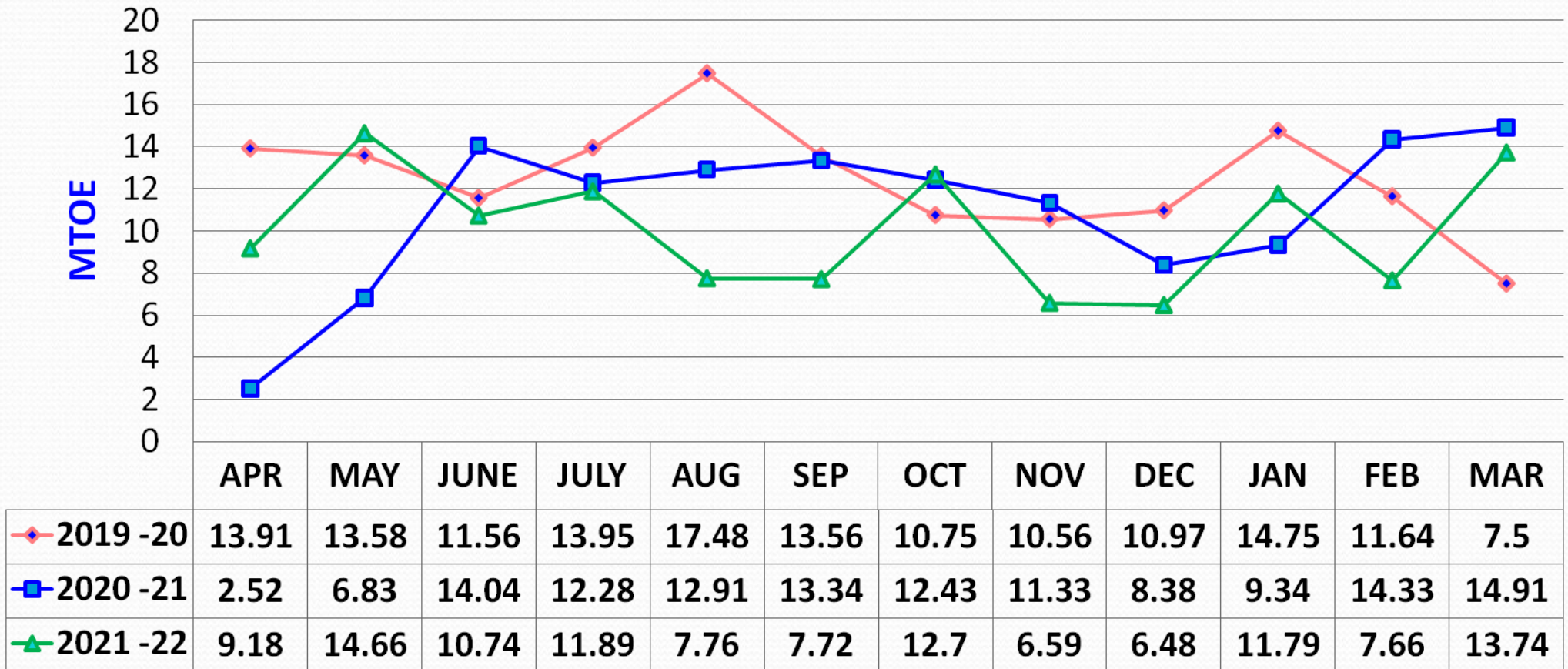




# MONTHLY ENERGY(ELECT & THERMAL) CONSUMPTION PATTERN IN 3 YEARS



## MONTHLY ENERGY CONSUMPTION PATTERN IN LAST 3 YEAR



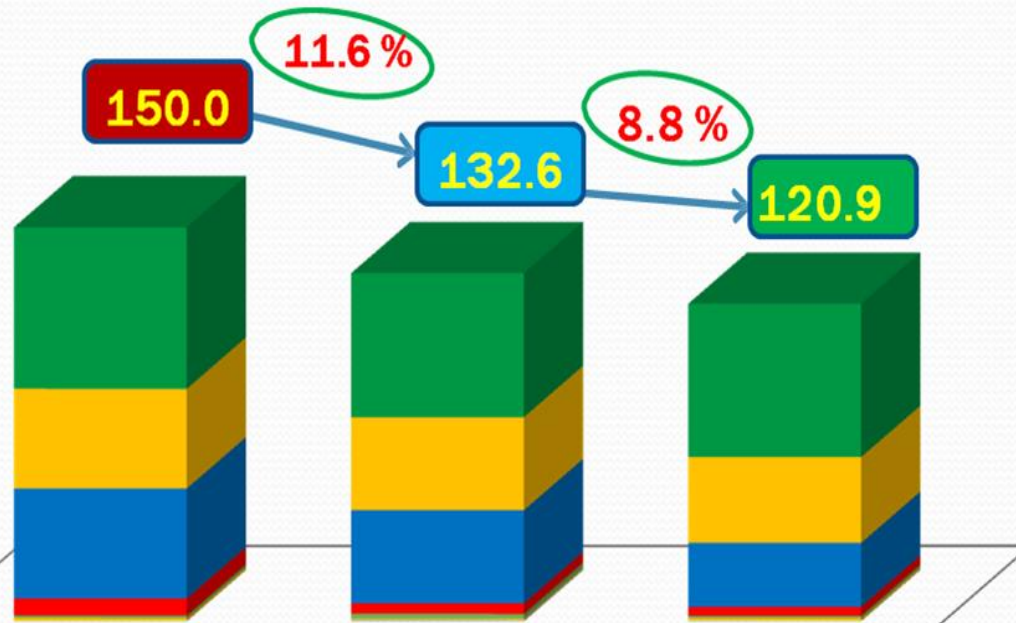
- In APR 2020, the reduced energy consumption is observed due to closure of Foundry Shop during the COVID-19 lockdown.
- In JUNE 2020, the consumption increased due to sudden demand spike of brake blocks.
- in NOV & DEC -21 , the variation is concerned with less operation & production in foundry shop due to less stock of hard cock.



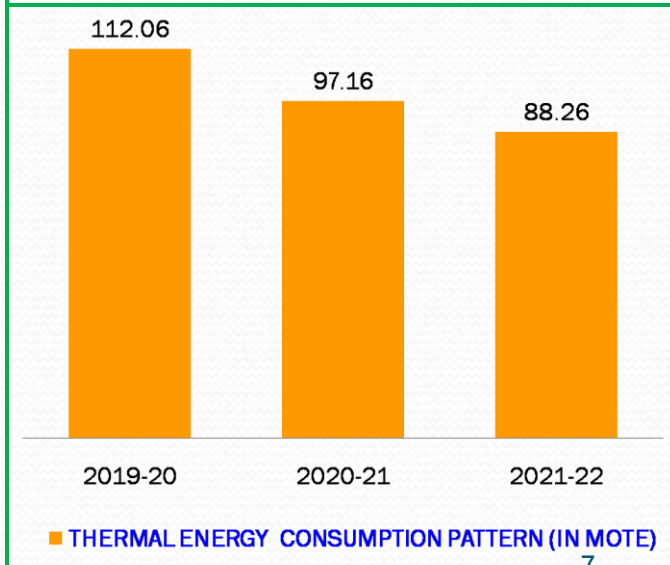
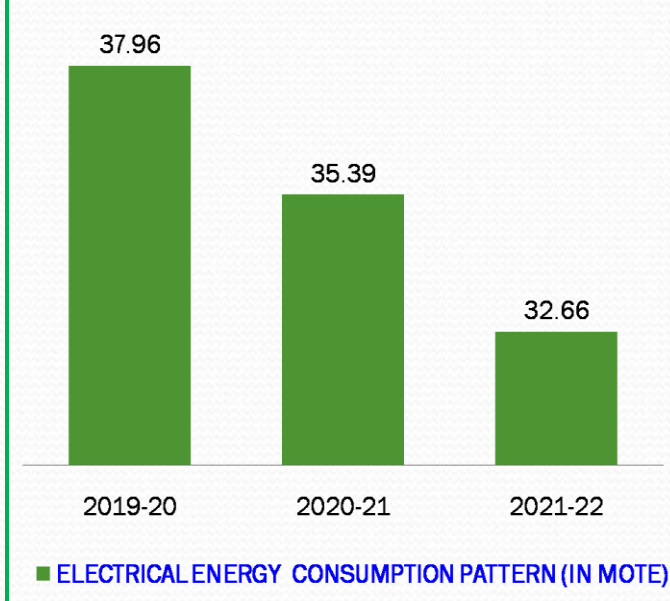
# SOURCE WISE ENERGY CONSUMPTION PATTERN IN 3 YEARS (IN MOTE)



MTOE



	2019-20	2020-21	2021-22
■ HARD COKE	61.48	54.8	58.4
■ ELECTRICITY	37.96	35.39	32.66
■ REFUSED OIL	41.88	35.46	24.32
■ HSD OIL	6.54	4.05	3.46
■ LDO	1.02	1.83	1.02
■ ACETYLENE	1.01	0.59	0.9
■ CUTTING GAS	0.14	0.43	0.18



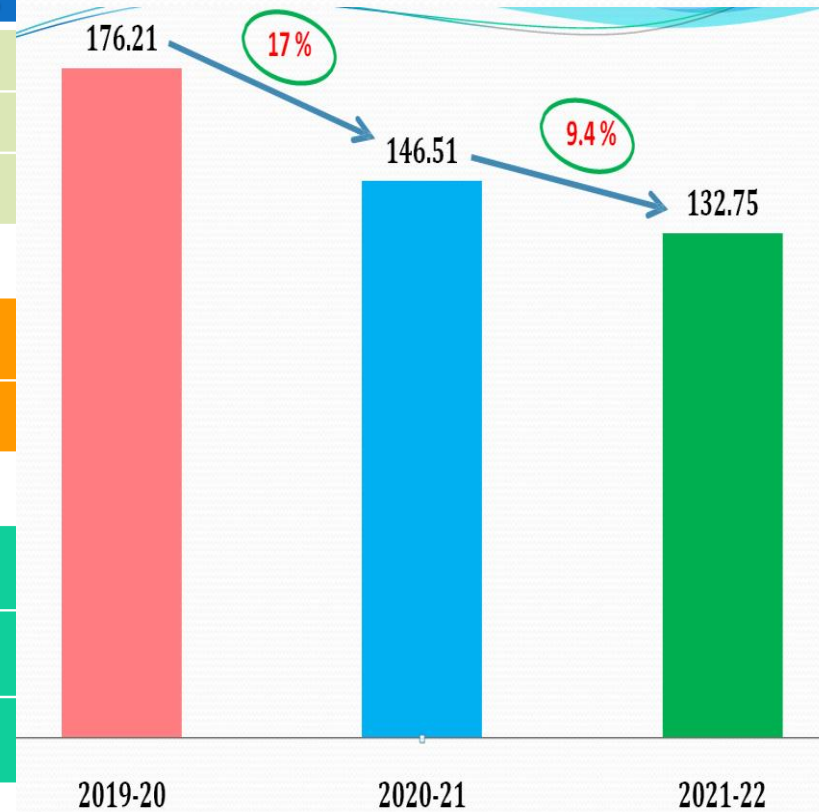




# SPECIFIC ENERGY CONSUMPTION (KgOE / Eq. Outturn)



ENERGY EFFICIENCY	2019-20	2020-21	2021-22
Electrical Energy ( in KWH)	441412	411475	379800
Electrical Energy ( in MTOE )	37.96	35.39	32.66
Specific Electrical Energy (KgOE/Eq. Outturn)	44.59	39.11	35.85
Thermal Energy (in MTOE )	112.02	97.31	88.26
Specific Thermal Energy (KgOE/Eq Outturn)	131.62	107.40	96.90
Total Energy Usage (in MTOE)	150.02	132.55	120.92
Specific Energy Consumption (KgOE/Eq Outturn)	176.21	146.51	132.75
%age Reduction in SEC w.r.t base year (2019-20)		16.85	24.66
Equivalent Outturn Unit (in MT)	851.39	904.70	910.66



**OVERALL ENERGY CONSUMPTION (SEC)  
(KgOE/Eq. OUTTURN)**

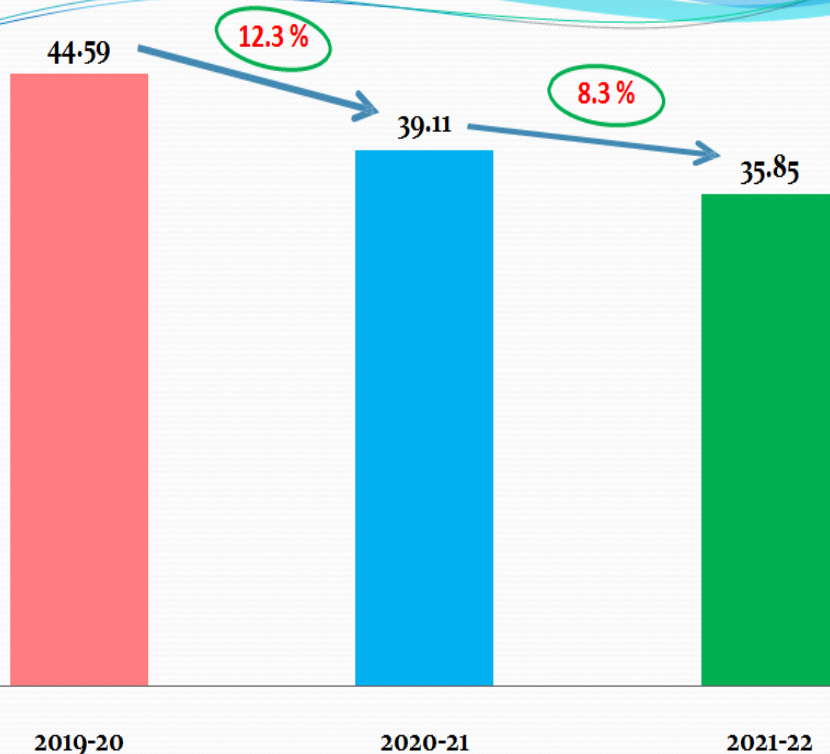




# SPECIFIC ELECTRICAL ENERGY CONSUMPTION (KgOE / Eq. Outturn)



## REDUCTION IN ELECTRICAL ENERGY (SEC)



REDUCTION IN ELECTRICAL ENERGY (SEC)  
(KgOE/Eq. OUTTURN)

SEC REDUCTION by **19.7 %** w.r.t BASE YEAR 2019-20 IS ACHIEVED THROUGH :

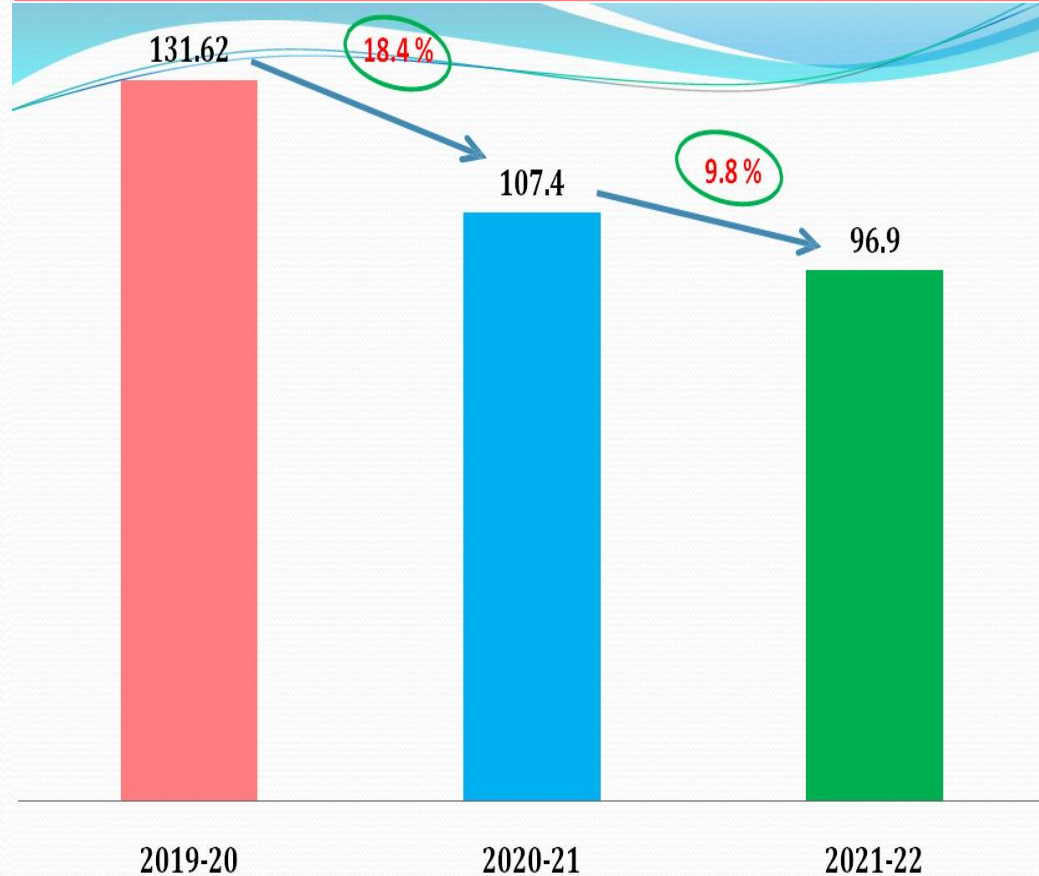
- Replacement of 3 nos. conventional welding sets with IGBT based welding set.
- Use of released 35cfm (14hp) air compressors for localized use in place of large compressors.
- Replacement of 1 no. old milling lathe machine with new universal milling lathe machine.
- Add 50 Kvar power capacitor for pf correction.
- Review the pattern's design of aluminum bar casting for manufacturing of Pre-shortner
- use of timer switch for boundary wall lights.
- Replacement of 10 nos. wall mounted air circulators.
- Using of renewable energy – 300 KWp solar plant



# SPECIFIC THERMAL ENERGY CONSUMPTION (KgOE / Eq. Outturn)



## REDUCTION IN THERMAL ENERGY (SEC)



THERMAL ENERGY CONSUMPTION (SEC)  
(KgOE/Eq. OUTTURN)

SEC REDUCTION BY 26.4 % w.r.t BASE YEAR 2019 -20 IS ACHIEVED THROUGH :

- Replacement of 50 nos. **CI pulley** with **Fabricated type pulley**.
- Using of 01 no. **Air plasma cutting** in place of Oxy – acetylene cutting .
- Using of **sira** in manufacturing of core for Molding.
- Insure **appropriate proportion** of material during charging of cupola furnace.
- Replacement of 01 no. diesel operated fork lift with **battery operated fork lift**.





# NATIONAL BENCH MARKING & TARGET SETTING



S. No	WORKSHOP NAME	Specific Electrical Energy Consumption (KWH/ECU)	Specific Thermal Energy Consumption (Kcal/ECU)
1	JAGADHRI WORKSHOP, NR	409.88	195036
2	AJMER WORKSHOP, NWR	797	288939
3	DLMW, PATIALA	13600	14625336
4	KALKA WORKSHOP , NR	417	968999.4

Kalka Workshop's caters to POH activities of only Narrow Gauge Coaches. We strive to reduce the Specific consumption in coming years.

## Target setting by Internal Bench making (in MOTE)

Details	2021-22		2022-23		2023-24		2024-25	
	SEC Target	SEC Achieved	SEC Target	Reduction w.r.t previous year	SEC Target	Reduction w.r.t previous year	SEC Target	Reduction w.r.t previous year
KLK/ELEC	37.8	32.66	31.77	3 %	30.2	5 %	28.5	5 %
KLK/THERMAL	118	88.26	85.61	3 %	81.33	5.3 %	74.1	9%
Kalka W/shop (TOTAL)	155.8	120.92	117.38	3 %	111.5	5 %	102.6	8%
<b>Over All Targeted Reduction w.r.t Base Year 2021-22</b>								<b>15 %</b>



# ROAD MAP OF TARGET TO REDUCE SEC



## SHORT TERM TARGETS

SN	Project	Qty	Estimated Annual savings
1	Installation of APFC , Cap: 200 Kvar.(as recommendation of energy Audits report)	1	91391
2	Replacement Existing Non Star ACs with 5 Star Rated ACs.(recommendation of energy Audits report)	5	10305
3	Provision of Solar street lights	12	1577
4	Provision of Solar tube Lights	8	1489
5	Provision of timer switch boundary wall lights	1	960
6	Replacement of old aluminium wiring with copper wiring & proper switching	-	-
7	Energy (thermal & Electrical) Audits by BEE certified External auditor	-	-
8	Electric arc furnace	1	66 M Kcal

## MID TERM TARGETS

1	IGBT Based welding Sets	4	31468
2	Provision of Online EMS system	25	-
3	Provision of Energy monitoring system of all machine having load above 10HP	10	-

## LONG TERM TARGETS

1	Replacement of reciprocating air compressor with energy efficient screw compressor	1	42316
3	Installation of 200kWp Solar PV panels on the roof tops of the shed (RESCO – Model)	3	2.0 Lakh





# ENERGY SAVING PROJECT IMPLEMENTED IN 2020 -21



SN	Action Taken	Qty	Annual Saving ( kWh)	Saving @ Rs. 8.7/kWh (Lakh of Rs.)
1	Provision of astronomical timer for boundary wall light	1 No.	1000	0.08
2	Replacement of 3 nos. oil cooled conventional type welding plant with IGBT based welding set	3 Nos.	43000	3.7
3	Provision of Energy Saver on Welding Plant	2 Nos.	13000	1.13
4	Replacement of old lathe machine with new universal milling machine	1	12000	1.03
5	Replacement of old ACs with 5 star energy efficient Air conditioner in NG coach	12	-	-



# ENERGY SAVING PROJECT IMPLEMENTED IN 2021 -22



SN	ACTION TAKEN	QTY	ANNUAL SAVING (KWH)	SAVING @ RS. 8.7/KWH (LAKH OF RS.)
1	Use of released 35cfm (14hp) air compressors for localized use in place of large compressors. Nil Investment.	01 location	20000	1.74
2	Entered in PPA for Installation of 300 KWp rooftop SPV Panels and purchase of energy @ Rs 3.38 for 25 years. Nil Investment.	03 Sheds	347476	18.0
3	Use of fabricated pulley in place of CI pulley for alternator driving in NG coach	50 Nos.	20 M kcal	0.089
4	Design change of pattern of aluminum bar casting for pre-shortener		5440	0.05
5	Replacement of old AC , 1.0 ton	1	2000	0.024
6	Replacement of old AC , 1.5 ton	1	2732	0.024
7	Replacement of oil cooled conventional type welding set with IGBT based welding set	4	25743	2.22
8	Provision of Air plasma cutting machine	1	-	-





**Translucent roofing sheets (100 %) have been provided in sheds to use natural light.**

**Annual Equivalent Savings : 3,000 KWh**

**Provision of Renewable solar energy systems Onsite, 300 KWp at Kalka Workshop**

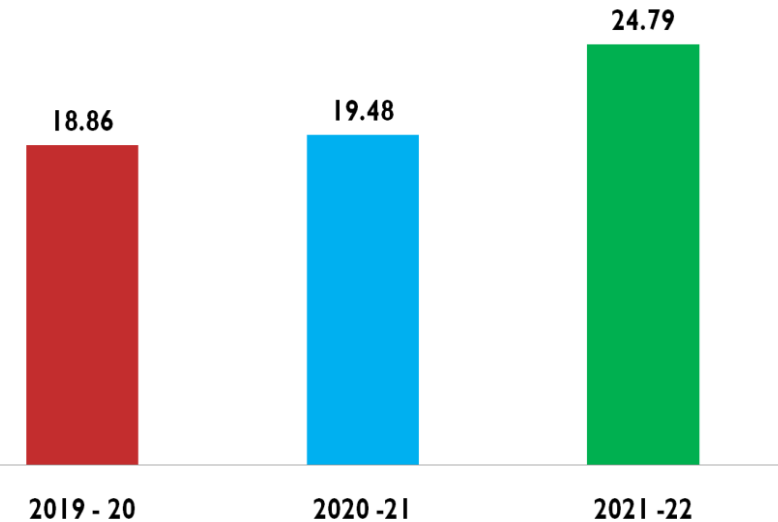


# UTILIZATION OF RENEWABLE ENERGY SOURCE



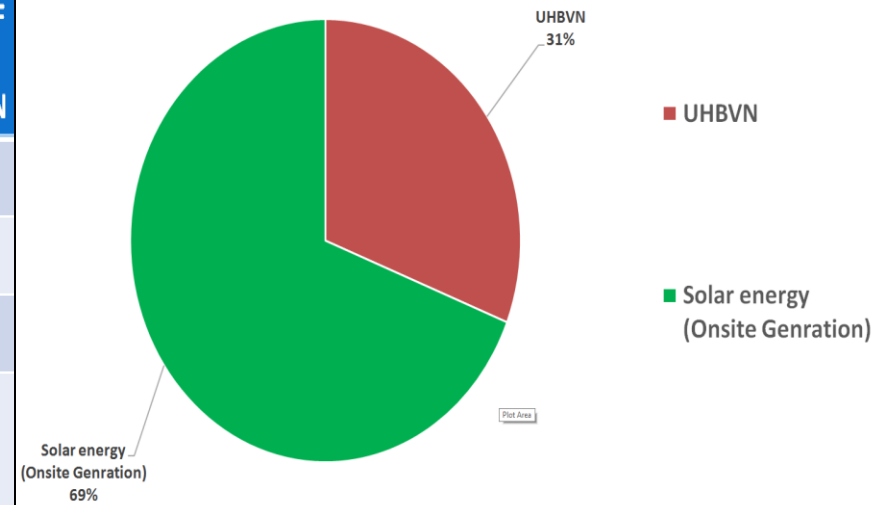
## Renewable energy systems Onsite in last 3 years

YEAR	2019-20	2020-21	2021-22
Thermal Energy (in MTOe)	112.06	97.16	88.28
Electrical Energy (in MTOe)	37.96	35.39	32.66
Total Energy Usage (MTOe)	150.02	132.55	120.94
Equivalent Outturn Unit	851	905	911
RE Utilized (in MTOe)	23.83	21.68	22.45
RE Generated (in MTOe)	28.29	25.82	29.73
% Substitution of RE	18.86	19.48	24.79
% Increase in RE Substitution from base year 2019-20	-	3.3	31.5



% Substitute of Renewable Energy

SOURCE OF RENEWABLE ENERGY	YEAR	INVESTMENT MODE	INSTALLED CAPACITY	ANNUAL POWER GENERATION (IN LAC KWH)	% OF RE SUBSTITUTE OF TOTAL ELECTRICAL ENERGY CONSUMPTION
ON SITE ROOF TOP SOLAR PV PANEL	2019-20	UNDER RESCO MODEL	300 KWp	3.3	62.78 %
	2020-21		300 KWp	3.0	61.27 %
	2021-22		300 KWp	3.5	68.74 %
IN PIPE LINE (PROPOSAL OF SOLAR PV PANEL)	2021-22	UNDER RESCO MODEL	200 KWp	2.0 (ESTIMATED)	100 %



SUBSTITUTE OF ELECTRICAL ENERGY





# GHG EMISSION INVENTORISATION



## Total Specific GHG Emissions ( Scope- 1& 2)

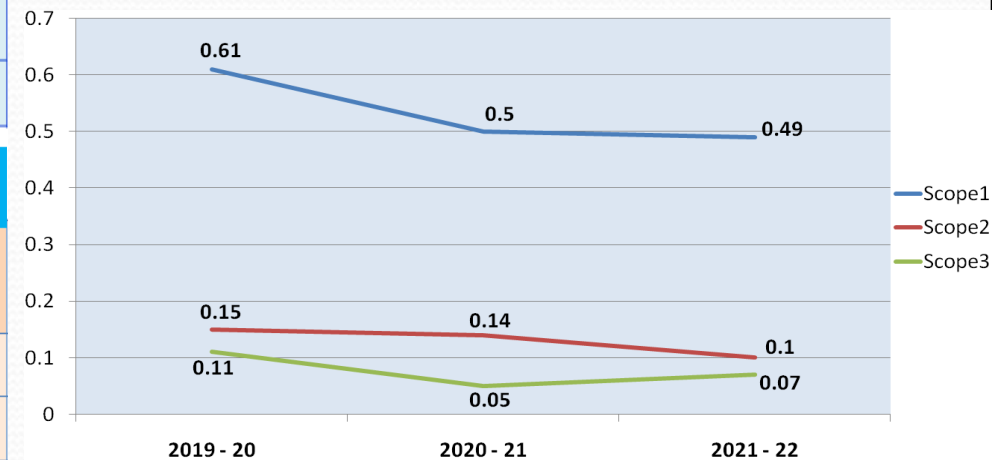
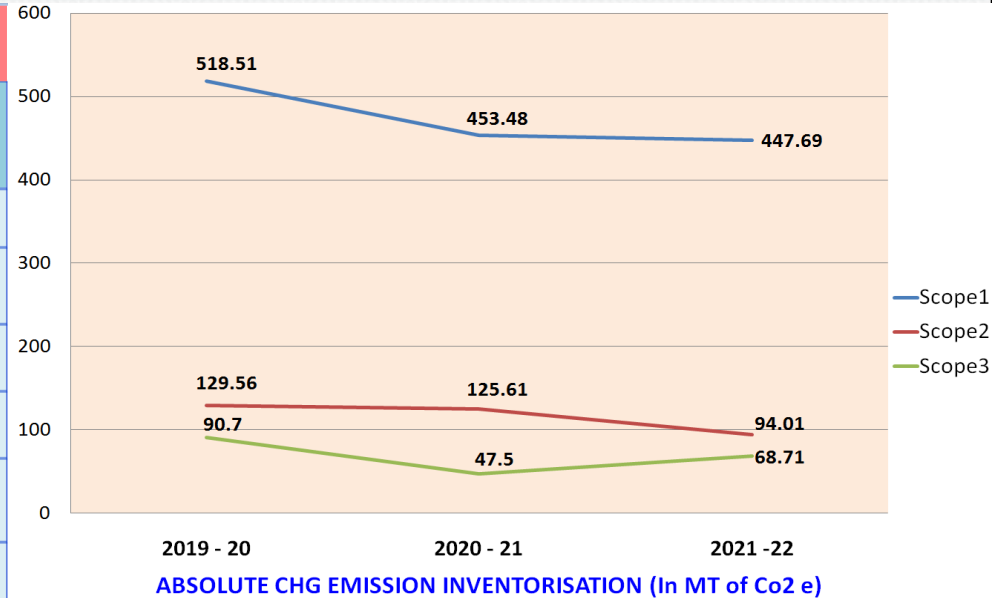
Description	Units	2019-20	2020-21	2021-22
Scope 1 Emissions	Ton of CO2 e	518.51	453.48	447.69
Specific GHG Emissions of Scope - 1	(MT of CO <sub>2</sub> e/Out-turn)	0.61	0.50	0.49
Scope 2 Emissions	Ton of CO2 e	129.56	125.61	94.01
Specific GHG Emissions of Scope - 2	(MT of CO <sub>2</sub> e/Out-turn)	0.15	0.14	0.10
Total Emissions (Scope – 1&2)	MT of CO2 e	648.07	579.09	541.70
Specific GHG Emissions (Scope1&2)	(MT of CO <sub>2</sub> e/Out-turn)	0.76	0.64	0.59
Annual Outturn	In MT	851.39	904.7	910.7

% age Reduction in Specific Total GHG Emissions (Scope – 1 & 2) since 2019-20 = 22.4 %

## Total Specific GHG Emissions ( Scope - 3)

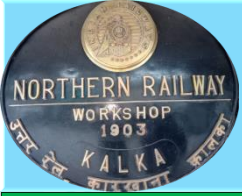
Year	GHG Emissions in MT of CO <sub>2</sub> eq.	Specific GHG Emission in MT CO <sub>2</sub> e per MT out-turn
2019-20	90.7	0.11
2020-21	47.5	0.05
2021-22	68.71	0.07

% Reduction in Specific GHG emission (Scope-3) since 2019-20 = 36.4%



With the improvement in Energy efficiency and Utilization of Renewable Solar energy, there is reduction in Green house gas intensity for Scope -1 emission intensity by 19.7%, Scope-2 emission intensity by 33.3% and Scope-3 emission intensity by 36.4% in last 03 years.

Specific GHG Inventorisation (in MT/Eq. Outturn of CO2 e)



# GHG EMISSION INVENTORISATION

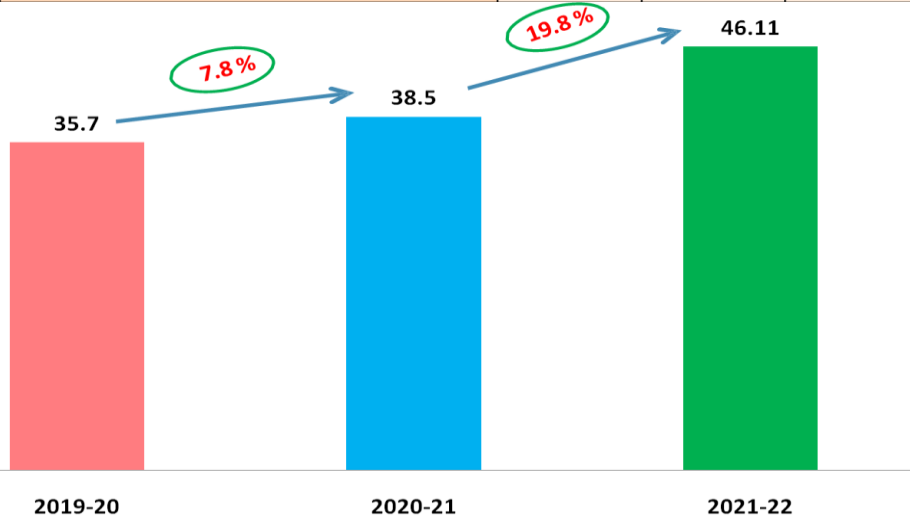


## Carbon Neutral Approach

S.No	Emission/Offset scope	Total Emission /Offset (in MT of CO2)		
		2019-20	2020-21	2021-22
1	Scope-1(both coal and thermal energy)	518.51	453.48	447.69
2	Scope-2( electrical and renewable energy)	129.56	125.61	94.01
3	Scope-3	90.7	47.5	68.71
<b>Total Emission (A)</b>		<b>738.77</b>	<b>626.59</b>	<b>610.41</b>
1	Emission offset onsite renewable energy(B)	260.7	237	276.5
2	Emission offset due to offsite solar & wind(C)	-	-	-
3	Carbon sequestration from trees (D)	3	4	5
<b>Total emission offset(E)=(B+C+D)</b>		<b>263.7</b>	<b>241</b>	<b>281.5</b>
<b>Net Emissions {F}=(A-E)</b>		<b>475.07</b>	<b>385.59</b>	<b>328.91</b>
<b>Carbon emission offset=(E/A)%</b>		<b>35.7%</b>	<b>38.5%</b>	<b>46.11%</b>

## GHG MITIGATION EFFORTS :-

- **69 % substitution** of overall energy consumption from RE (Solar PV) achieved through installation of **300 KWp roof top Solar Plant**. Further installation of 200 KWp Solar power plant is under process at HQ level under RESCO Model.
- **Online stack emission monitoring system (OCSMS) and Automatic Pollution control device (APCD)** has been installed on Furnace.
- Implementing **Paperless working** by using of Railway's digital portals like **WISE, IRMMS, AIMS & E-office** etc.
- **100% Green Supply Chain** is implemented in procurement and disposal of material/scrap through IREPS.
- Emphasis is on **bulk purchase** of materials by increasing procurement powers of the officials and hence utilisation of full capacity of transport vehicles. Setting up of Divisional Store Depots having **three months stock holding capacity** to avoid frequent material logistics.
- Re-use of waste wherever possible. For e.g. **Waste refused Oil and Ferrous & Non Ferrous Scrap** used in foundry Shop ,Conversion of 19 Nos. Out lived NG coaches into Vista-Dome Coach, Conversion 37 scraped BG Axel in to NG axel, Dust / Scrap Bins & sculptures are made from shop generated waste.
- 300 staff quarters are available at out-skirt of workshop and around 100 staff commute through **passenger trains** being suburban pass holders thereby **scope-3 emission** via employees commute is negligible.
- Replacement of Diesel operated fork lifter with **Battery operated fork lifter** .



% Carbon Emission Offset  
(Total Emission Offset/Total Emission)





# GREEN SUPPLY CHAIN MANAGEMENT



NORTHERN RAILWAY

C&W CUM DSL STORE DEPOT, KALKA

## GREEN SUPPLY CHAIN POLICY



- o ENCOURAGE SUPPLIERS TO OPT GREEN PRACTICES & GREEN CO CERTIFICATIONS.
- o PROMOTE THE CONSERVATION OF NATURAL RESOURCES & LEGAL, STATUTORY & REGULATORY ENVIRONMENT COMPLAINE.
- o REDUCE THE OVERALL CARBON SIGNATURE AND THE IMPACT ON ENVIRONMENT BY MINIMIZING WASTE AND GREEN HOUSE GAS EMISSION WITH THE USE OF EFFICIENT PROCESSES, PRODUCTS AND SERVICES.

*K.P.*  
Assistant Materials Manager  
Northern Railway Kalka



DISPLAY OF NG COACH ITEMS at C&W WORKSHOP STORE DEPOT KALKA FOR VENDORS

## VARIOUS VANDER AWARNACE PROGRAMME AT ORGANISATIONAL LEVEL

- RAILWAY EXHIBITION LUCKNOW – APRIL, 2019
- RAIL MUSEUM, NEW DELHI – MAY, 2019
- CII, CHANDIGARH – MAY, 2019
- DLMW Patiala-MAY,2019
- MSME LUDHIANA – MAY, 2019
- VDM, RADDISON BLUE, JAMMU – MAY, 2019
- RAIL MUSEUM, JANUARY,2020
- IREE-21, New Delhi, December 2021



Vendor Meet at Jammu 2019



Items of KSR displayed in IREE-21, New Delhi

Vendor Meet at Ambala Cantt 2019

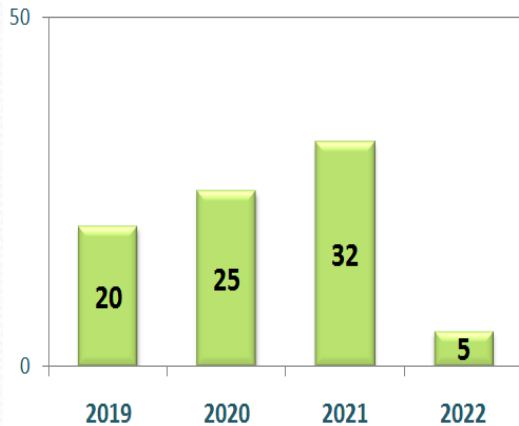


# GREEN SUPPLY CHAIN MANAGEMENT



## VENDOR TRAINING & AWARENESS PROGRAMME

NO. OF EMAIL FORWARDED TO VENDORS



SOME OF THE FIRMS CONTACTED IN 2021-22

S.No.	CODE	EMAIL ID
1	A.D.ELECTRO STEEL CO.PVT.LTD - KOLKATA	adec@adelectrosteel.net
2	HINDUSTAN WAGON - HOWRAH	hindustanwagon@rediffmail.com
3	HARSH INDUSTRIES - MOHALI	harshind73@gmail.com
4	G.B. SPRINGS PRIVATE LIMITED - DEHRADUN	gbsiddn@gmail.com
5	CHEMIN SPRINGS INDIA PRIVATE LIMITED - HARIDWAR	care@cheminsprings.com
6	LAL BABA MACHINO IMPEX PVT.LTD.- KOLKATA	railway.lbmi@gmail.com
7	M.B. ENGINEERING WORKS - HOWRAH	mbengineering8@gmail.com
8	RAIL UDYOG - HOWRAH	rail_udyog@yahoo.co.in
9	RAMKRISHNA ENGINEERING INDUSTRIES - HOWRAH	sknikunj@yahoo.com
10	M G ENTERPRISES - KOLKATA	asishchakraborty505@yahoo.com
11	RANEY ENGINEERING CO. - HOWRAH	raneyengg@gmail.com
12	M/S ANAND LIME INDUSTRIES - KALKA	anandlimeindustries@gmail.com
13	M/S TIWARI ENTERPRISES - HOWRAH	arun.tiwari95@yahoo.in
14	M/S SAM INDUSTRIES - HOWRAH	sumitk10@hotmail.com
15	M/S AMEYAA - DELHI	ameyaa020@gmail.com

## USE OF ONLINE PORTAL INDIAN RAILWAY E-PROCUREMENT SYSTEM

### ONLINE PROCUREMENT THROUGH DIGITAL PORTAL

	2019-20	2020-21	2021-22
E-PROCUREMENT (in No.)	114	71	82
E-PROCUREMENT (in Lac.)	130.44	47.91	79.48
GEM Procurement (in No.)	37	20	51
GEM Procurement (in Lac.)	36.90	2.47	31.74

Decrease in publishing of tenders on IREPS is due to shifting of general items procurement on GEM Portal.

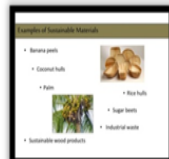
## Reduction of carbon in supply chain

	2019-20	2020-21	2021-22
No. of Consignments Received	431	193	241
No. of Travel Saved (in KM)	43100 KM	19300 KM	24100 KM
CO <sub>2</sub> Emission Saved: (Emission factor 0.18931605 kg/km)	8.15 t	3.65 t	4.56 t

Due to implementation of online system firms representatives need not to visit this office.

Taking average of 100 KM per receipt :

### SAMPLE OF MAIL/PAMPHLET







# WASTE UTILIZATION & MANAGEMENT



## कैरिज एवं वैगन वर्कशाप उत्तर रेलवे, कालका



### CARRIAGE & WAGON WORKSHOP NORTHERN RAILWAY, KALKA

## WASTE MANAGEMENT POLICY

We at Carriage & Wagon Workshop kalka are committed to manage waste through environmentally and safe practices.

**Our waste management policy is aimed to:-**

1. Reduce, recycle and reuse the waste and effluent wherever practicable
2. Segregation, handling, storage, transportation and disposal of the generated waste in environment friendly and safe manner :
3. To comply with all waste management rules through creation awareness, training and involvement of staff.

सोनाय समीर

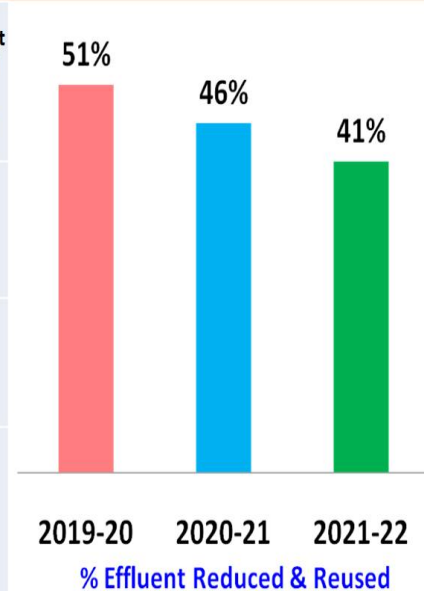
Asstt. Works Manager

## LIQUID & GAS WASTE MANAGEMENT

### SAMPLE COLLECTION OF WATER AT ETP & DETAILS OF TREATED WATER



S. No	Year	Total Effluent Generated (KL)	ETP Water inlet (KL)	ETP water outlet (KL)	% Effluent reduced and reused
1	2019-20	3.93	2.013	1.99	51%
2	2020-21	4.56	2.21	2.11	46%
3	2021-22	4.95	2.08	2.01	41%



### SAMPLE COLLECTION OF STACK OF FURNACE & GENERAL AIR QUALITY





# WASTE UTILIZATION & MANAGEMENT

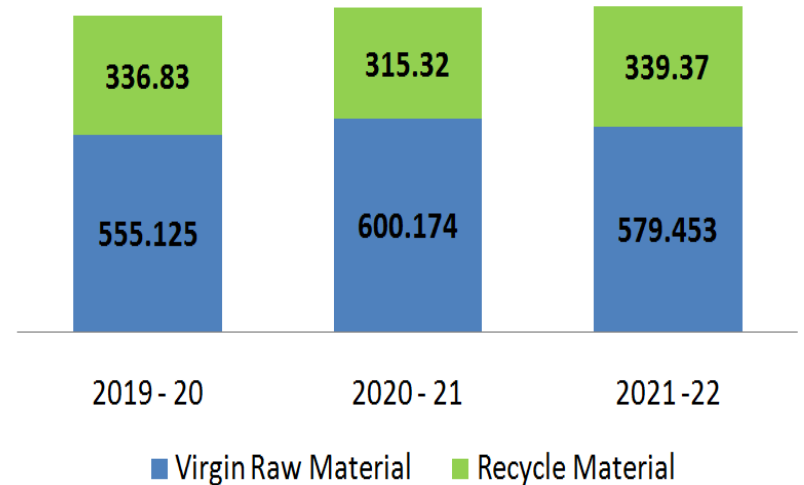


## SOLID WASTE MANAGEMENT

TYPE OF SOLID WASTE	YEAR WISE QTY. (in MT)			METHOD OF DISPOSAL
	2019-20	2020-21	2021-22	
<b>WASTE GENERATED IN WORKSHOP &amp; THEIR DISPOSAL</b>				
Ferrous Scarp (MT's)	186.8	186.1	203.48	Auction To Recycle
Non - Hazardous Waste (MT)	336.4	291.4	230.5	Auction To Recycle
Hazardous Waste (MT)	18.3	11.3	3.8	Auction to HSPCBB approved Recyclers
Released Grease mixed with Kerosene Oil	0.015	0.012	0.017	Reused as lubricant for Rail Junction Points
ZERO Value Waste	0.080	0.064	0.072	Send to MC dump Yard
Hazardous Waste (Sludge)	0.423	0.371	0.502	Disposal through HSPCBB approved recyclers
<b>WASTE COLLECTED FROM DIVISION &amp; USED IN FOUNDRY SHOP FOR CASTING</b>				
ALUMINIUM SCRAP	18	0.91	40.4	WASTE COLLECTED FROM DIVISION & USED IN FOUNDRY SHOP FOR CASTING
C.I. SCRAP	65	45.6	82	
Released / Refused Oil	44.34	37.54	25.75	

## Replacement of Raw Material by Recycled Material

S N	TYPE OF MATERIAL	YEAR WISE QUANTITY (IN MT)		
		2019 - 20	2020 - 21	2021 - 22
1	Virgin Raw Material	555.125	600.174	579.453
2	Recycle Raw Material	336.83	315.32	339.37
3	Absolute Consumption Of Raw material	891.955	915.494	918.823
4	% Replacement of Raw material by recycle material ( Recycle Material/Raw Material)	37.76%	34.44%	36.94%
5	Total Equivalent Outturn (MT)	851.39	904.7	910.66







# INNOVATIVE PROJECT -1



## Manufacturing of Pre-shortener

### Objective:

To reduce **manufacturing time, production cost, and material costs** along with **conservation of energy** by changing the **design of pattern of Aluminum Bar casting** from circular shape to octagonal shape. Only this change in pattern shape avoids the machining work & saves electrical energy involved in the machining process. This also saves material due to the less diameter of octagonal bar.

**Date of implementation : FEB-2019**

### Saving:

#### Energy:

Time saved in machining work involved in conversion of circular to octagonal = 5.4 Min per piece.

Load of Motor of milling machine = 7.5 KW

Total electrical energy save per unit product = 0.68 Kwh per piece

#### Total Time :

Total Time save = Time taken (previously) – time taken ( mod.)  
= 110 Min-35 Min = 75 Minutes per unit product

#### Material: @ 50 % less material use

Area of Bar (Pervious) – Area of Octagonal Bar

= 491 Sq MM – 237 Sq MM

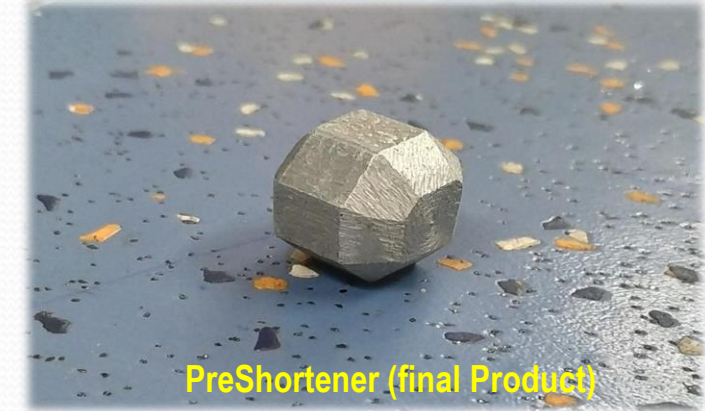
= **254 Sq. MM (50%)**



Previously Use of circular Al Bar



Use of modified Octagonal Al Bar



PreShortener (final Product)





# INNOVATIVE PROJECT -2



## Provision of Fabricated type pulley in NG Coaches

**Objective:** To overcome frequent failure of CI cast type pulley (Wt -52 kg) and save thermal energy & man Hours used for casting of pulley as existing CI cast type pulley were removed and use fabricated type pulley (wt - 28.5 kg) for alternator drive.

### Savings:

**Thermal Energy:** @104kg coal/per pulley  
= 1.68 GJ per pulley

Total saving for 125 pulley = 210 GJ

**Raw Material:** @ 23.5 kg per pulley

Total saving for 125 pulley = **2938 Kg**

### Other Advantage:

- Long life & easy to repair / replacement
- Reduce the Tare weight of coach by 23.5 kg
- Save CO<sub>2</sub> emission as easy transportation



Existing Cast Iron Pulley (wt - 52 kg.)



Newly developed fabricated Pulley (wt - 28.5 kg.)





# INNOVATIVE PROJECT -3



## Provision of Solar Panel in NG coach of KVR / KSR

**Objective:** To minimise Carbon Emission as use of Renewal Energy for hotel Load of NG Coach and save electrical energy

**Date of implementation :** OCT-2019

**Savings:**

**Energy:**

365 days @ 4kWh/day/coach = 1460 kWh

Total saving for 1 coach = 1460 kWh

Annual Monetary Savings = **Rs. 12629/-**

**Carbon credit :** @ 820 g/kWh = 1197 Kg

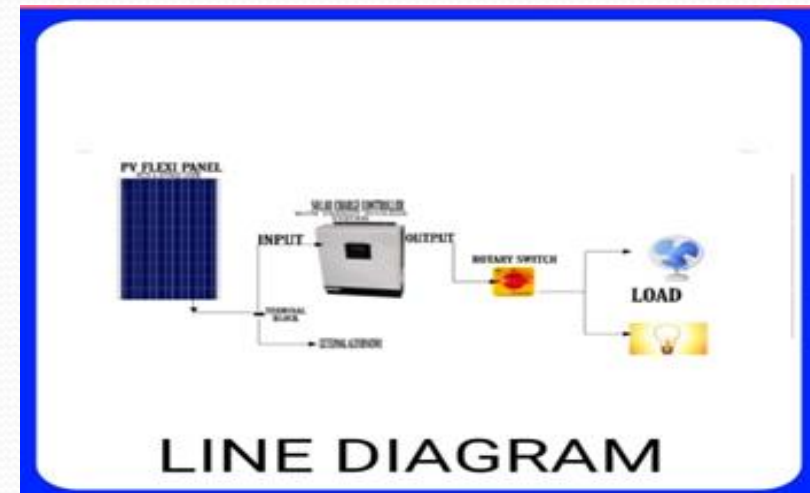
**Waste :** Reduce hazardous waste by 300 kg

**Monetary :** Rs. 50 K in initial Investment

**Coach weight :** Reduce the Tare weight of coach by 0.5 MT



**Poly crystalline flexi type Solar Panel on Roof of NG Coach/KSR**



**LINE DIAGRAM**





# INNOVATIVE PROJECT - 4



## Provision of Bio-Digestive tanks in NG coaches of KSR (UNESCO Heritage site)

### Objective:

To Achieve **Zero - defecation** on ground & support to the IR project “Clean Rail-Clean India”

### Advantages :

- Reduce **environment pollution**
- Railway Stations of **UNESCO world heritage site** and other NG Section is being now become clean which support “**Swachh Bharat Abhiyan**” of Government of India.
- Improved Aesthetics at Railway Stations Railway Stations of UNESCO world heritage site
- Provides **healthy & hygienic** atmosphere to Track maintenance staff & those who manually clean the toilet Seat at the platforms
- Preventing damages to tracks due to **Corrosion**



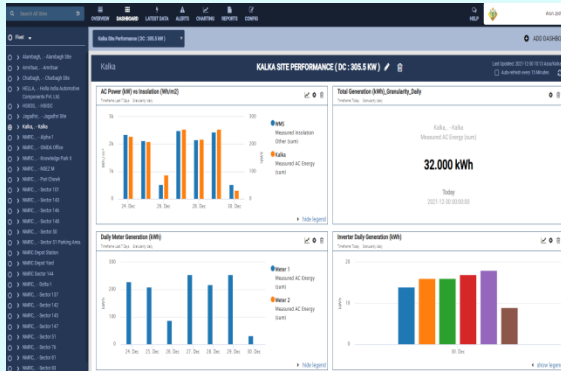




# TEAM WORK, EMPLOYEE INVOLVEMENT & MONITORING



## ON LINE MONITORING OF SOLAR POWER GENERATION



ON LINE monitoring of solar generation of On site PV SOLAR Panel, Cap; 300 KWp

## MICRO MONITORING OF MACHINE



20 Nos. 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 area of work

**SUPERVISORS (27 Nos.)**

All supervisors are trained on energy efficiency and management

9 supervisors are trained on Internal Audit of Energy Management System

**OFFICERS (3 Nos.)**

Awareness and the requirements of Energy Management System by outside expertise



# TEAM WORK, EMPLOYEE INVOLVEMENT & MONITORING



**WEEKLY PERFORMANCE REVIEW MEETING CHAIRED BY AWM/KLK  
(CONDUCTED EVERY FRIDAY TO REVIEW ENERGY PERFORMANCE AND OUTTURN OF WORKSHOP)**



## KAIZEN

S N	Suggestion/Activities	Environmental saving	Suggested by	Year of imp
1	Use of timer to minimise operational time of wall mounted air circulators	Save 3 hrs/day operational time	Sh. Gurdeep Singh, JE	2022
2	Change in design (Circular to Octagonal) of mould of Casting of Al Bar for Pre shortener	Save material 50% & 0.68 Kwh electrical energy per piece	Sh. Baldev Singh	2021
3	Renovation of Battery Section	Minimise the soil pollution, improve working Environment	Sh. Gagan Deep	2021
4	Shower testing for testing of leakage from coach shell	Improve safety of employee, save water	Sh. Surender Kumar, SSE	2021
5	Use of Bio Toilet In NG Coach	Minimize environment pollution, Provides healthy & hygienic atmosphere	Sh. Gurdeep Singh, JE	2021
6	Use of LED Light fitting in NG Coach	80% Save energy, minimise hazardous wste generation	Sh. Dev Raj, SSE	2019
7	Use of fabricated pulley in NG Coach	Save Energy & raw martial.	Sh. Mukesh meena, SSE	2019
8	Use of Solar panel in NG Coach	Improve safety, Minimize the use of LA Battery, save energy,	Sh. Dhruv Kumar, SSE	2019





# IMPLEMENTATION OF ISO 50001 / GREEN CO/IGBC



**KALKA WORKSHOP ACHIEVED GOLD GREEN CO RATING**

**INTERCERT®**  
CERTIFICATE OF REGISTRATION

INTERCERT hereby certifies that the Energy Management System of  
**CARRIAGE & WAGON WORKSHOP KALKA**

CARRIAGE & WAGON WORKSHOP-NORTHERN RAILWAY,  
KALKA - HARYANA—133302, INDIA

Has been successfully assessed as per the requirements of  
**ISO 50001:2018**

For the scope of  
Workshop's activities for Narrow Gauge Coaches under Carriage & Wagon Kalka.

Initial Certification Date : 21-12-2020  
Certificate Issue Date : 21-12-2020  
Surveillance Validity Date : 20-12-2021  
Recertification Date : 20-12-2023  
Registration Number : IC-En-2012105

Issued on behalf of Intercert Head - Certifications

IAF IAS

The validity of this certificate can be verified at [www.intercert.com](http://www.intercert.com) or through email at [info@intercert.com](mailto:info@intercert.com). This certificate is the property of INTERCERT, C-1118, Insaia One, B-6, Sector 62, NoIDA - 201301 and must be returned on request. Accreditation details are available with IAS, International Accreditation Services Inc, USA at [www.iasweb.org](http://www.iasweb.org)

No. 15-W/Energy Management/ISO - 50001/KLK  
Date: 01.02.2021

**Subject:** Energy Consumption (Thermal & Electrical) Review meeting  
Ref. 1. ISO 50001:2018  
2. No. 15-W/Energy Management/ISO - 50001/KLK dated: 25.01.2021

As above apropos energy consumption (Thermal & Electrical Both) review meeting was held on date 30.01.2021 in meeting room. Meeting was chaired by AWM. The member present in review meeting were

Sr. No.	Member's Name	Designation
1	Sh. Lalit Kalia	SSE/MW
2	Sh. Dhruv Kumar Sinha	SSE/Elect
3	Sh. Staish Kumar	SSE/Idg
4	Sh. Dinesh Gupta	SSE/Machine
5	Sh. Sukhdev Singh	SSE/Tool
6	Sh. Mukesh Meena	SSE/CR
7	Sh. Sandeep Choudhary	SSE/ISO
8	Sh. Amjan Soren	SSE/Planning
9	Sh. Gurdeep Saini	SSE/Safety

Minutes of review meeting on agenda points are given following:

- The SEC of all thermal Fuels reduced significantly by the value HSD - 4.74 Ltrs/Outturn, LDO - 1.34 Ltrs/Outturn, Refuse Oil - 12.39 kg/Outturn, DA- 0.34 CUM/Outturn. The consumption of Hard coke has been also reduced but almost negligible (0.04 MT/outturn).The SEC of BMCG has been increased by 0.27Kg/Outturn since its replacing the DA consumption
- Electrical Energy consumption is reduced by 9500 Kwh w.r.t previous year. Need to More emphasis to motivate/ awareness of staffs for energy saving.
- Working of Solar power panel is being monitored on line & data to be recorded on daily basis. 60 % of total electrical energy consumption to be fulfilled by RE (Solar energy).
- Solar panel to be maintained /cleaned regularly and same to be recorded in register
- A request letter to be submitted for installation of another solar panel, 200 Kw
- furnace of foundry shop shall be run on full capacity
- Equipment wise energy consumption trend to be recorded and maintained in a register.
- Energy consumption data to be maintained in daily/monthly & yearly basis and analysed accordingly.
- It is observed that thermal fuels have not been included in scope of external energy audits previously done 3 times through dy. CEE/JUDW therefore it is requested that all thermal fuel consumption is to be also included in scope of external energy audit.
- Use of Refuse oil to be switched to LDO. SSE /foundry & SSE/material should expedite the work.
- CNC plasma cutting machine have to arrange/procure in assembly section so the consumption of DA/Oxygen Can be reduce. Accordingly SSE/Machine should plan & expedite the work.
- Full capacity of truck should be utilised. Further SSE/MW plan and Expedite to arrange/procure a new vehicle of better fuel efficiency and BS VI emission standard.

Assistant Works Manager  
NR, C & W Workshop, Kalka

Copy To: Dy. CME (W) & DY.CEE/JUDW for kind info please.

**ISO 50001:2018**

**Minutes of energy review meeting**

## ALLOCATION OF FUNDS FOR ENERGY CONSERVATION PROJECT

**REVENU FUND**

**MODERNISATION PROGRAMME**

**M & P PROGRAMME**

**ENVROMENT FUNDS**

**ROLLING STOCK PROGRAMME**

- **% INVESTMENT OF ENERGY SAVING PROJECTS ON TOTAL TURN OVER OF WORKSHOP : 0.06**
- **1% VALUE OF EVERY ON GOING PROJECT IS UTILIZED IN ENERGY / ENVIORMENT SAVING PROJET**



# AWARDS & ACCOLADES



C & W Workshop, NR, Kalka is awarded as **"Energy Efficient Unit"** in CII 21<sup>st</sup> National Award for Excellence in Energy Management 2020.

C & W Workshop, NR, Kalka – Team receiving Award as **"First Prize"** in State Level Energy Conservation award (**SLECA-2020**) by New & renewal Energy Department (Haryana) & HAREDA







# LEARNING FROM AWARDS PROGRAMME



- Learn About Various Techniques & Ideas To **Control & Monitoring Of Wastage** Of Energy.
- How Maintain The **Energy Score Card** Of Machine And Employee.
- **Kaizen Philosophy** And Its Benefits.
- Role Of **Training Programme** And Evaluation Of Its Impact On Energy Saving.
- Know About **Next Gen Energy Efficient Appliances**.
- Learn The **Daily Variance Analysis** & Its Benefits.
- Better **Awareness** Among Employees.
- **Motivate** For Further Improvement In Own Idea To Save Energy.

**PLEASE CONTRIBUTE TO SAVE ENERGY**



**Thanks**