23rd National Award for "Excellence in Energy Management – 2022"

Kirloskar Oil Engines Ltd., Kagal-Kolhapur

Presented by-

VM Deshpande-Sr. GM-Maintenance & Utilities

SP Parab-Sr. Manager-Utilities

NN Kulkarni-Corporate Energy Manager

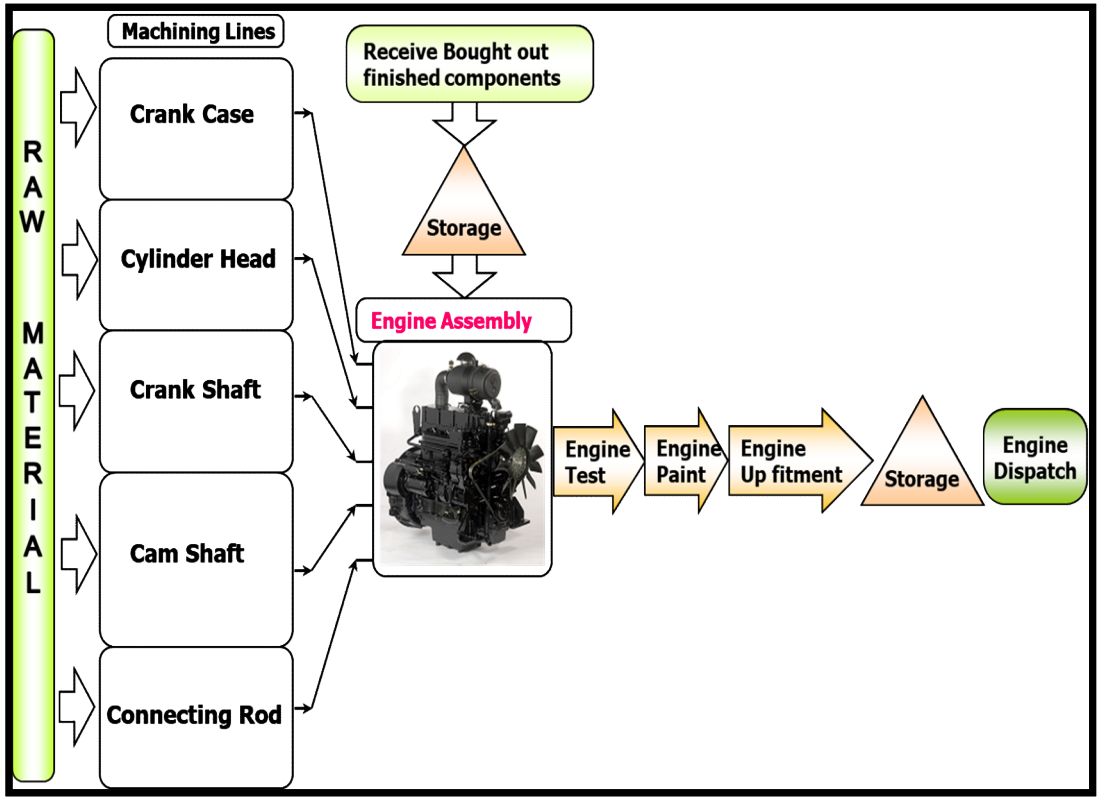
Content of the presentation

Kirloskar Oil Engines

- Company profile
- Specific Energy Consumption (Last 3 years FY 19-20 to FY 21-22)
- Information of Competitors, National and Global Benchmarks
- Energy Saving Projects implemented in last 3 years
- Innovative projects implemented 2021-22
- Utilization of Renewable energy sources
- Waste utilization and Management
- GHG Inventorisation
- Green Supply Chain Management
- Team Work, Employee involvement and monitoring
- Implementation of ISO 50001, IGBC and GreenCo rating
- Learning from CII Energy Award or any other award program

Company profile

kirloskar Oil Engines



Product	Product Name	Capacities (2 Shifts Basis)	Range	Application
	Generating Sets with air cooled and liquid cooled engines	1650 / month	5 KVA to **1010** KVA	Power Generation
	DV Engine with 8, 10 and 12 Cylinders	200 / Month	400 HP to 750 HP	
	Liquid Cooled with 1,2,3,4 and 6 Cylinder Engines	4000 / month	14 HP to 330 HP	
	Air Cooled with 1,2,3,4,5 and 6 Cylinder Engines	4000 / month	10 HP to 120 HP	
	Varsha Pump sets	8000 / month	3.2 HP to 5 HP @ 1500, 1800 & 2600 rpm	Agriculture

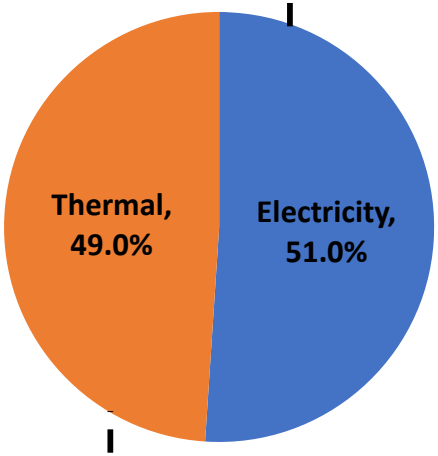
Incorporated in 1946 as a part of the Kirloskar Group of Companies, Kirloskar Oil Engines Ltd. is an engineering conglomerate, founded by the late Mr. Laxmanrao Kirloskar.

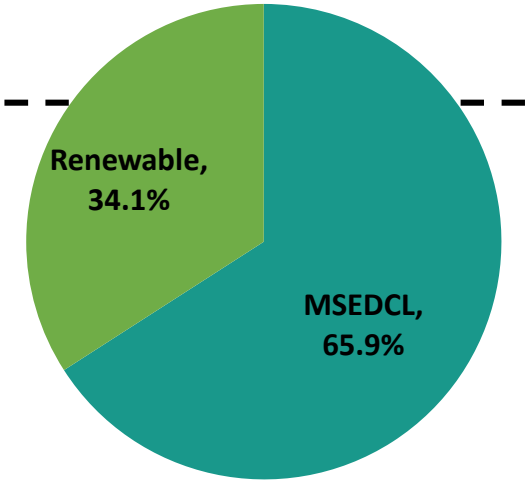
1. Kagal
2. Khadki
3. Nashik
4. Bhare

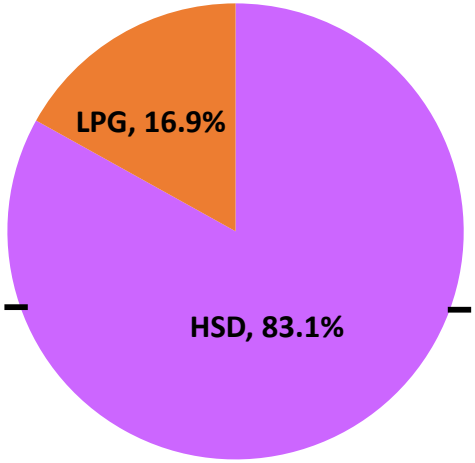
Company profile

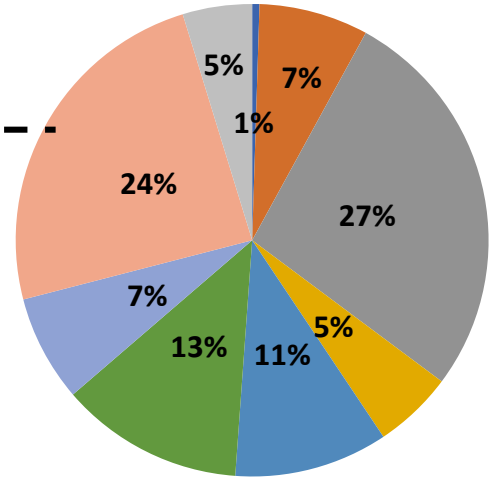
kirloskar
Oil Engines

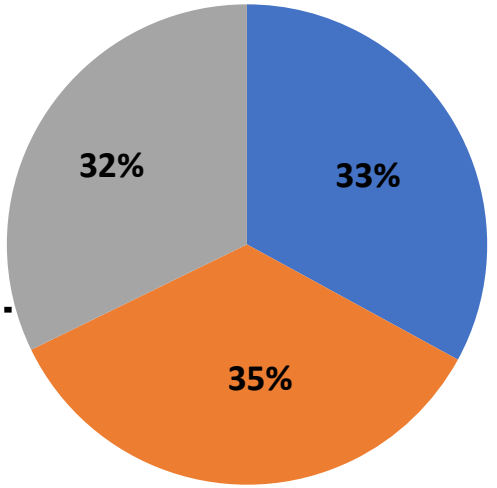
Energy consumption overview











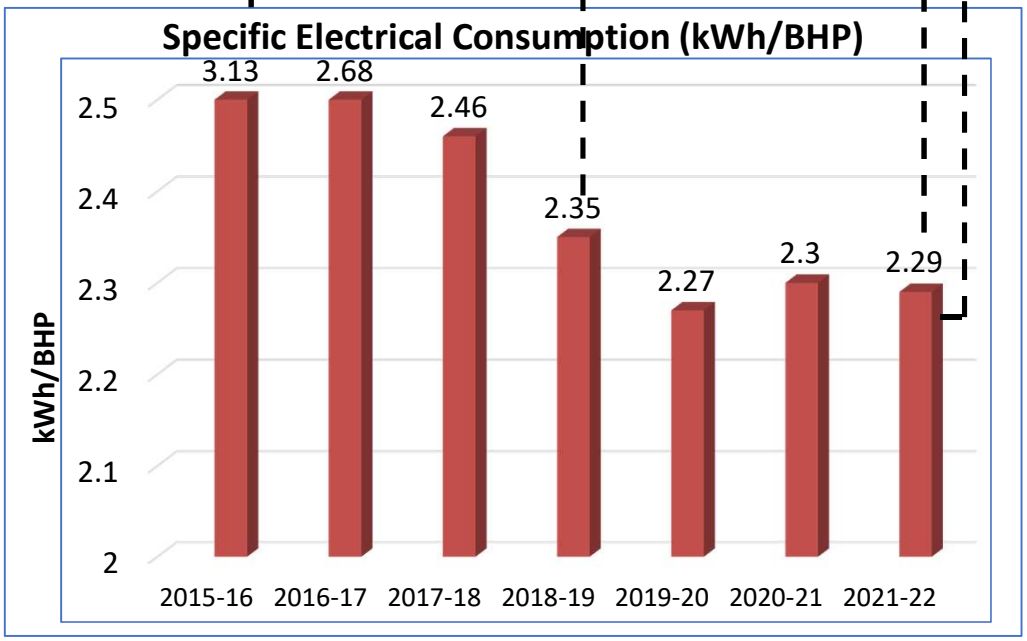
Sp. Energy consumption-Performance

kirloskar Oil Engines

ELECTRICAL

26.5%

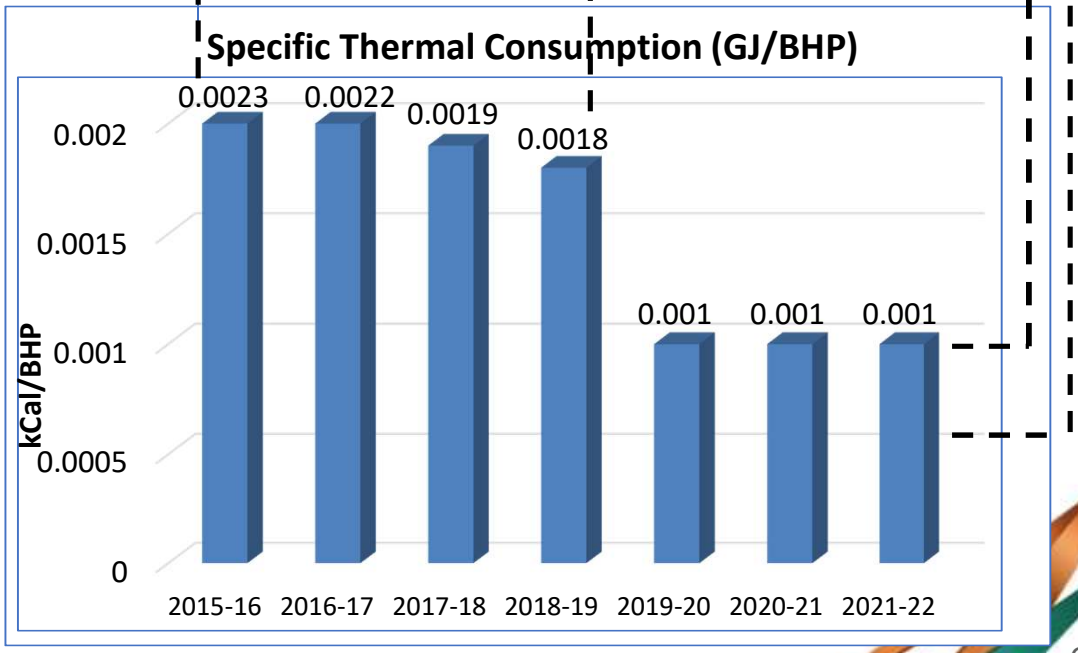
2.1%



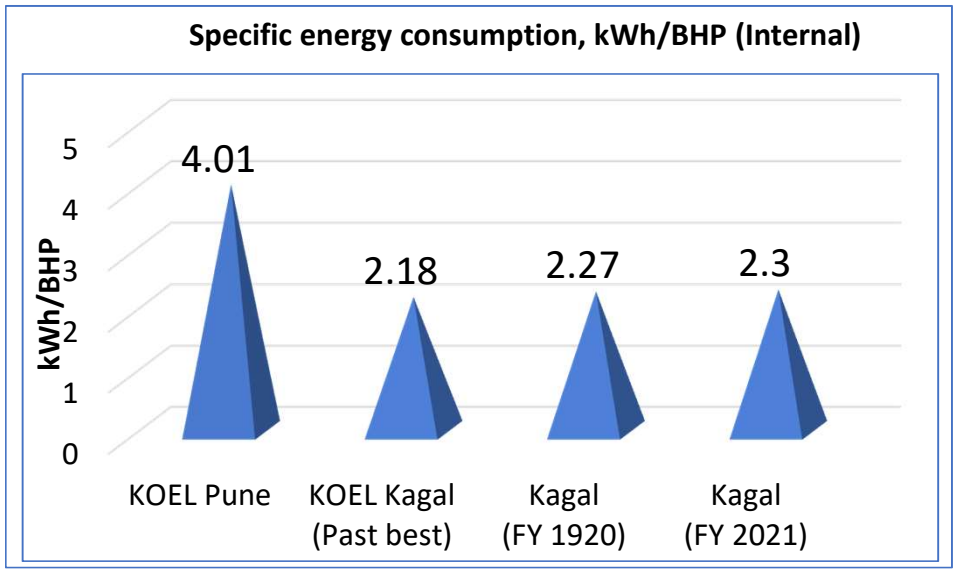
THERMAL

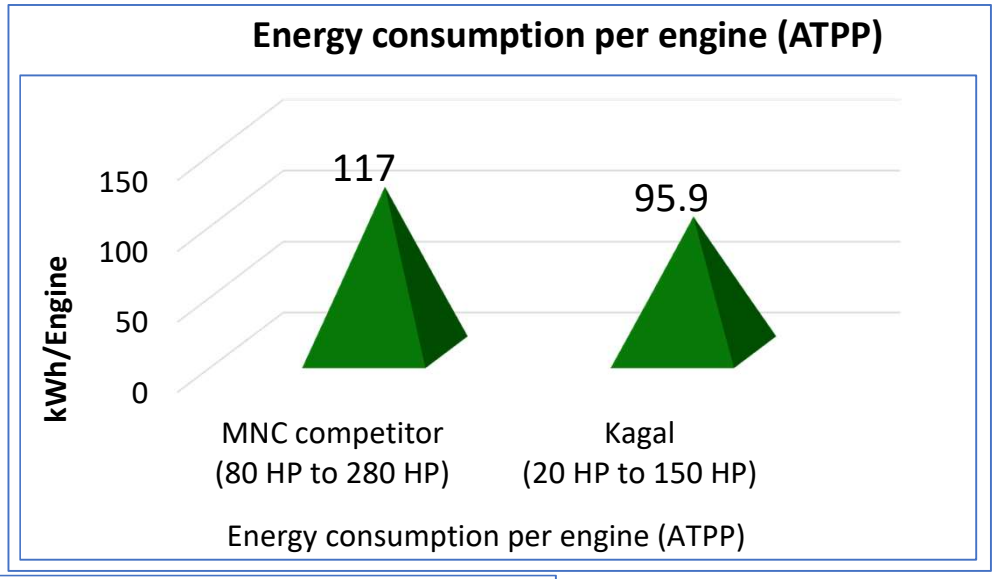
56.5%

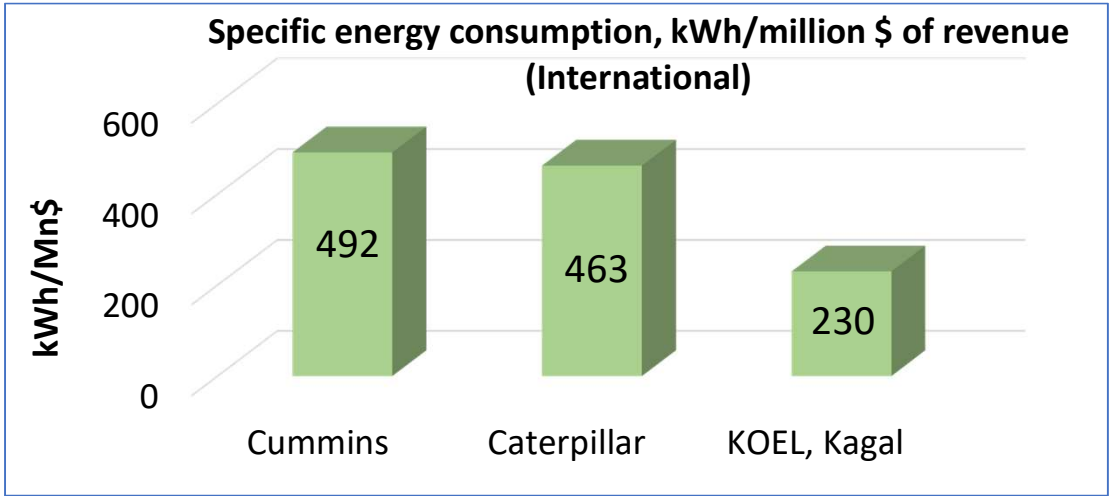
44.5%



Information of Competitors, National and Global Benchmarks







Energy Saving projects implemented in last three years

Kirloskar Oil Engines

Category	No. of projects	Units saving In Million kWh	Fuel saving Million Kcal	Cost saving in Million Rs.	Investment in Million Rs.
Zero Investment	74	0.59	722	10.24	0
Moderate Investment	1	0.02	0	0.02	0.10
High Investment	4	3.32	0	23.86	114.15
Total	79	3.93	722	34.12	114.25

Energy Saving projects implemented in last three years

Category	No. of projects	Units saving In Million kWh	Fuel saving Million Kcal	Cost saving in Million Rs.	Investment in Million Rs.
FY19-20	11	0.25	722.52	6.84	0
FY20-21	26	0.16	0	1.36	0.20
FY21-22	42	3.54	0	26.36	114
Total	**79**	**3.95**	**722.52**	**34.56**	**114.2**

Innovative projects

1. Elimination of usage of compressed air through Karakuri kaizen

SBU: Kagal Plant	Department: EP-2 Machine shop	Plant / Office Location: (WHERE) SL90 Cylinder head line	Name of Contact Person & Contact Details: (WHO) Mr. Umesh D Kumbhar

Name / Title of the Practices: (WHAT)	Purpose of the Practices: (WHY)	Completion Date: (WHEN)
Powerless lifter at final FG output conveyor	ZERO Energy management system for compressed air cost saving	14 Jun 2021

Description of Initiative's/Practices: (HOW) Process Flow / Schematic Diagram / Before & After Photos :- Elimination of pneumatic cylinder by providing POWERLESS LIFTER with Gravity- Weight – Break mechanism through KARAKURI kaizen under the concept of ZERO energy management system

Before

Operator uses compressed air operated pneumatic knob to up and down the lifter

Previously we were using pneumatic system for unloading of FG cylinder head from output conveyor to FG trolley by spending 97.5 m3/min compressed air i.e. 3450 CFM through DIA 10 mm orifice pipe.

After

Implemented Gravity- weight – break mechanism/ KARAKURI kaizen for elimination of overall compressed air system.

Now, the operator uses foot operated mechanical lifter easily to release the lifter movement downwards and upward direction up to fixed stopper, through powerless gravity weight break mechanism.

Foot press

Results Achievement:

1) Total Rs 2.37 Lakhs Power cost saved per annum
3) Enhanced component handling process without additional resource

Scope for Horizontal Deployment:

1. DV cylinder head line
2. 6R6K4K Cylinder head line
3. R810 cylinder head line
4. Cam Box machining line
5. Other lines where there same function

Please see the actual Video's for better understanding

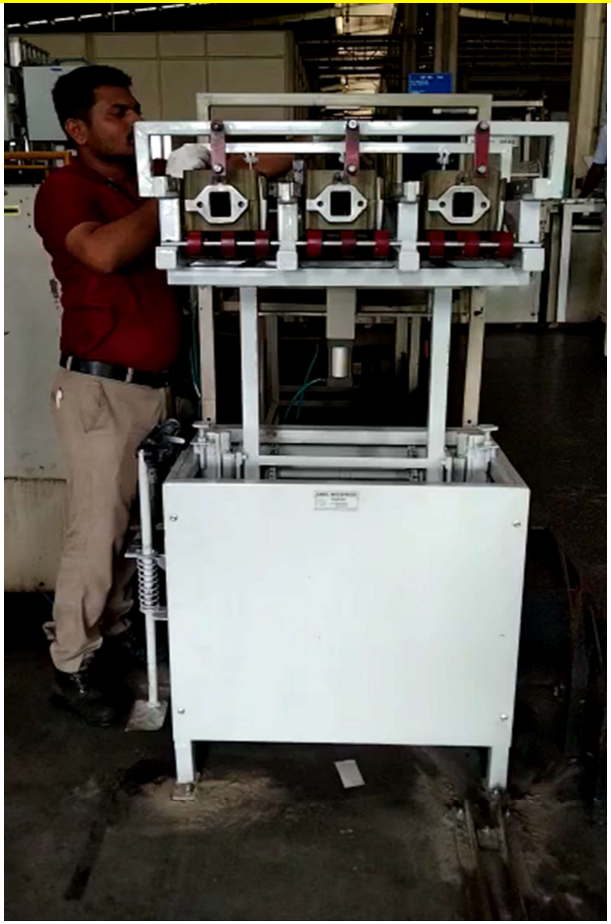
Kirloskar Oil Engines

Before

Pneumatic lifter

After

Powerless – Gravity – weight – Break- lifter



Innovative projects

2. Gravity Conveyor implemented for engine handling

Location	Project Title: - Gravity Conveyor implemented for engine handling	Technology
Kagal plant-II		KARAKURI KAIZEN

Objective of Project:

Description of the Energy Conservation Measure: Earlier, engine handling was done with 4 over head cranes. After implementation of gravity conveyor, 2 overhead cranes had been eliminated.

Picture Before modification	Picture after modification
	
Total Investment in Rs.	**4 lakhs.**
Annual Energy Savings cost in Rs.	**0.22 Lakhs**
Other Savings in Rs.	**1 . 1 Manpower saved (1.68 lakhs/annum)**
Payback Period	**2 Months**
Implementation Date:	**28th Dec 2020**

Energy savings Calculations –

For details of cost saving refer the attached excel sheet

Cost saving details_Gravity conv

Energy Savings	**0.22 Lakhs**
Name of the Employees involve in implementation of the project	**Rizvan Gavandi**

Innovative projects

3. Modification in cooling circuit to eliminate PHE

Location	Project Title: -	Technology
ME/SE ATPP	Energy Conservation	Electrical

Objective of Project: **ENERGY SAVING BY ELLIMINATION HEAT EXCHANGER**

Description of the Energy Conservation Measure:

1) At ME/SE ATPP Test Bed for engine coolant conditioning, Plate type Heat Exchanger (PHE) & Cooling tower is used.
2) Heat exchanger is in primary & Cooling tower is in secondary cooling circuit
3) The effectiveness of cooling tower is not at the fullest, as it is in the secondary circuit & not running at 100% efficiency.
4) Cooling tower capacity is sufficient for test bed cooling.
5) To optimize cooling tower efficiency, heat exchanger is removed from system & direct cooling tower is used for coolant conditioning.
6) By doing this, 15HP & 7.5HP water pumps removed from the system.

Picture Before modification	Picture after modification
	

Investment in Rs.	15000/-
ial Energy Savings in Rs.	804960/-
r Savings in Rs.	Pipeline modification cost Rs. 75000/-
ack Period	1 month.
ementation Date:	15/10/2021

gy savings Calculations –

- **For existing system at ME testing**

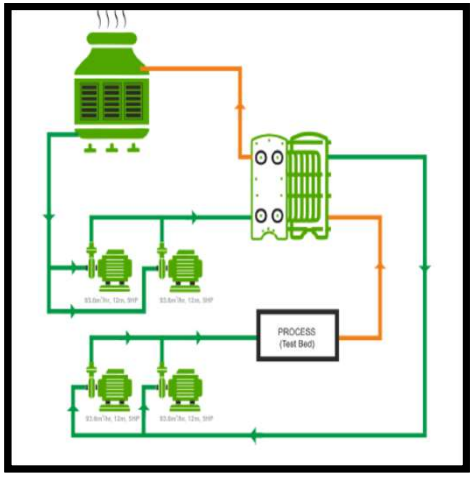
15HP/11Kw pump (at 75%load 24 hrs. working)
8.25Kw X 24hrs = 198 Kwh/day
198 Kwh X 26 day = 5418 Kwh/month
5418 Kwh X 12 month = 61778 Kwh/month

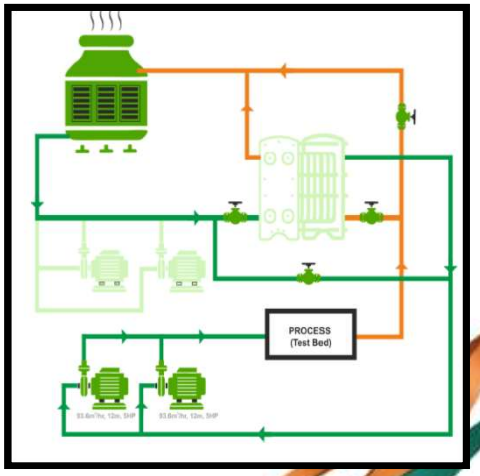
- **For existing system at SE testing**

7.5HP/5Kw pump (at 75%load 16 hrs. working)
3.75Kw X 16hrs = 60 Kwh/day
60 Kwh X 26 day = 1560 Kwh/month
1560 Kwh X 12 month = 18720 Kwh/month

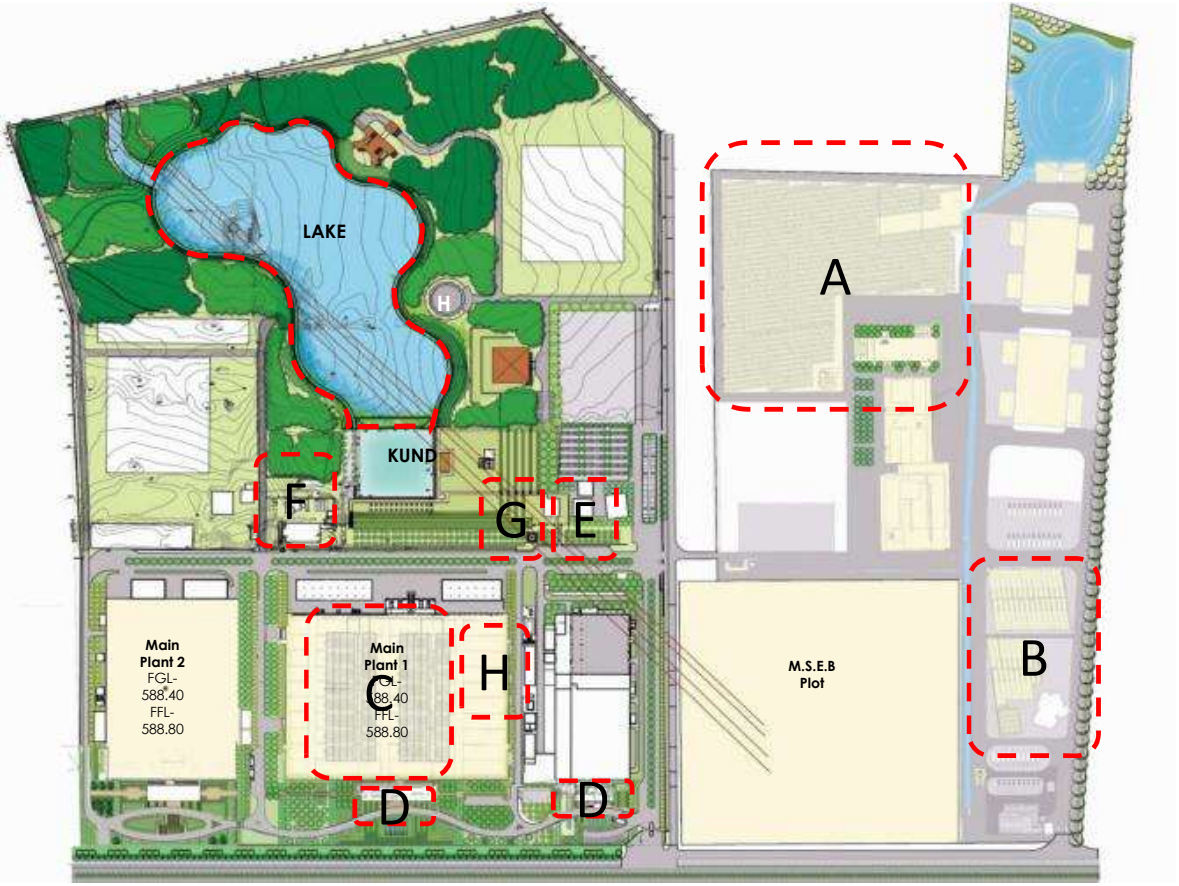
- **Annual Saving done 80496Kwh**
- **Cost saving done by elimination PHE 80496*10= Rs. 804960/- per year**
- **Total cost saving Rs. 804960/- & Rs. 75000/-**
- **Total cost saving done Rs. 879960/-**

Emissions Rate is 0 Oz per day	
gy Savings kWh.	80496 Kwh/year
e of the Employees involve plementation of the project	Mr. Rahul Patil (T.NO.701786)





Utilization of Renewable energy resources



Projects to achieve the Target	Units to be substituted in lakh kWh	% Contribution	Financial Year 2018	2019	2020	2021	Status
5.5 MWp Solar Captive Power Plant	75	48%					
Installation of Wind Ball	0.1	0.1%					
Installation of Solar DC Pump	0.1	0.1%					
2.16 MW Solar Power Plant	24	27%					
Transfer of 1 windmill to KOEL	12	13%					
Maximizing use of Solar Thermal Energy for Paint Booth and Thermic Fluid Heater	1.72	2%					
	101	**90%**					

A - Fixed Axis Solar PV, 3.8 MWp

B – Single Axis Tracking Solar PV, 0.45 MWp

C- Roof Top Mounted Solar PV, 1.25 MWp

D- Admin Building Roof Top Mounted Solar PV, 82 kWp

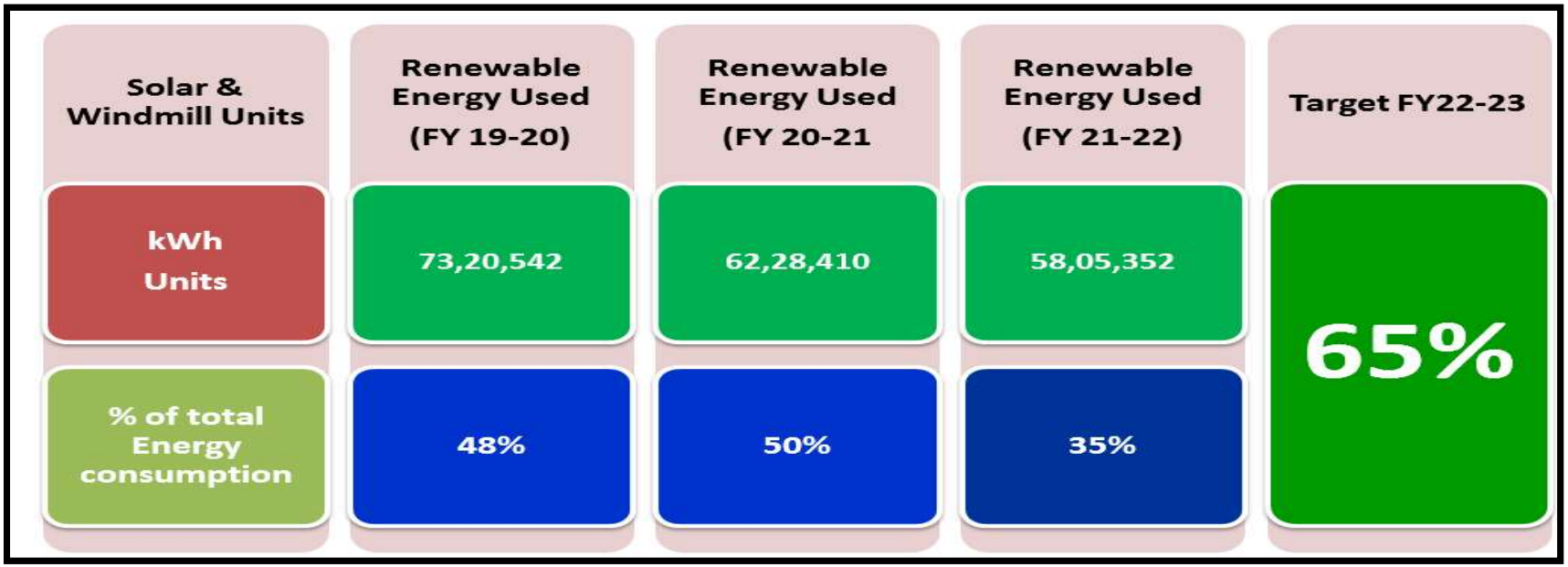
E – Solar Parabola Steam Generator, 350 Kg/Day

F – 1 KW Solar Lighting and 15 KW Solar Pumping System

G – Biogas Plant & Generator, 30 Cum / Day, 15 KVA Generator

H – Solar Hot water System for Paint Booth, 1500 LPD

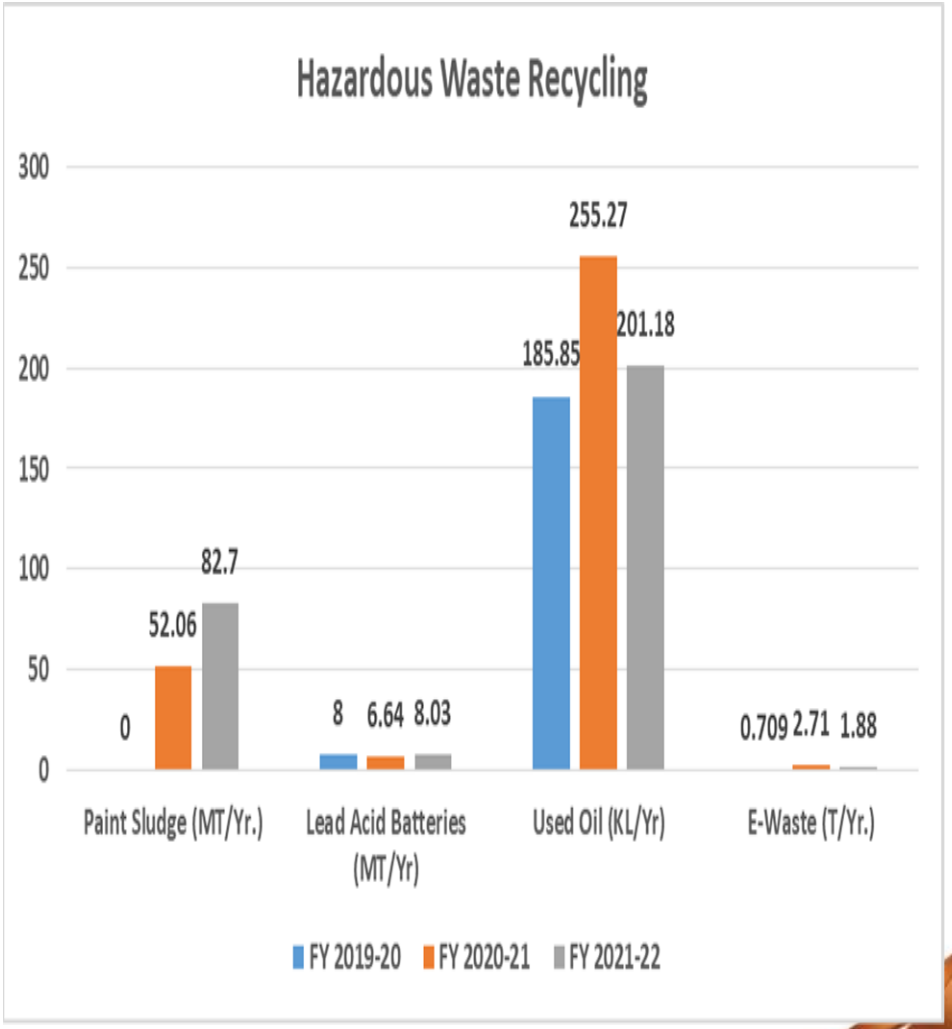
Utilization of Renewable energy resources



Sr. No.	Year	Details	Installation	Investment (Rs. Crs)
1	2019-20	5.5 MWp Captive Solar Power Plant	Onsite	25
2	2019-20	15 KVA Biogas generator	Onsite	0.015
3	2019-20	15hp Solar Pumping and 1 kWp Solar lighting	Onsite	0.10
4	2021-22	2.68 MWp Captive Solar Power Plant	Onsite	12.5
5	2021-22	300 Nos. of Solar Street Lights	Onsite	0.5
			Total	**38.2**

Waste utilization and Management

Type of waste	Source of generation	Destination of disposal
Paint Sludge (MT/Yr.)	Paint Booths	CHWTSDF/Authorised recycler
ETP sludge (MT/Y)	ETP/STP	CHWTSDF
Phosphate Sludge (MT/Yr.)	Genset pretreatment	CHWTSDF
Waste Powder, Rockwool, Waste Glass tissue paper	Genset	CHWTSDF
Waste and Used oils (KL/Y)	Engine Testing, Coolant Preparation, Maintenance, Material Handling	CHWTSDF/Authorised recycler
Used/ Scrap Batteries (Kg/Y)	Material Handling Equipment's	Authorised Recycler
Kitchen/food waste	Factory	Biogas plant, Bio-methanation, Biogas generator
Wooden Scrap (MT)	Engine packing	Authorised Vendor
Rubber /Plastic (MT)	Engine packing	Authorised Vendor, Waste plastic to fuel plant
Grinding Dust (MT)	Grinding Operations machine shop	Authorised Vendor



Waste utilization and Management

Sr. No.	Name of Recycled Materials	FY 2020-21	FY 2021-22	UOM
1	Used Oil	178.99	118.84	KL/A
2	Bio-methane from Waste food	1587	3764	m^3/A
3	Fuel from plastic waste	6.67	8.25	KL/A

Use of Recycled oil

Use of Plastic fuel for burners and material handling equipment

Use of Bio-methane for electricity generation

GHG Inventorization

Carbon Foot Print Report Data - **Kagal-1** Plant

Sr. No.	Source	Scope	Unit	Consumption			GHG Emission (tco2)		
				FY19-20	FY20-21	FY21-22	FY19-20	FY20-21	FY21-22
1	HSD	1	kl	1,272.00	1,081.50	1,348.00	3,339.76	2,779.46	3,464.36
2	LPG	1	kg	1,86,143.50	1,56,461.50	1,90,285.00	558.43	458.43	557.54
3	FO	1	kl	16.91	73.14	-	50.37	231.85	-
4	Compact Natural Gas (CNG)	1	SCM	-	-	-	-	-	-
5	CO2 for cutting	1	kg	-	-	-	-	-	
6	CO2 for welding	1	kg	-	-	-	-	-	
7	CO2 in fire extinguisher	1	kg	-	-	-	-	-	
	Total Scope 1 =						**3,949**	**3,470**	**4,022**
	Scope 2								
1	Electricity Purchased	2	kWh	82,80,590	78,87,434	1,12,23,809	7,555	6,468	9,204
	Total Scope 2 =						**7,555**	**6,468**	**9,204**
	Offset								
1	Electricity Renewable		kWh	73,20,542	62,28,409	58,05,352	6,679	5,107	4,760
2	Biogas		m3	3,794	1,174	3,713	7	2	7
3	Solar		kg of steam	7,277	4,381	3,506	0.00	0.89	0.71

GHG Inventorization

GHG Emission Sources - Scope1

LPG

1. LPG Bank used for process

HSD & FO DG sets

CO2 fire extinguishers

Fork Lifts – HSD Consumption for internal material handling

Engine test beds – test beds at ME,SE,HHP ATPP & GENSET shop consumes HSD during testing of engines

GHG Emission Sources- Scope 2

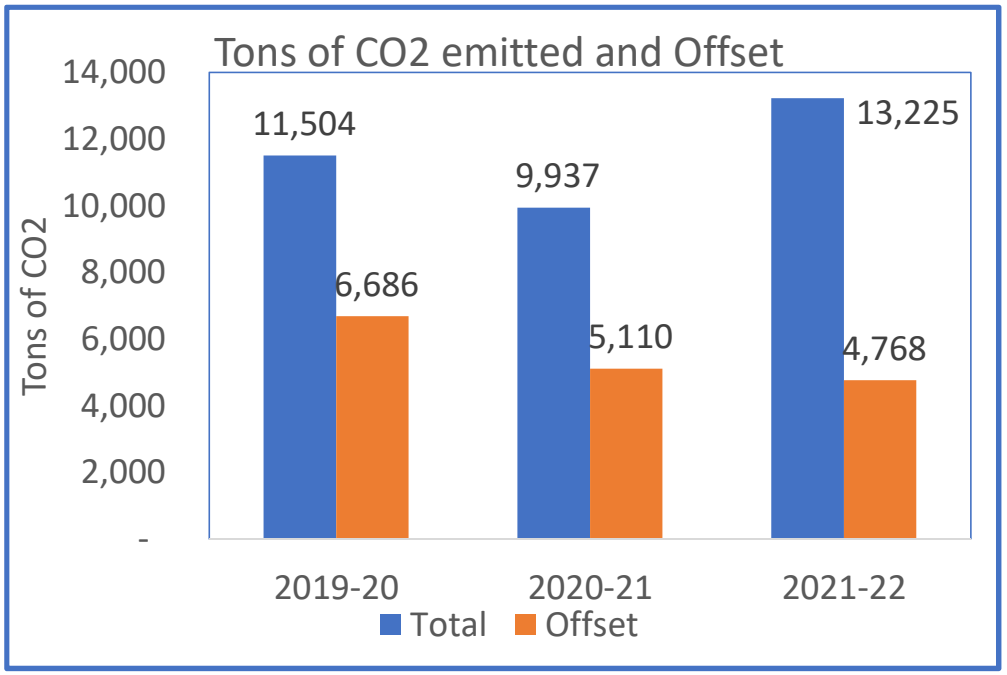
GHG Emission Sources - Scope3

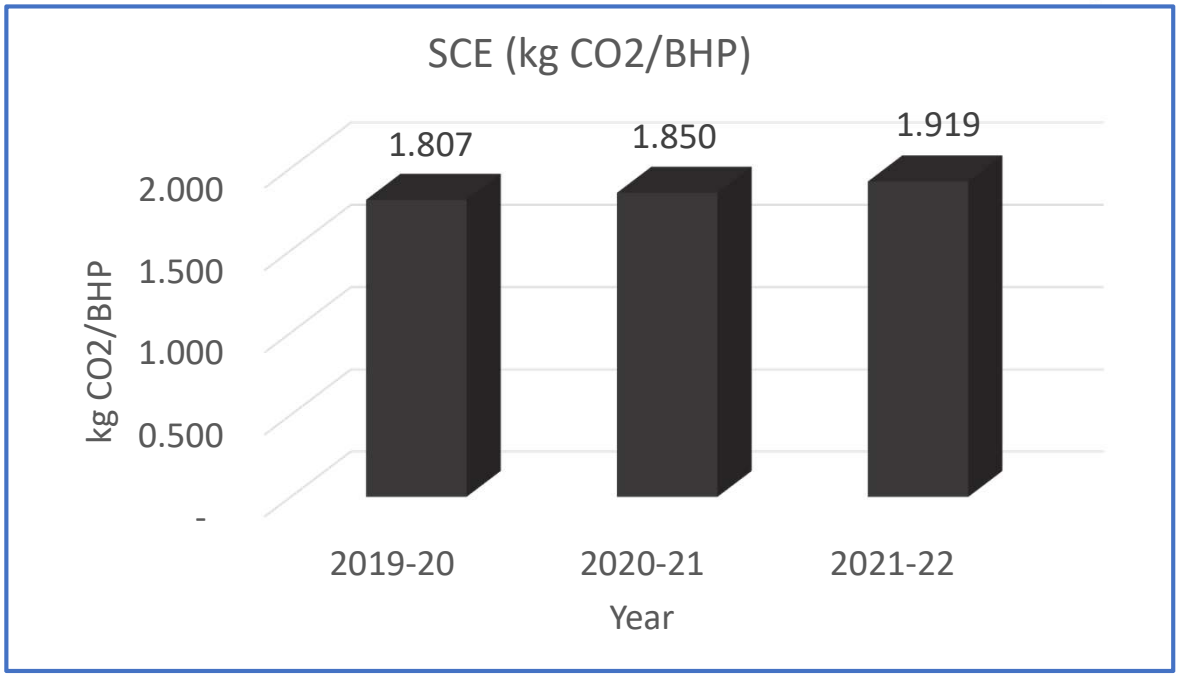
Employee commute to workplace Transportation of employees between their homes and their worksites – 49 and 27 seater buses

Employee business travel (Data of cabs booked through company, flights, rail etc.)

T&D losses (for electricity purchased)

GHG Inventorization

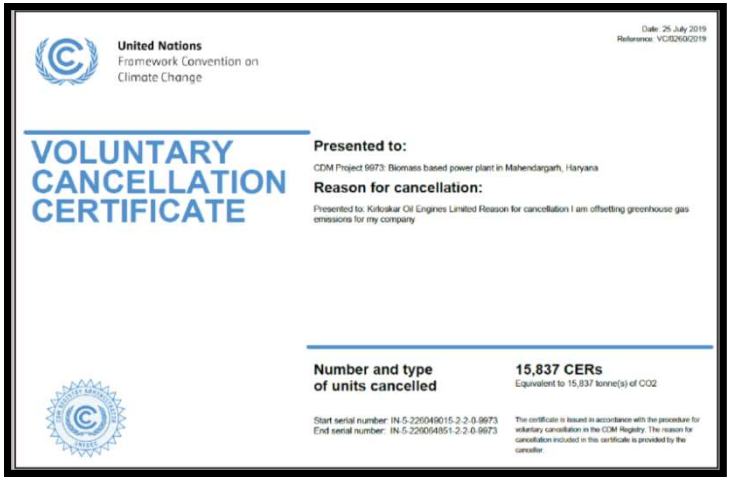




Location	Tons of CO2 emitted		BHP		kgs of CO2 emitted/BHP	
	FY 20-21	FY 21-22	FY 20-21	FY 21-22	FY 20-21	FY 21-22
Kagal	9937	13225	53,72,481	68,93,554	1.85	1.9

- Even under fluctuating loading of plant, Restoration of operations after pandemic and frequent change in shift schedules and manpower, KOEL Kagal facility retained the Specific Carbon Emission (SCE) to a tune of 1.9 kgs of CO_2.

GHG Inventorization - Initiatives



United Nations
Framework Convention on
Climate Change

Date: 25 July 2019
Reference: VC/0260/2019

VOLUNTARY CANCELLATION CERTIFICATE

Presented to:

CDM Project 9973: Biomass based power plant in Mahendargarh, Haryana

Reason for cancellation:

Presented to: Kirloskar Oil Engines Limited Reason for cancellation I am offsetting greenhouse gas emissions for my company

Number and type of units cancelled

15,837 CERs

Equivalent to 15,837 tonne(s) of CO2

Start serial number: IN-5-226049015-2-2-0-9973
End serial number: IN-5-226064851-2-2-0-9973

The certificate is issued in accordance with the procedure for voluntary cancellation in the CDM Registry. The reason for cancellation included in this certificate is provided by the canceller.

United Nations
Framework Convention on
Climate Change

Date: 07 January 2022
Reference: VC/0022/2022

VOLUNTARY CANCELLATION CERTIFICATE

Presented to:

CDM Project 1642: SHYAM DRI WHR CPP

Reason for cancellation:

Retired for Carbon Neutrality for Kirloskar Oil Engines limited for FY 2019-20.

Number and type of units cancelled

4,648 CERs

Equivalent to 4,648 tonne(s) of CO2

Start serial number: IN-5-225959492-2-2-0-1642
End serial number: IN-5-225964139-2-2-0-1642

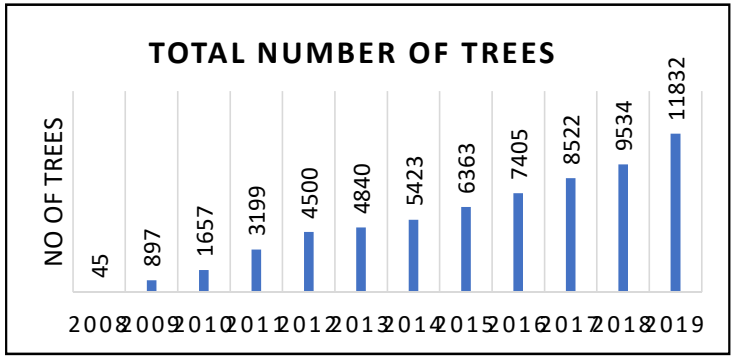
The certificate is issued in accordance with the procedure for voluntary cancellation in the CDM Registry. The reason for cancellation included in this certificate is provided by the canceller.

Carbon neutral certification for consecutive 2 years

kirloskar
Oil Engines

Total Carbon Stock in trees of KOEL, Kagal campus is 61.47 tons.

Carbon sequestered through vegetation is 1.22 tons per year.



Recommendations from Carbon Sequestration study:-

Key indigenous species such as Ficus religiosa (Pimpal), Ficus benghaensis (Vad), F.racemosa (Umbar), Tamarindus indica (Chinch) will help sequestering more amount of carbons in future.

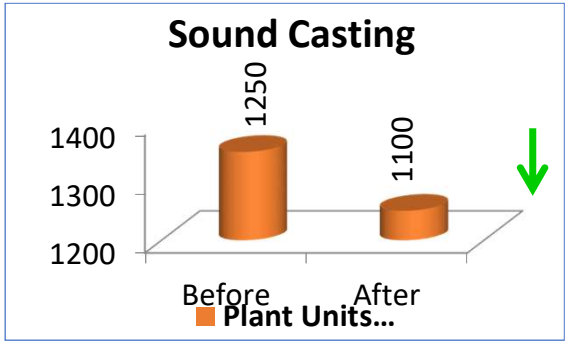
Carbon Sequestration Study

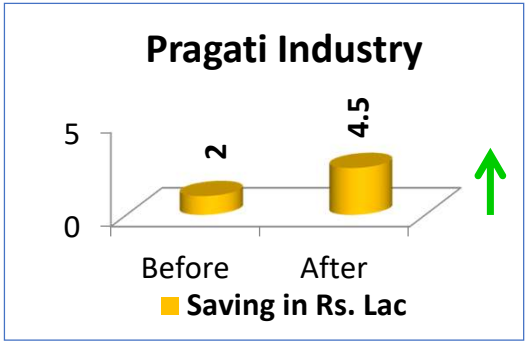
Green supply management

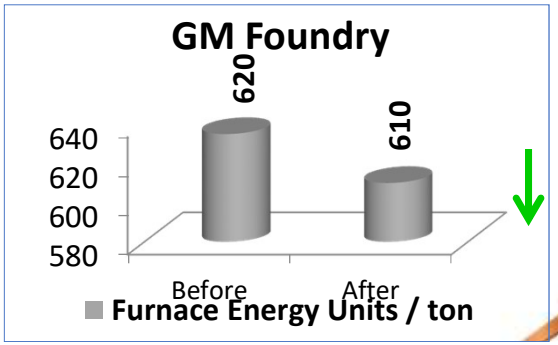
Make or Buy	Supplier Base	Supplier Quality	Supplier Engagement	Commodity Strategy

• Decision on Product Platform
• Outsourcing of Components
  • Sub Contracting
  • Finished parts
• O/S of Products
• O/S of In House Parts
	• Location
	• Certification
	• Infrastructure
	• Technology
	• Payment Terms
	• Freight
	• After Market
		• PPM reduction
		• Supplier Processes Improvements
		• Process and Product Audits
		• PPAP approvals
		SCM Policy
			• Supplier Conference
			• Quarterly Communication
			• Monthly Score Card
			• Supplier Training
			• Supplier Survey
			• Quality Contest
				• Industry Analysis
				• Commodity Source Plan
				• Dual Sourcing
				• Supplier Rationalization
				• Risk Mitigation & Financial Analysis

• KOEL Investment • Amortization • Capitalization • Upkeep & Maintenance	• Price Approval Process • 8 Levers of Cost Reduction • Capturing Cost Reduction	• Material Planning • Ordering • TOC-Consumption based Procurement • Material Handling • Packaging • Milk Run	• Requirements at Supplier end • OSHAS compliance • Child Labour • Hazardous Material Handling • Waste Disposal	

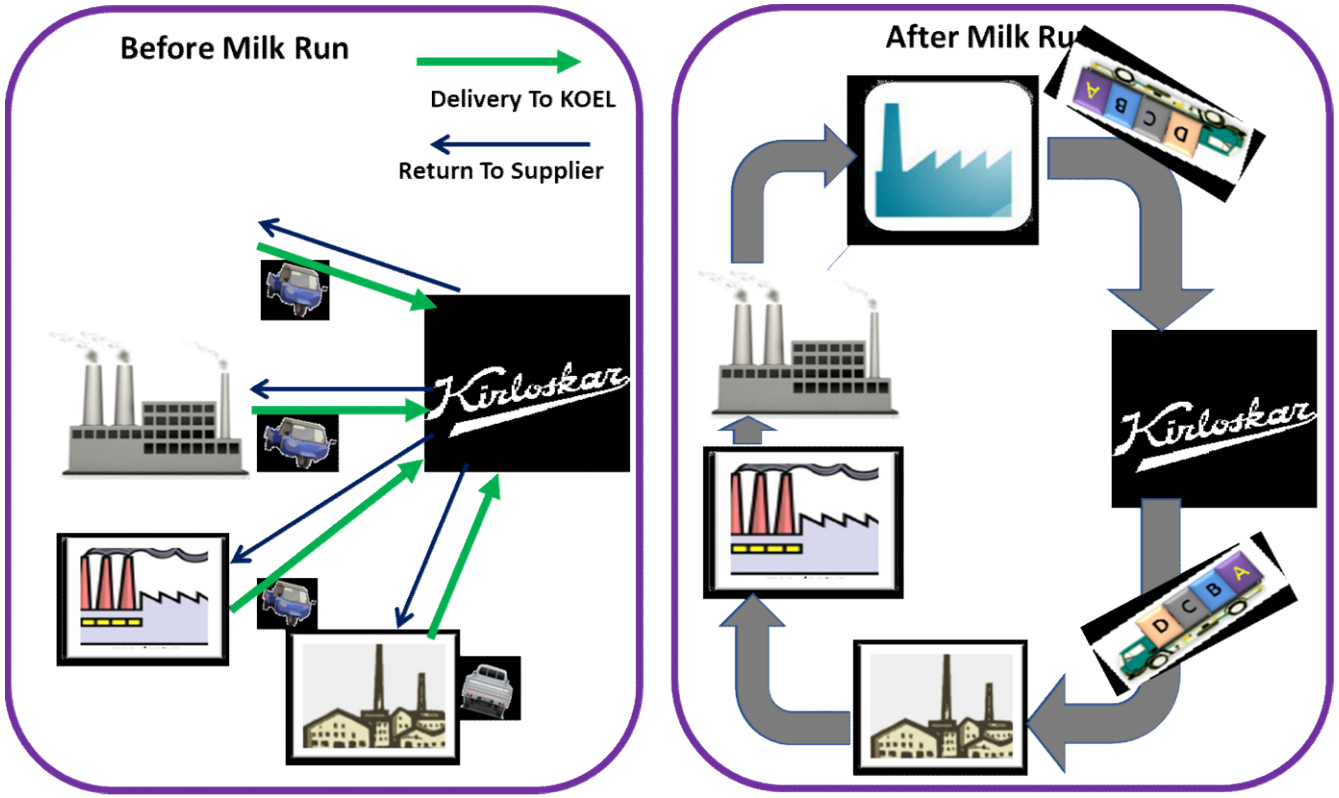






Green supply management

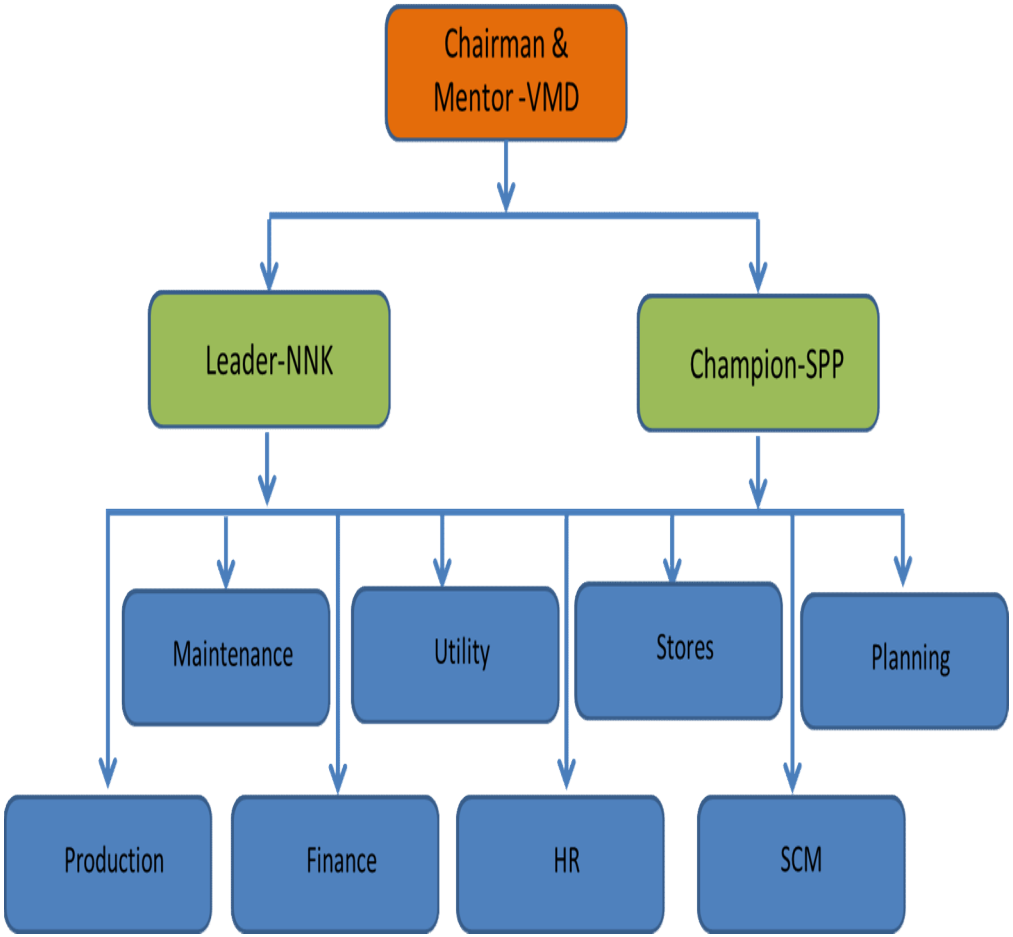
Milk Run -Model



Benefits

- Earlier Traffic Incoming Avg. 77 vehicle entries/day. - Aprox. 21% reduction
- Earlier Avg. monthly Diesel Consumption 2200 ltrs. - Approx. 12% reduction
- Reduction Freight Payment by 4.13 Crs in last three years. - Avg. 13.8 % reduction per year.
- Advance information Proactive alerts.
- Reduced personal visits .
- Defined accountability & Responsibility.
- Improved relationship .

Team work, employee involvement and monitoring



Kagal ENCON Team			
SN	Name	Department	Role for ENCON Team
1	Deshpande Vivek M	Maintenance & Utility	Chairman and Mentor
2	Kulkarni Nitin N	Energy Manager	Leader
3	Parab Santosh P	Utility	Champion
4	Gururaj Paramae	ME	Process improvement
5	Dalvi Sanjay M	Maintenance	Innovation/Modification/Upgradation
6	Patil Amol M	EP1 Machine Shop	Innovation/Modification/Upgradation
7	Kulkarni Atul D	Finance	Certification
8	Mukherjee Ranjeet K	Utility	Innovation/Modification/Upgradation
9	Kokare Sambhaji R	Genset Canopy	LPG/Water
10	Erande Nitin P	Maintenance	Innovation/Modification/Upgradation
11	Lohar Baban K	Utilities	Innovation/Modification/Upgradation
12	Mali Sayajirao S	Maintenance	Innovation/Modification/Upgradation
13	Daunde Sujeet J	E Series	Fuel optimization/Electrical
14	Pawar Rahul G	HR	Biogas/Solar utilization/Vehicle
15	Singh Shrikant B	General Stores	Reuse/Rcycle
16	Konduskar Anil	Production Planning	Plant load factor/Data production
17	Mohite Milind M	ME ATPP	Fuel optimization/Electrical
18	Jagtap Ganesh P	Maintenance	Innovation/Modification/Upgradation
19	Patil Vinayak M	EP2 ATPP	Fuel optimization/Electrical
20	Hande Vilas B	EP1 Machine shop	Innovation/Modification/Upgradation
21	Kumbhar Umesh D	EP2 Machine shop	Innovation/Modification/Upgradation
22	Shinde Yuvraj	Plant 2	Innovation/Modification/Upgradation

Team work, employee involvement and monitoring

Kirloskar Oil Engines

- ✓ Daily Review Meetings
- ✓ Monthly ENCON Meetings
- ✓ Bimonthly Corporate Utilities Meetings
- ✓ Annual K Gr ENCON Assessment Awards
- ✓ Annual CII National Level Energy Excellence Awards
- ✓ Annual MEDA State Level Energy Excellence Awards
- ✓ Internal Energy Audits

Mitsubishi Electricals – VFD Applications

Godrej – Energy Efficiency in Air Compressor

Internal Process | **Trainings and Exhibitions** | **Participation in awards and conferences**

Implementation of GreenCo/IGBC/ISO 50001 rating

Kirloskar Oil Engines

"GreenCo Platinum rated Factory" by the Confederation of Indian Industry (CII) in adherence to its GreenCo rating system.

"Platinum" certification in IGBC existing building certification category for Ep- 1 office building.

Implementation of EnMS ISO 50001 system is in process.
Lead Auditors-
Mr. Nitin Kulkarni
Mr. Santosh Parab

IGBC

CII
Confederation of Indian Industry

Indian Green Building Council (IGBC)

hereby certifies that

Administration Building – 2, Kirloskar Oil Engines Ltd.

Kagal, Kolhapur, Maharashtra

(IGBC Registration No: GEB 14 1018)

has successfully achieved the Green Building Standards required for the following level of certification under the

IGBC Green Existing Buildings Rating System

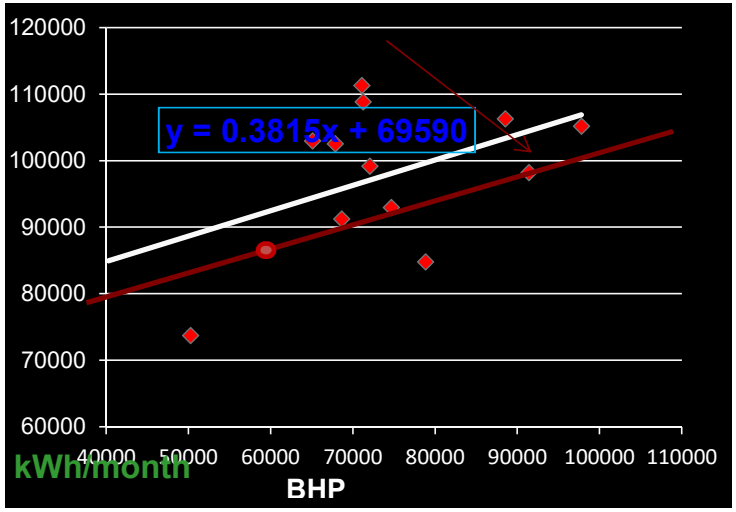
Platinum

April 2019

(This certification is valid for 3 years)

Gurmit Singh Arora	V Suresh	S Raghupathy	K S Venkatagiri
Chair, IGBC Green EB O&M	Chairman, IGBC	Deputy Director General, CII	Executive Director, CII-Godrej GBC

Learnings from various forums



Regression analysis

Target setting and Benchmarking

Technology adoption

- **Horizontal deployment of best practices**
- **Green CO and IGBC certification**
- **National and International benchmarks**
- **SWOT analysis of Organization**

Adoption of new energy efficient technologies-

- ✓**Vaayu**
- ✓**Axial blowers and fans**
- ✓**Heat pump**
- ✓**Solar Light pipe**
- ✓**Optimization in TAKT time**

Awards and Accolades

"GreenCo Platinum rated Factory" by the Confederation of Indian Industry (CII) in adherence to its GreenCo rating system.

CII's 20th National Award for being an "Excellent Energy Efficient Unit" and "National Energy Leader" award. 8 consecutive years winner at National level.

"Platinum" certification in IGBC existing building certification category for Ep- 1 office building.

Achieved carbon neutrality under the guidelines of PAS 2060:2014 for 2018-19.

Consecutive 6 years winner at State Level energy conservation awards by MEDA

"Noteworthy Water Efficient Unit" National Level certificate by CII Triveni water Institute CII Water Con Awards 2018.

Awards and Accolades

"Dr. R.J. Rathi Award" For Green Initiatives organized by MCCIA Pune, 2018"

2nd consecutive year winner in **Industry sector for Garden competition held by Garden's Club**

"Hat-Trick"- Consecutive Three years winner of "Golden Peacock Award for Energy Efficiency"

CII SR Award for best practices of rainwater harvesting in water management 2022

Installed and commissioned "Waste plastic to Fuel Conversion plant" with a yield of almost 70%.

Rainwater harvesting structures to utilise rainwater for industrial processes

Thank You.

Team - Kirloskar Oil Engines Ltd. Kagal-Kolhapur

https://koel.kirloskar.com

Contact details-

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Contact no.-9146015631

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