

24th National Award for “Excellence in Energy Management – 2023”

**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

Company profile

Specific Energy Consumption (Last 3 years FY 20-21 to FY 22-23)

Information of Competitors, National and Global Benchmarks

Energy Saving Projects implemented in last 3 years

Innovative projects implemented 2022-23

Utilization of Renewable energy sources

Waste utilization and Management

GHG Inventorisation

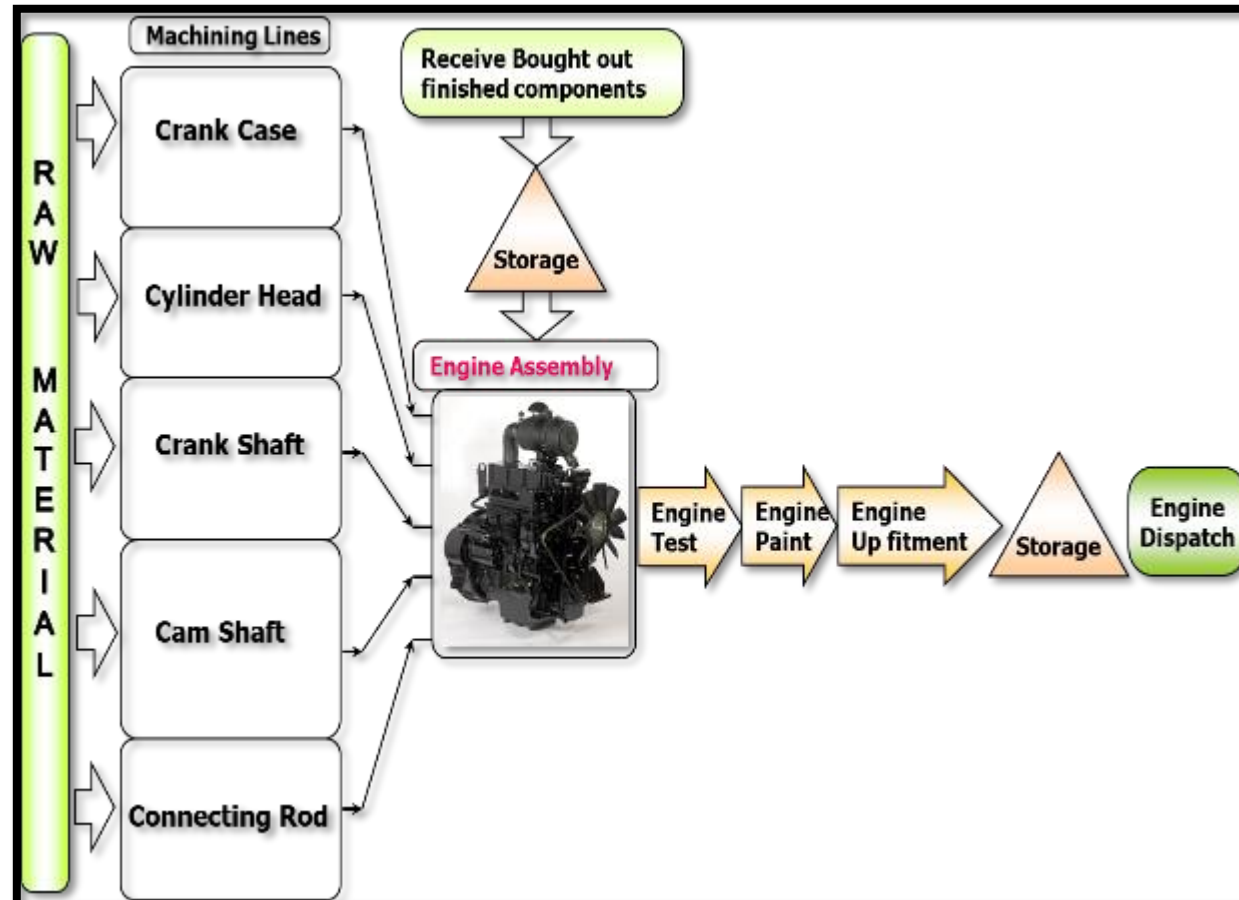
Green Supply Chain Management









EMS system and other requirements

Net zero commitment

Learning from CII Energy Award or any other award program

Company profile



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.

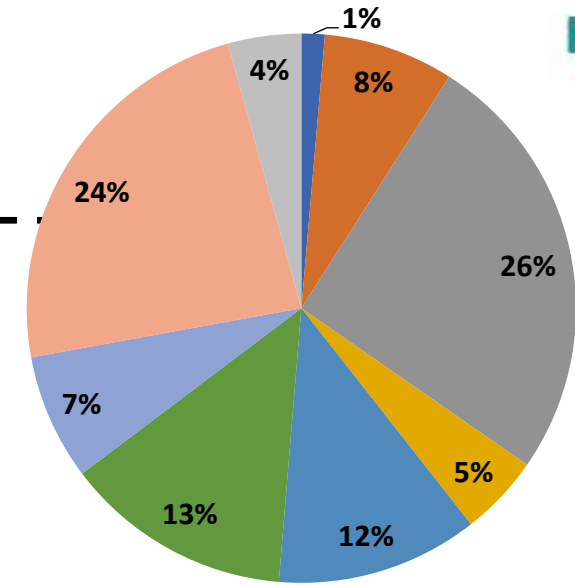
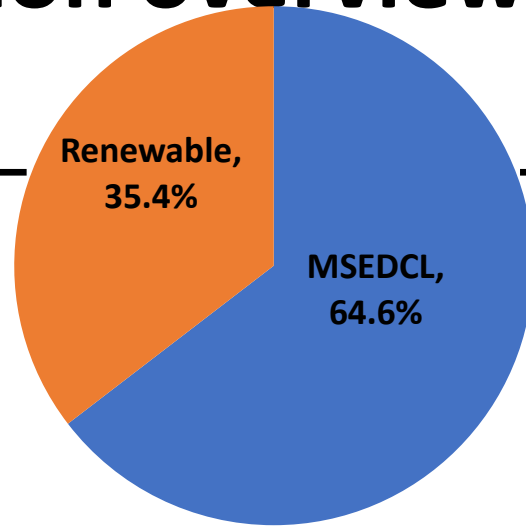
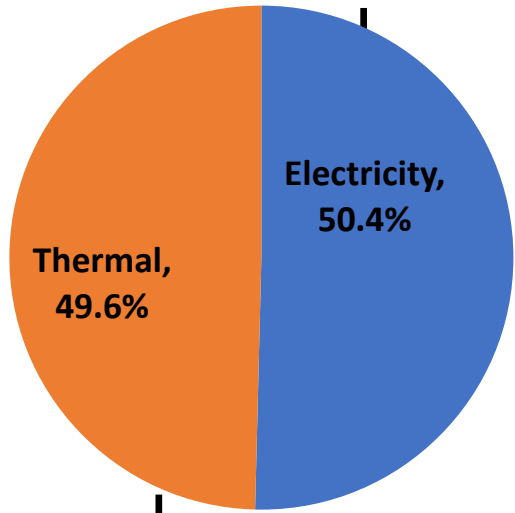
1. Kagal
3. Nashik

2. Khadki
4. Bhare

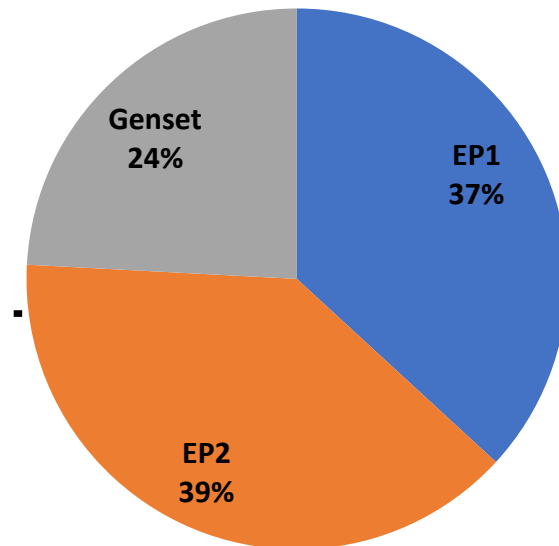
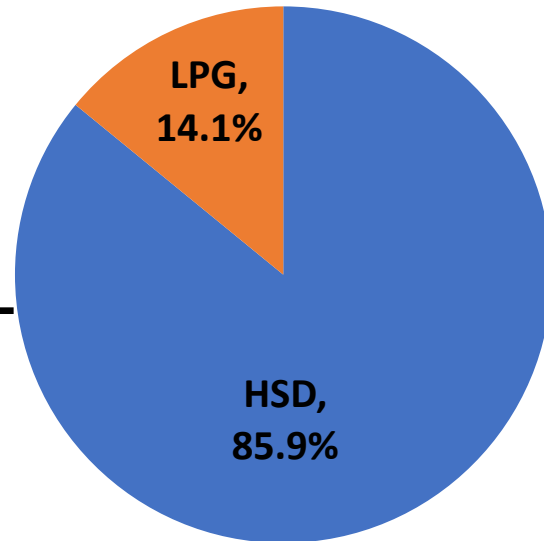
Company profile



Energy consumption overview



- SE-ATPP
- ME-ATPP
- EP-1 Machine Shop
- Genset
- EP-2 Engine ATPP
- EP-2 Machine Shop
- Fixed Consumption
- Compressor
- Shop Floor Lighting



- EP1
- EP2
- Genset

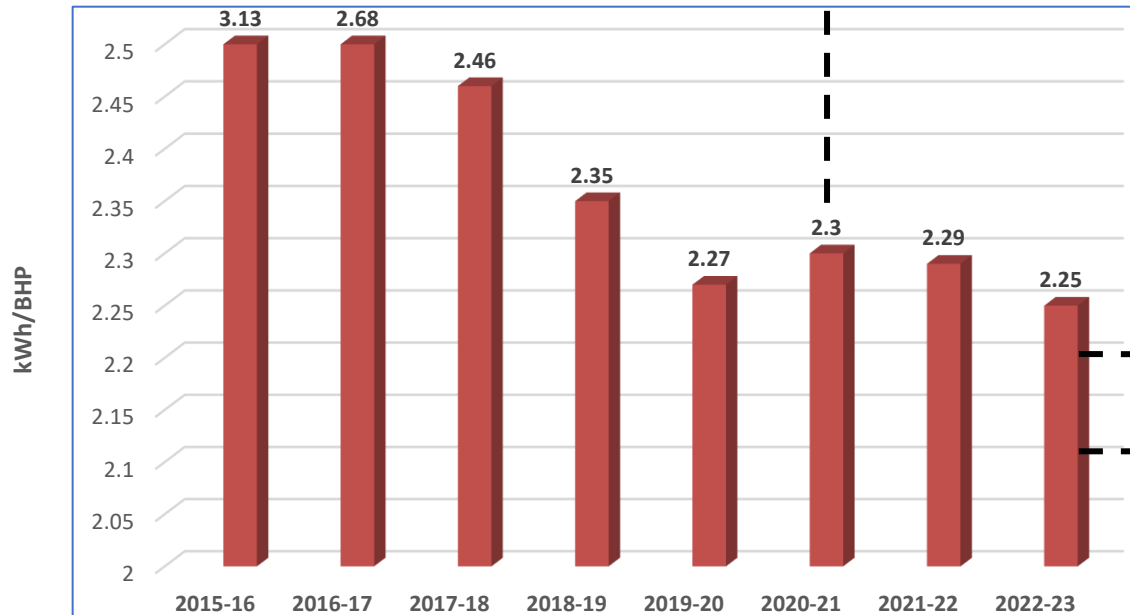
Sp. Energy consumption-Performance

ELECTRICAL

28.1%

2.17%

Specific Electrical Consumption (kWh/BHP)

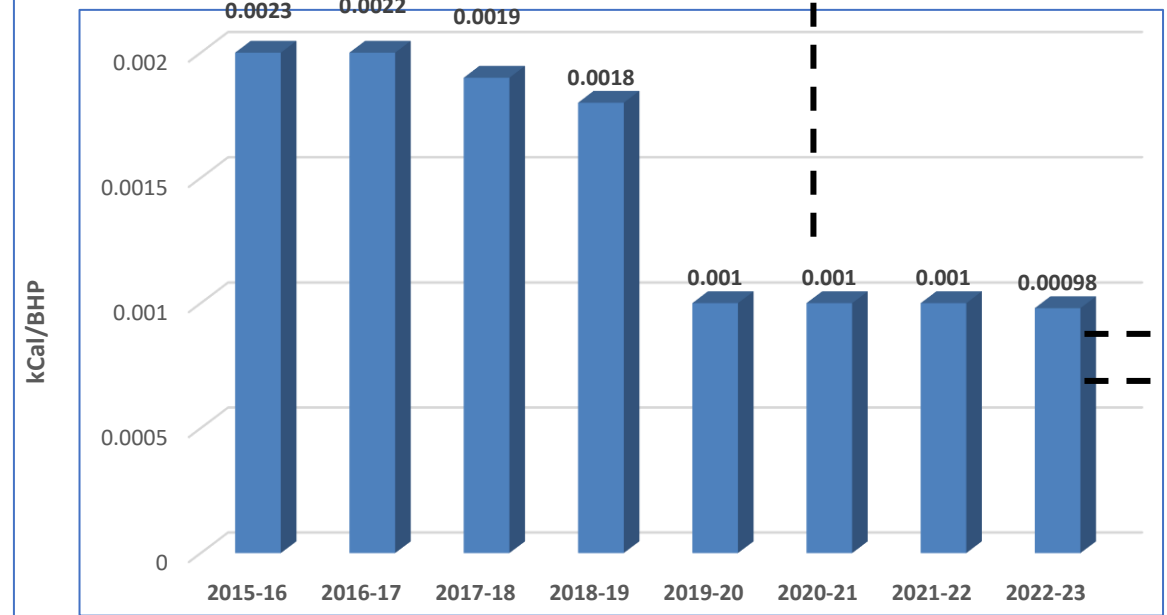


THERMAL

57.4%

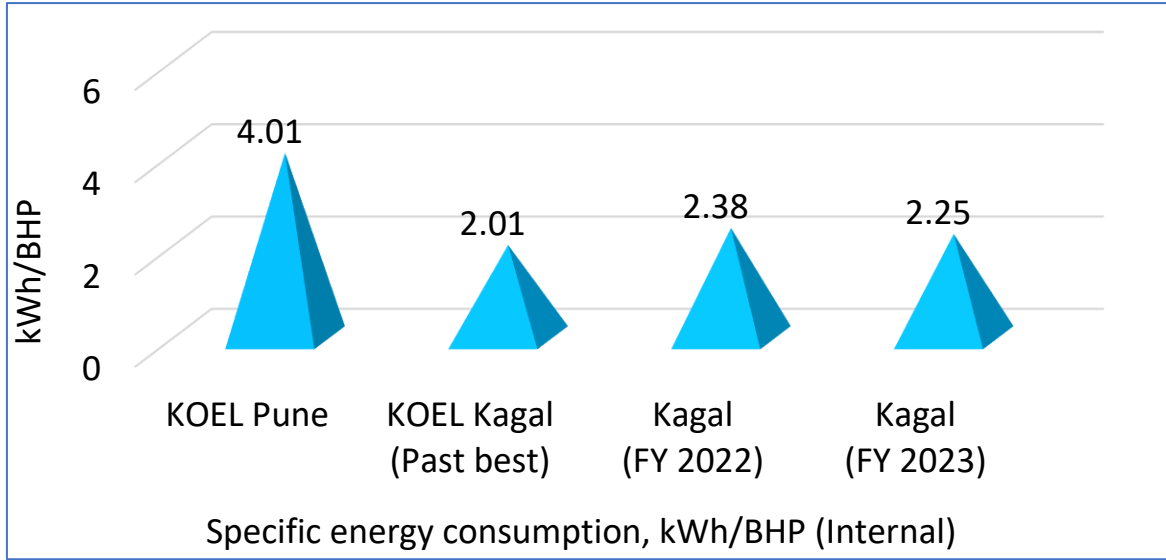
2%

Specific Thermal Consumption (GJ/BHP)

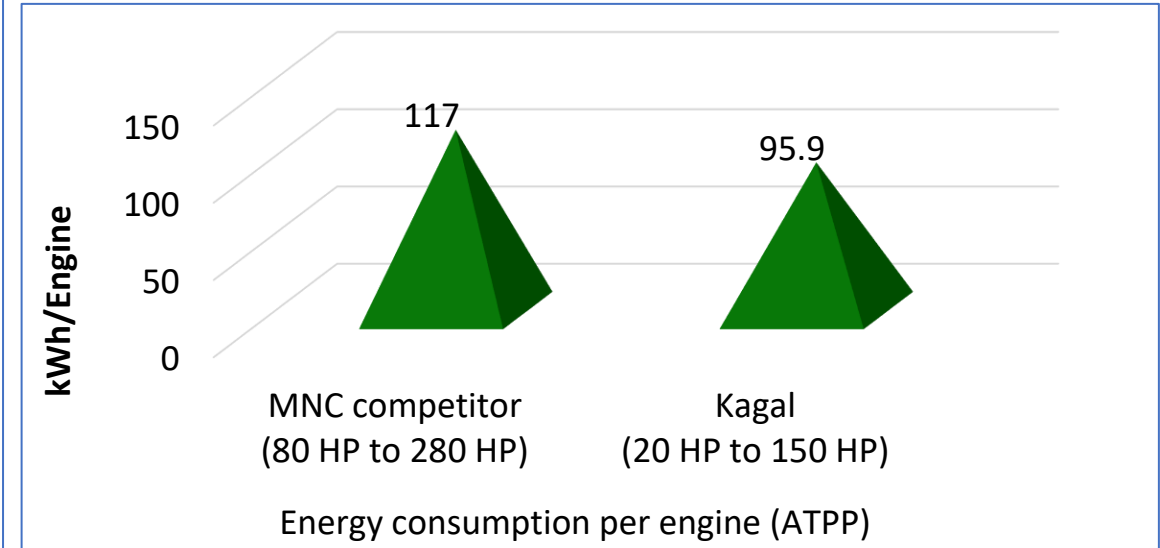


Information of Competitors, National and Global Benchmarks

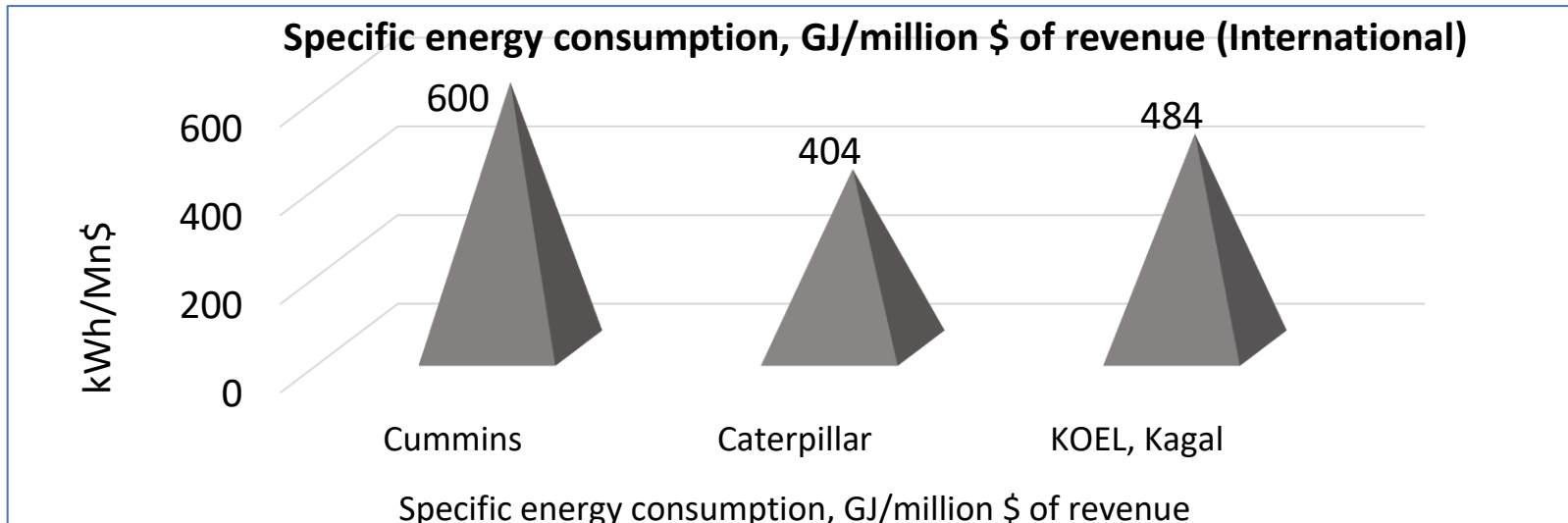
Specific energy consumption, kWh/BHP (Internal)



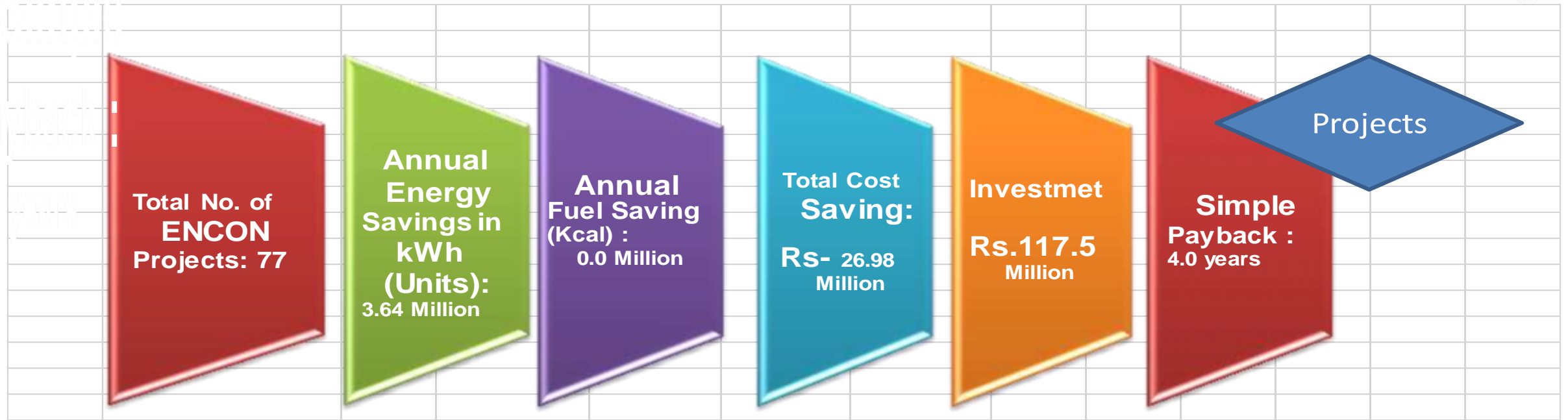
Energy consumption per engine (ATPP)



Specific energy consumption, GJ/million \$ of revenue (International)



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.
Zero Investment	70	0.43	0	3.96	0
Moderate Investment	1	0.02	0	0.19	0.10
High Investment	6	3.19	0	22.83	117.4
Total	77	3.64	0	26.98	117.5

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.
FY20-21	26	0.162	0	1.44	0.2
FY21-22	42	3.276	0	23.47	112.4
FY22-23	9	0.205	0	2.06	4.9
Total	77	3.64	0	26.98	117.5

Innovative projects

1. Elimination of usage of compressed air through Karakuri kaizen

SBU: Kagal Plant	Department: EP-2 Machine shop	Plant / Office Location: (WHERE) R810 Cylinder head line	Name of Contact Person & Contact Details: (WHO) Mr. Umesh D Kumbhar (9011017617)
Name / Title of the Practices: (WHAT) Powerless out put components handling conveyer		Purpose of the Practices: (WHY) ZERO Energy management system for handing of FG cylinder heads	Completion Date: (WHEN) 15 July 2023

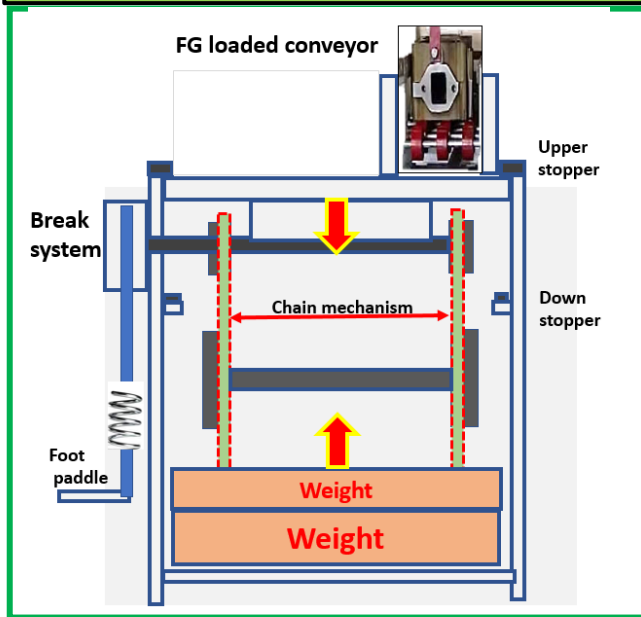
Description of Initiative's/Practices: (HOW) Process Flow / Schematic Diagram / Before & After Photos :- Elimination of pneumatic cylinder by providing POWERLESS concept with Gravity-Weight-Break mechanism through KARAKURI kaizen under the ZERO energy management system

BEFORE - Operator use pneumatic system to lift down FG cyl heads on out put conveyer & lift up the empty FG try to align with output conveyer for handling of FG cyl heads

[Play Video](#)



AFTER - Powerless easily hand operated Gravity -weight - break mechanism conveyer established for handling FG cylinder heads



Results Achievement: -Total Rs 4.17 Lakhs Power cost saved per annum

Scope for Horizontal Deployment: - NA (Due to it's unique location)

Innovative projects

2. Solar operated battery charging station



Results:

- ✓ System designed capacity 15 kWp @ 64 kWh per day
- ✓ Inverter capacity 15 kVA.
- ✓ Two forklift charge at a time
- ✓ Carbon offset -15 tons/annum

Innovative projects

3. Installation of 30 kW Windmills



Results:

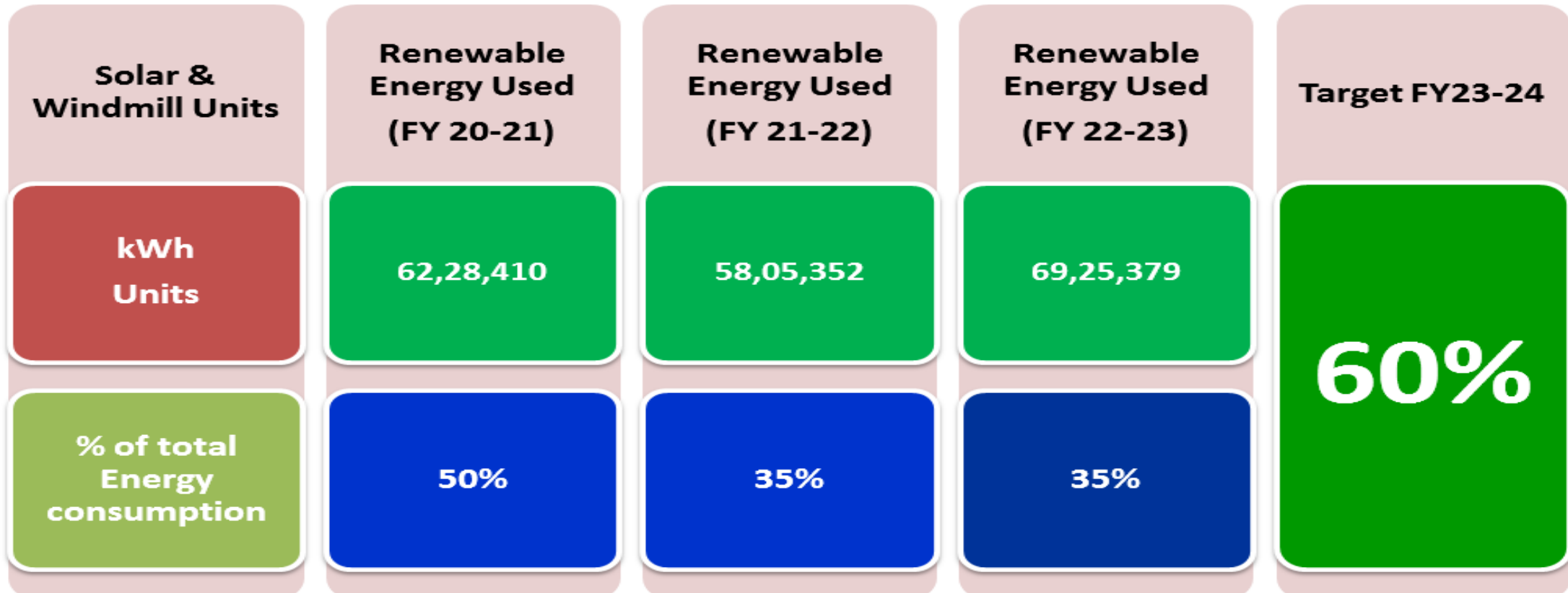
- ✓ Capacity- 5.1kW
- ✓ Qty- 6 Nos.
- ✓ Approx. unit generation average 43200kWh/ Year
- ✓ Annual cost benefit Rs- 432000/year
- ✓ Carbon offset -40 tons/year

Utilization of Renewable energy resources



- ❖ Captive Solar Power Plant-8.18 MWp
- ❖ Micro wind turbines- 30kWp
- ❖ Solar Battery Charging station-15kWp
- ❖ Solar Steam generator (Parabola)- 350 kgs/day
- ❖ Biogas and generator- 300kgs/day and 12 KVA
- ❖ Solar Pumping system-15kW
- ❖ Solar street lights-400 nos.
- ❖ Solar hot water generator-1500 ltrs/day

Utilization of Renewable energy resources

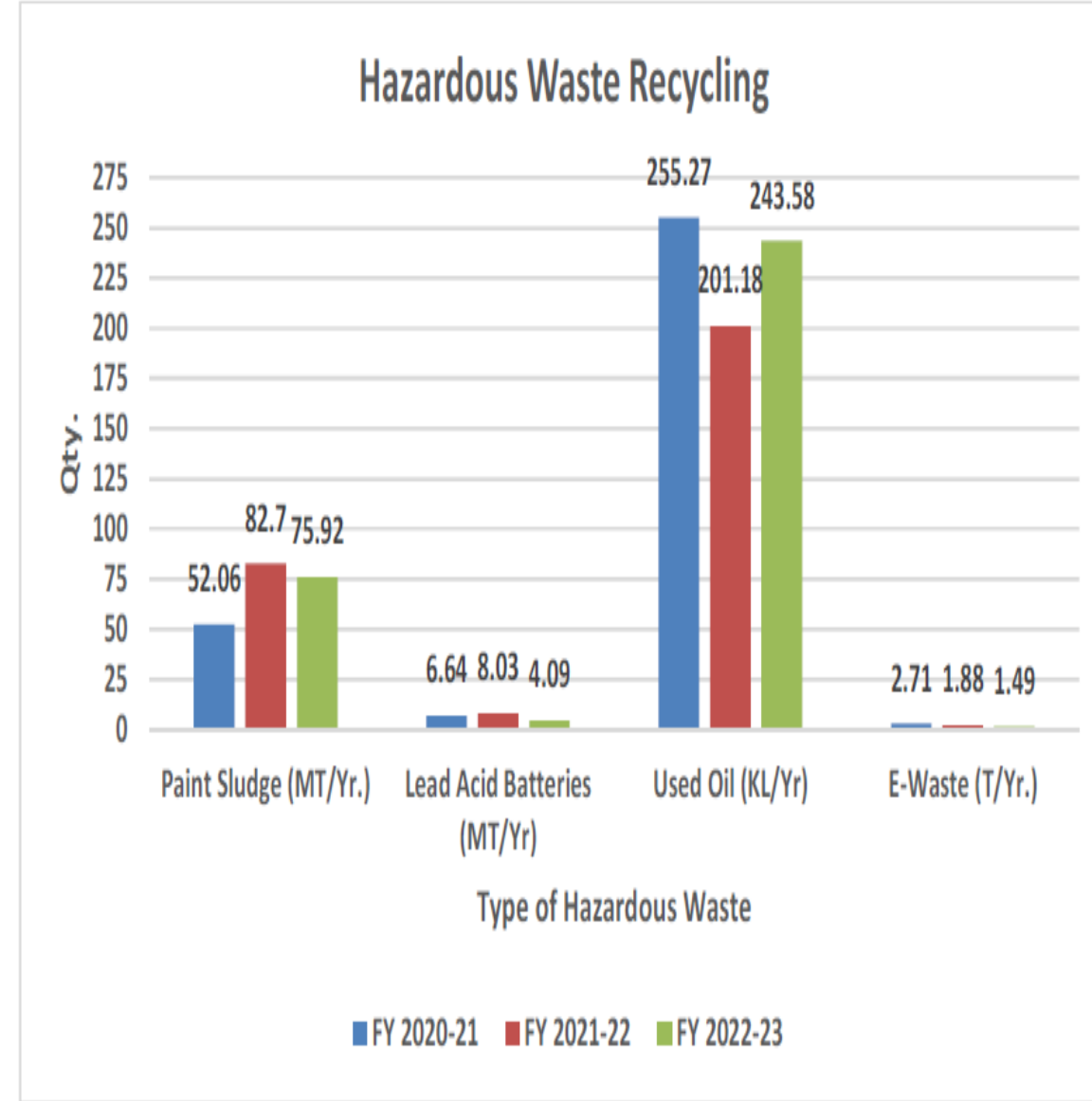


Even though energy consumption increased by 13% with respect to FY 2022-23, the share of renewable energy in total electrical consumption for FY22-23 is maintained to a tune of 35%. If we compare it with baseline year 2014, the share of RE would be 65%.

This has resulted into saving of Rs.5.19 Cr.

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 2021-22	FY 2022-23	UOM
1	Used Oil	118.84	160.09	KL/A
2	Bio-methane from Waste food	3764	7058.28	m ³ /A
3	Fuel from plastic waste	8.25	5.30	KL/A
4	Organic Compost from OWC (Organic Waste Converter installed in Jan-23)	--	1.708	T/A



Organic Waste Converter



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)		
				FY20-21	FY21-22	FY22-23	FY20-21	FY21-22	FY22-23
1	HSD	1	kl	1,081.50	1,348.00	1,642.00	2,839.59	3,464.36	4,219.94
2	LPG	1	kg	1,56,461.50	1,90,285.00	1,86,552.00	469.38	557.54	546.60
3	FO	1	kl	73.14	-	-	217.88	-	-
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 =						3,527	4,022	4,767
	Scope 2								
1	Electricity Purchased	2	kWh	78,87,434	1,12,23,809	1,26,26,398	7,196	9,204	10,354
	Total Scope 2 =						7,196	9,204	10,354
	Offset								
1	Electricity Renewable		kWh	62,28,409	58,05,352	69,25,379	5,683	4,760	5,679
2	Biogas		m3	1,174	3,713	6,171	2	7	12
3	Solar		kg of steam	4,381	3,506	-	0.00	0.71	-

GHG Inventorization

GHG Emission Sources - Scope 1

<p>LPG 1. LPG Bank used for process</p> 	<p>HSD & FO DG sets</p> 	<p>CO2 fire extinguishers</p> 
<p>Fork Lifts – HSD Consumption for internal material handling</p> 	<p>Engine test beds – test beds at ME,SE,HHP ATPP & GENSET shop consumes HSD during testing of engines</p> 	

GHG Emission Sources- Scope 2



GHG Emission Sources - Scope 3

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



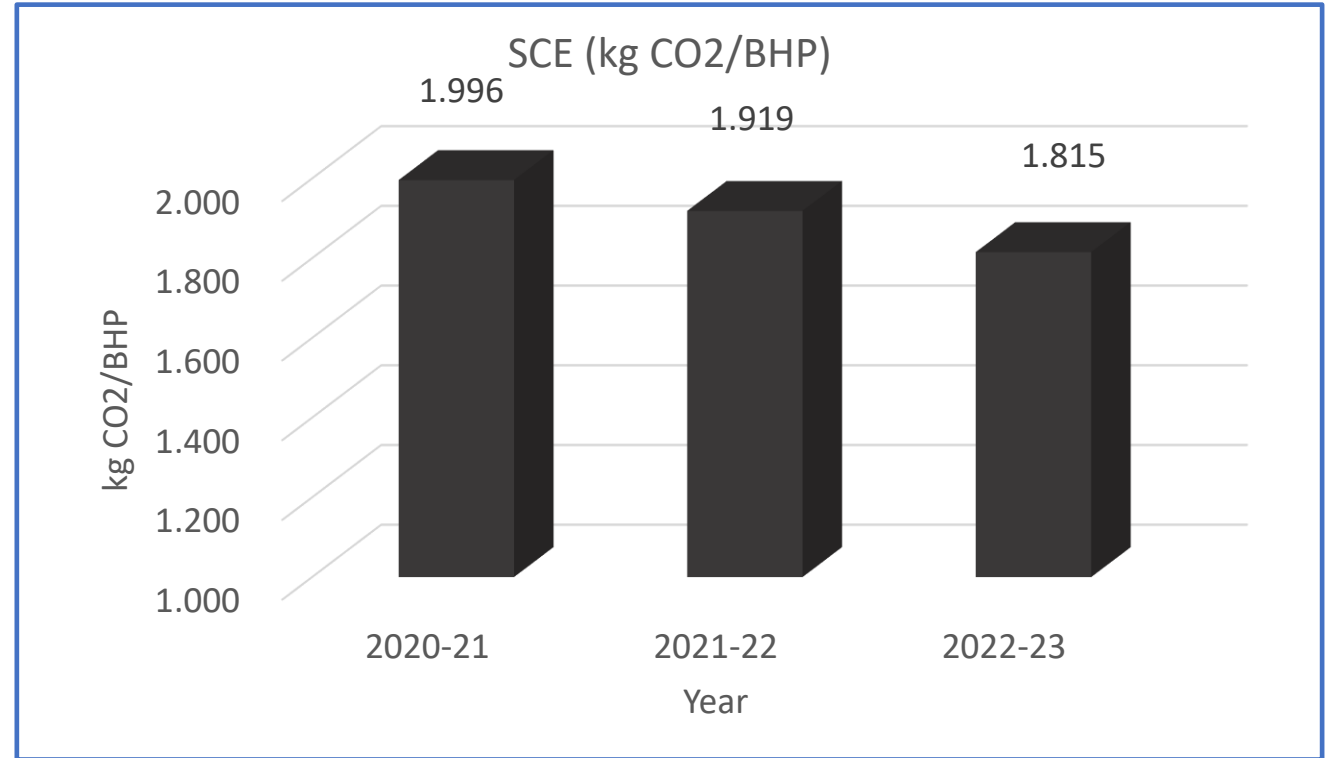
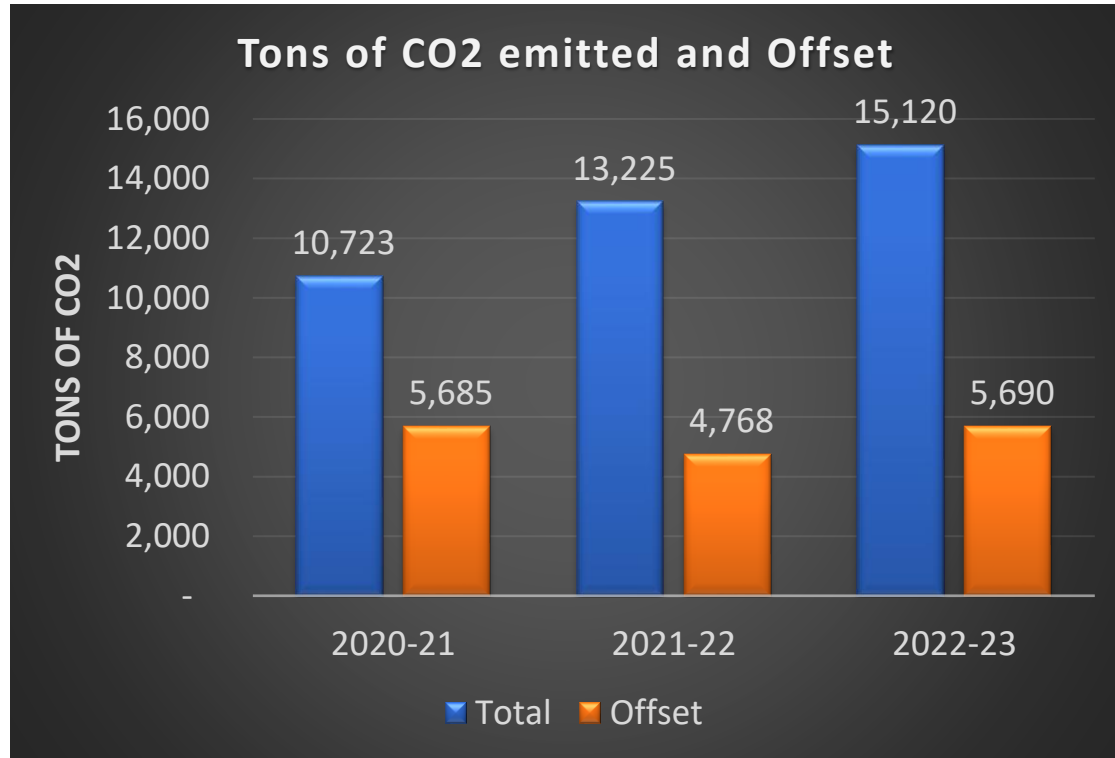
Employee business travel (Data of cabs booked through company, flights, rail etc.)



T&D losses (for electricity purchased)

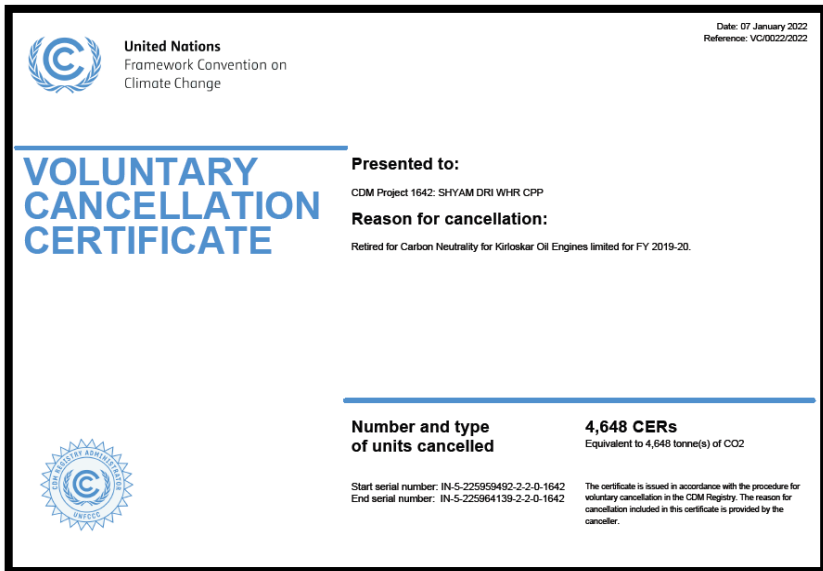
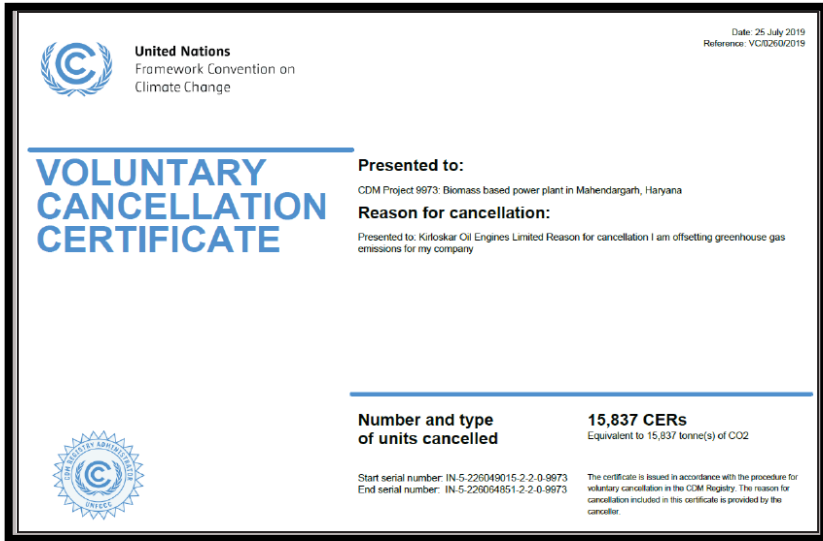


GHG Inventorization



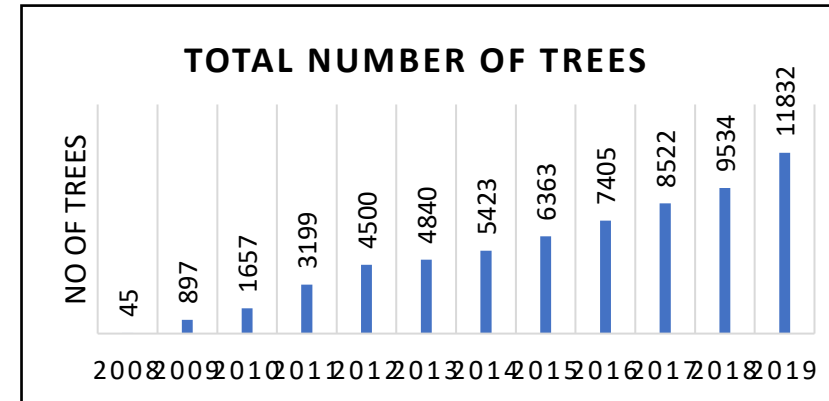
Location	Tons of CO2 emitted		BHP		kgs of CO2 emitted/BHP		
	FY 21-22	FY 22-23	FY 21-22	FY 22-23	FY 20-21	FY 21-22	Reduction
Kagal	13225	15120	68,93,554	83,29,536	1.92	1.82	5%

GHG Inventorization - Initiatives



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 neutral certification for consecutive 2 years

Carbon Sequestration Study

Green supply management

Make or Buy

- Decision on Product Platform
- Outsourcing of Components
 - Sub Contracting
 - Finished parts
- O/S of Products
- O/S of In House Parts

Supplier Base

- Location
- Certification
- Infrastructure
- Technology
- Payment Terms
- Freight
- After Market

Supplier Quality

- PPM reduction
- Supplier Processes Improvements
- Process and Product Audits
- PPAP approvals



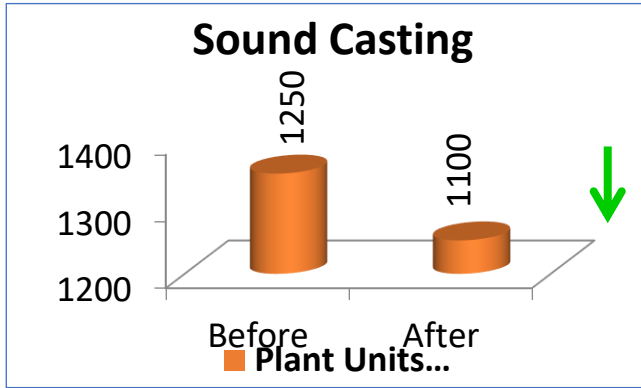
SCM Policy

Supplier Engagement

- Supplier Conference
- Quarterly Communication
- Monthly Score Card
- Supplier Training
- Supplier Survey
- Quality Contest

Commodity Strategy

- Industry Analysis
- Commodity Source Plan
- Dual Sourcing
- Supplier Rationalization
- Risk Mitigation & Financial Analysis

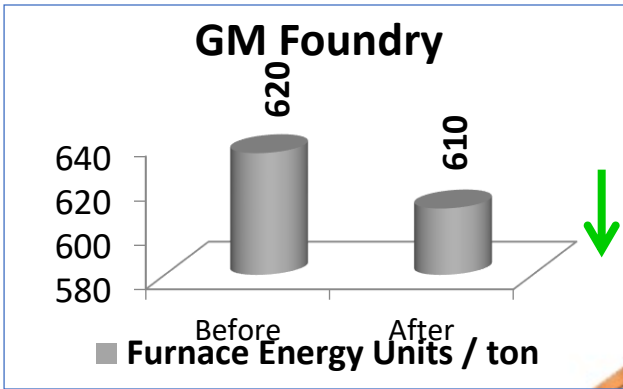
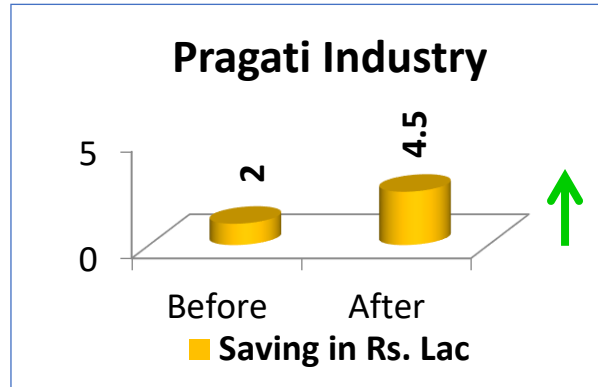


- KOEL Investment
- Amortization
- Capitalization
- Upkeep & Maintenance

- Price Approval Process
- 8 Levers of Cost Reduction
- Capturing Cost Reduction

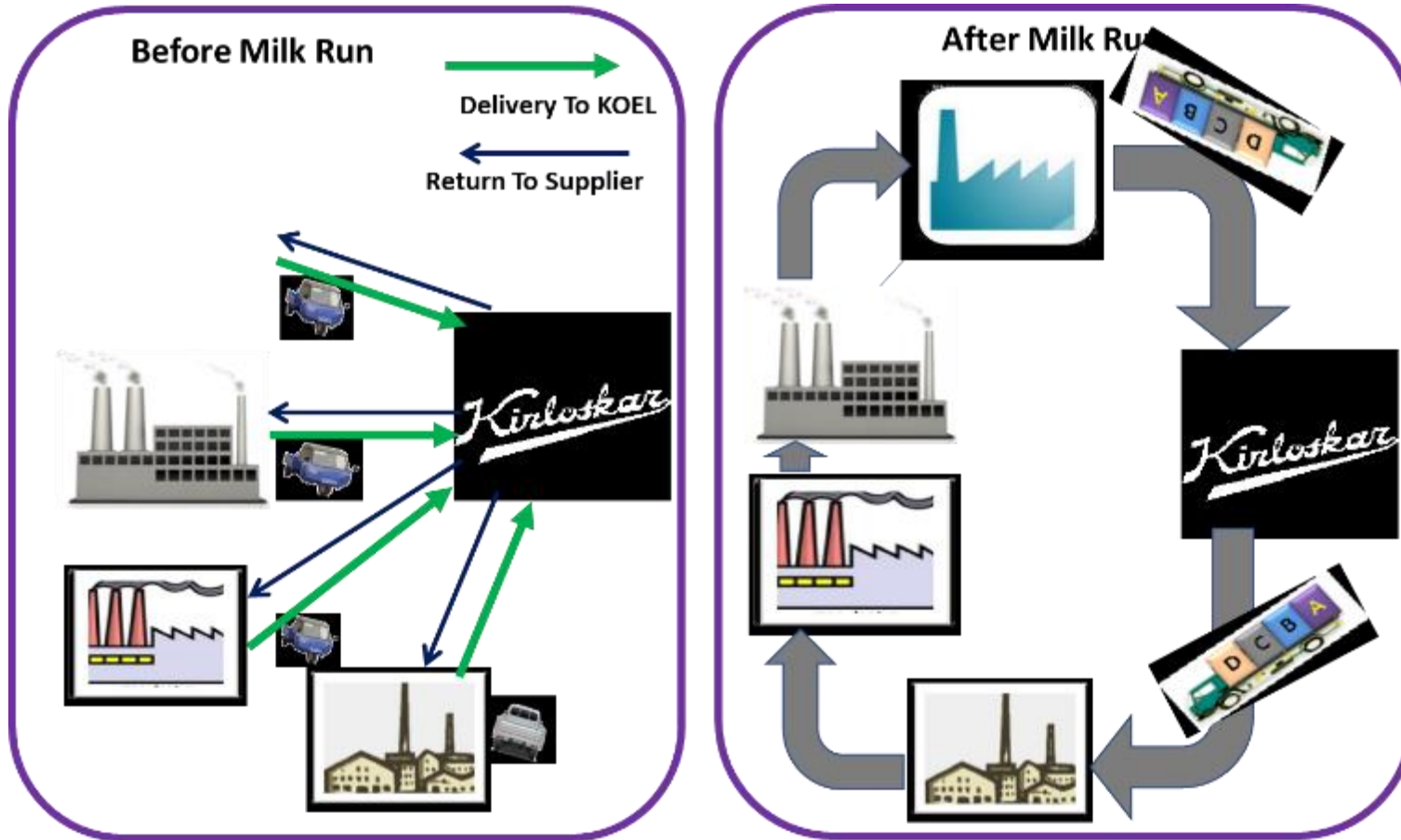
- Material Planning
- Ordering
- TOC-Consumption based Procurement
- Material Handling
- Packaging
- Milk Run

- Requirements at Supplier end
- OSHAS compliance
- Child Labour
- Hazardous Material Handling
- Waste Disposal



Green supply management

Milk Run -Model



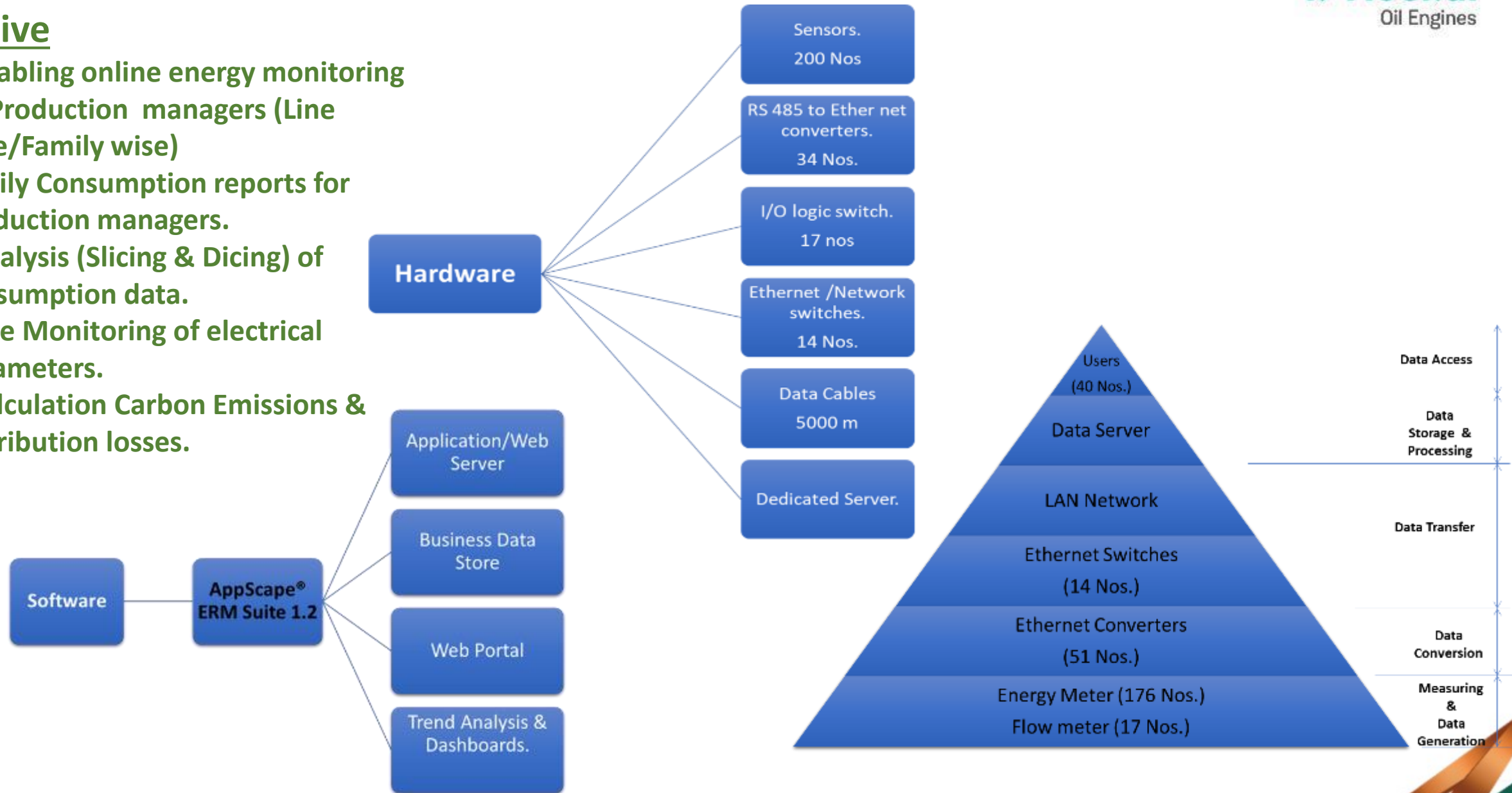
Benefits

- 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 .

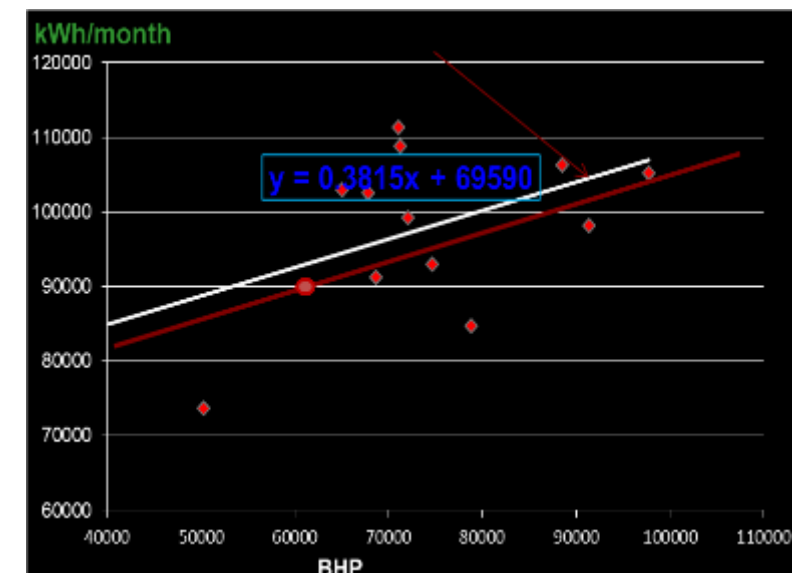
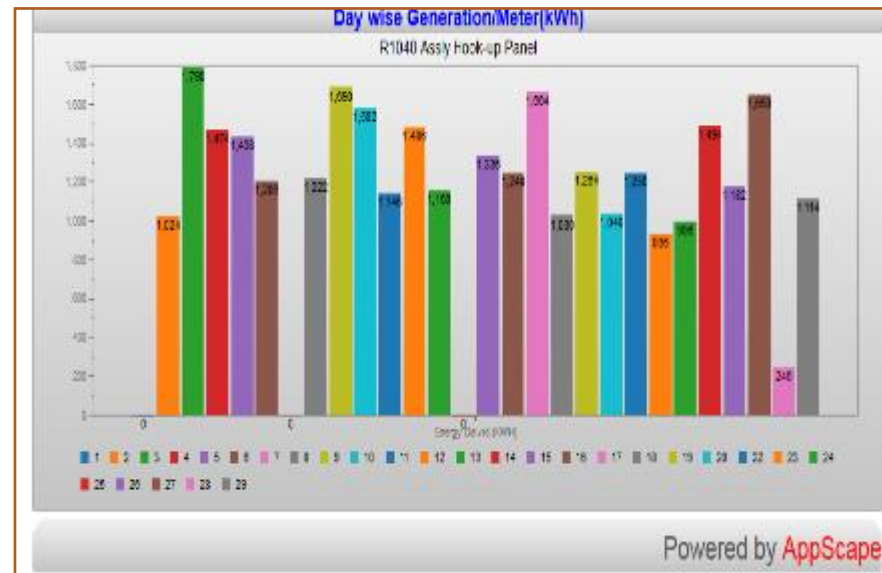
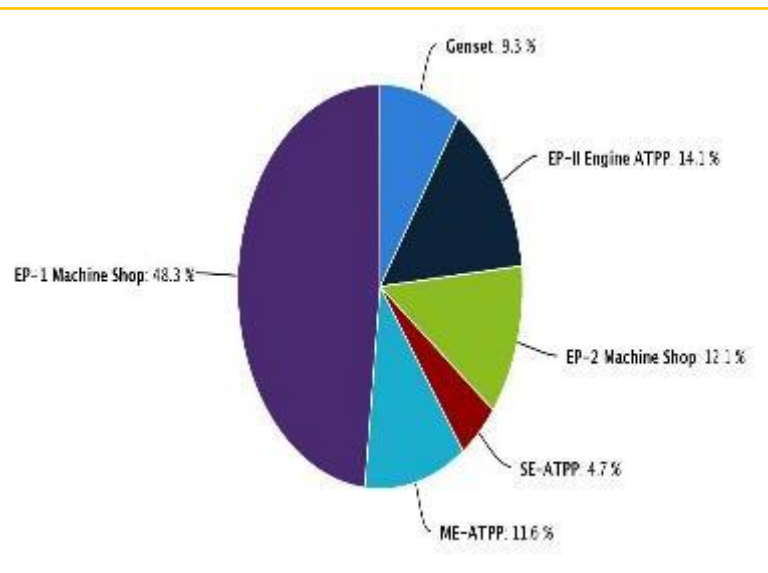
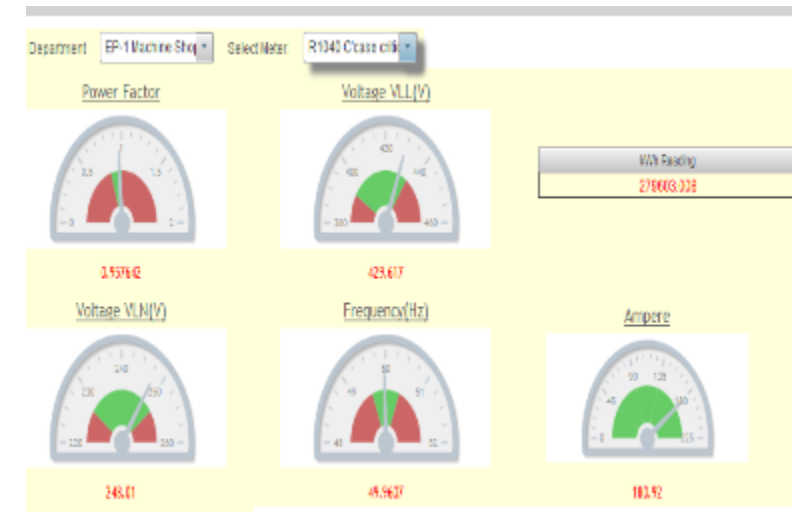
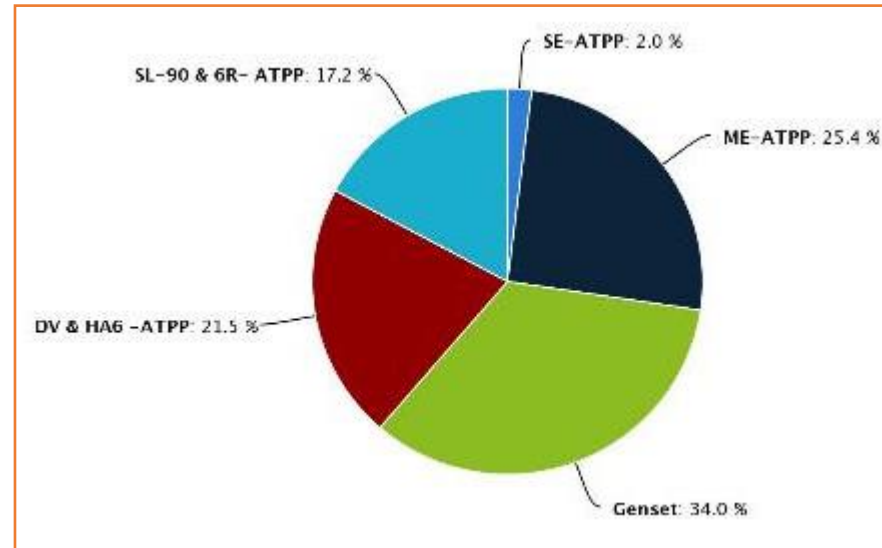
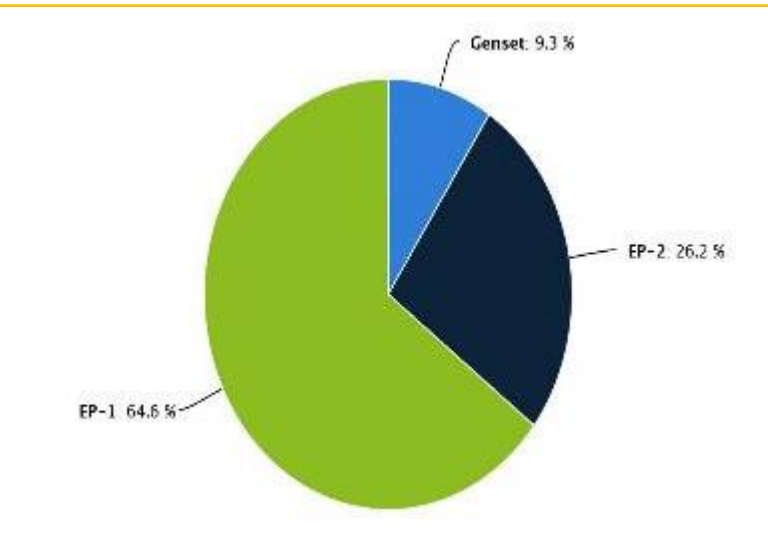
EMS system and Other requirements

Objective

- Enabling online energy monitoring by Production managers (Line wise/Family wise)
- Daily Consumption reports for Production managers.
- Analysis (Slicing & Dicing) of consumption data.
- Live Monitoring of electrical parameters.
- Calculation Carbon Emissions & distribution losses.



Data Analysis from EMS system



Net zero and Roadmap

- ❑ Net zero commitment year- 2030
- ❑ EP-100 commitment-Implementation of EnMS (ISO 50001:2018) by 2024, Double energy productivity

KOEL Kagal certified carbon neutral operations for 2018-19

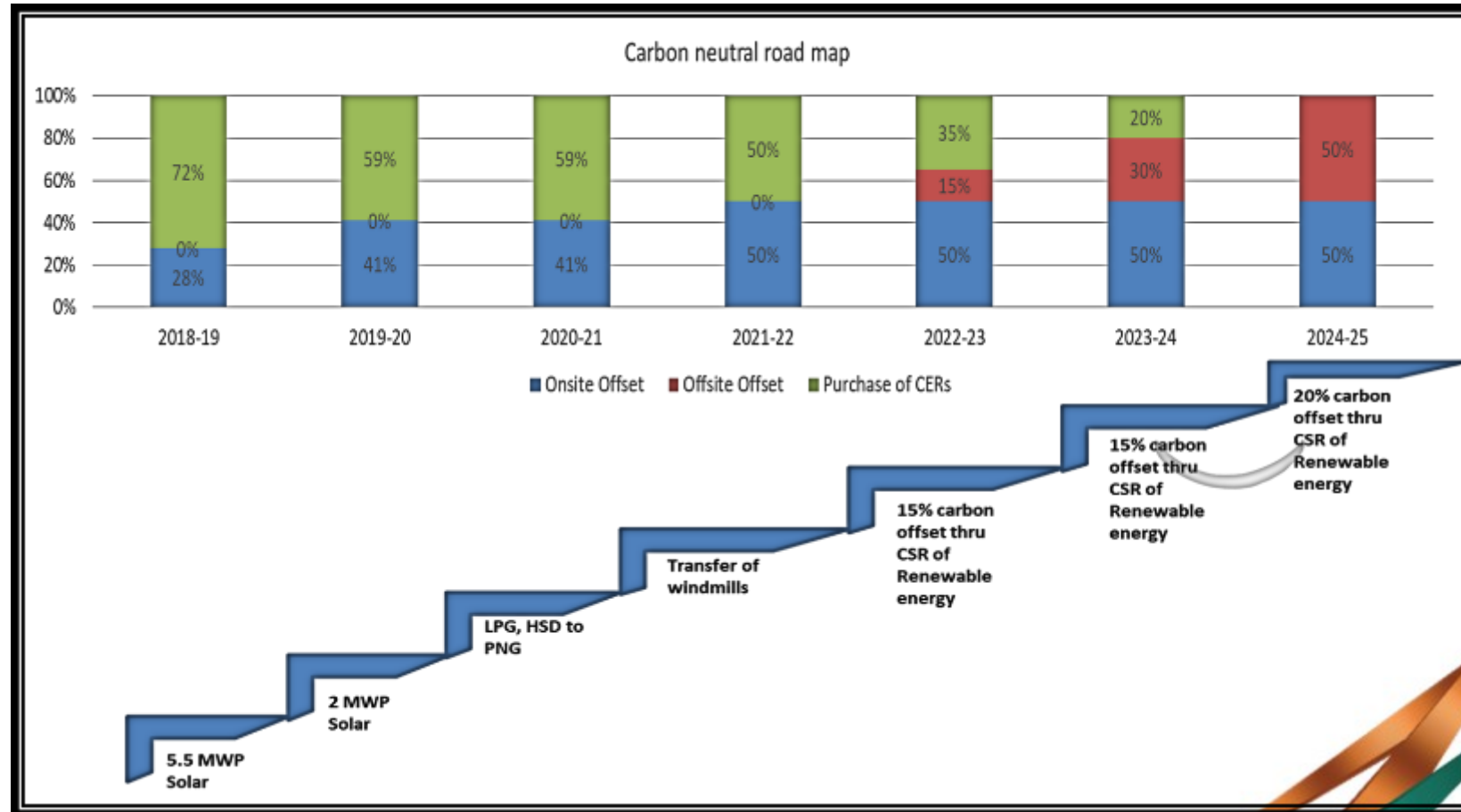
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Pravin Jadhav
Sustainability, ESG, CSR, CO2 footprint & reduction | 7k+ connections

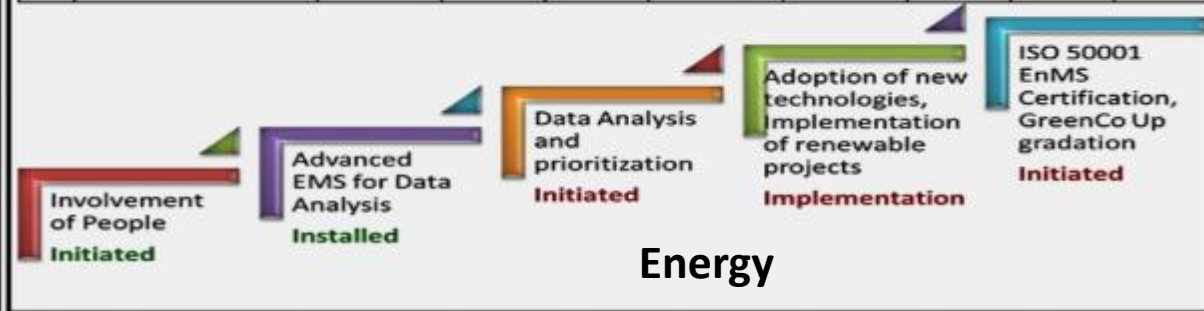
7 article

Kirloskar Oil Engines Limited (KOEL) is a leading engineering conglomerate, manufacturing internal combustion engines, generating sets and parts. Its largest manufacturing plant in Kagal, Kolhapur has been certified for carbon neutral operations in 2018-19 as per PAS 2060. Publically Available Specifications, PAS 2060 by BSI, 'Specification for the demonstration of carbon neutrality' was used to declare a Qualifying Explanatory Statement in consultation with RSM GC Advisory Services. RINA Services S.p.A. has provided

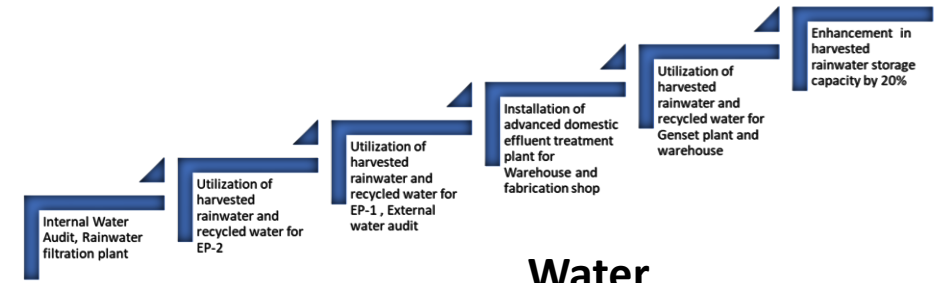
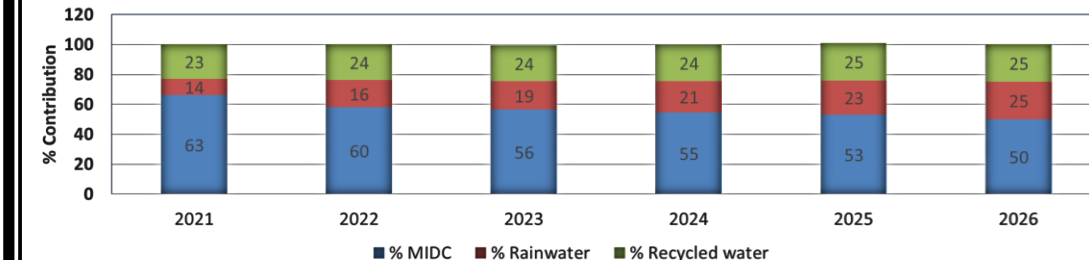


Roadmaps for the future...

Sr. No	Specific Energy Consumption	Present Status (kWh/BHP)			Short term target for specific Energy Consumption reduction		Long term target for specific Energy Consumption reduction		
		FY 16	FY 17	FY 18	FY 19	FY 20	FY 21	FY 22	FY 23
1	Specific Energy Consumption	3.25	2.68	2.46	2.39 (3% Reduction)	2.32 (3% Reduction)	2.20 (3% Reduction)	2.10 (5% Reduction)	2.00 (5% Reduction)



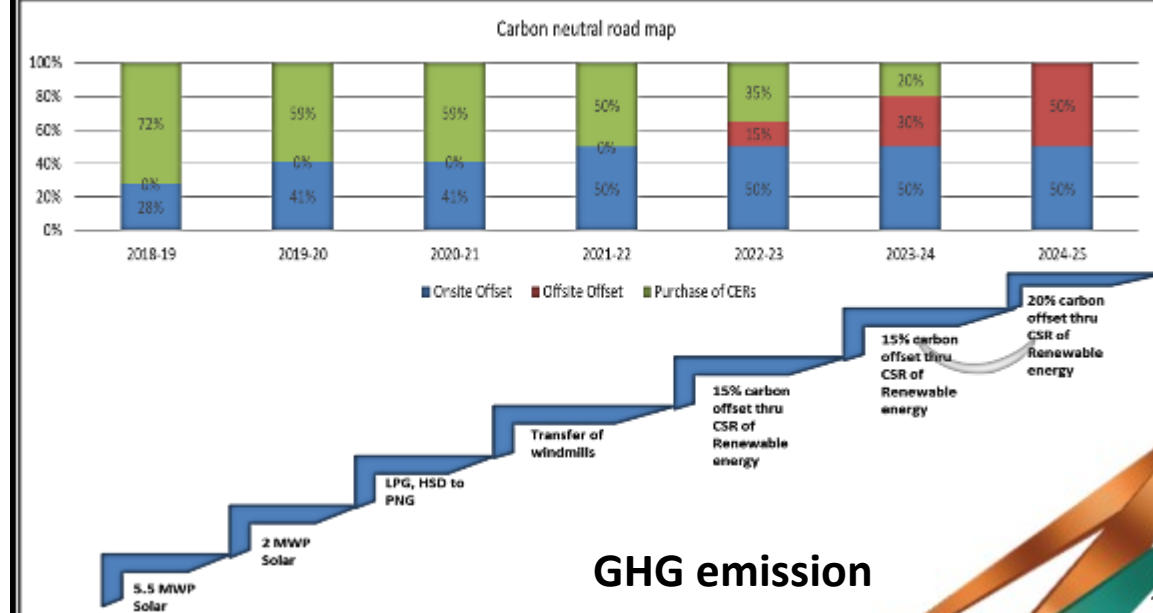
Energy



Water

Projects to achieve the Target	Units to be substituted in Lakh kWh	% Contribution	Financial year							Status
			2018	2019	2020	2021	2022	2023	2024	
5.5MWp Captive Solar Power Plant	75	48	█							Completed
Installation of Wind ball	0.10	0.10		█						Completed
Installation of Solar Pumps	0.10	0.10		█						Completed
Solar Charging system for battery operated vehicles					█	█				
Solar steam cooking for central kitchen							█			
2.16MWp Solar Power Plant	24	27						█		Completed
Transfer of windmill	12	13							█	In process
Substitution of Thermal energy with renewable energy	2	2							█	In process

Renewable Energy



GHG emission

Implementation of GreenCo/IGBC/ISO 50001 rating



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

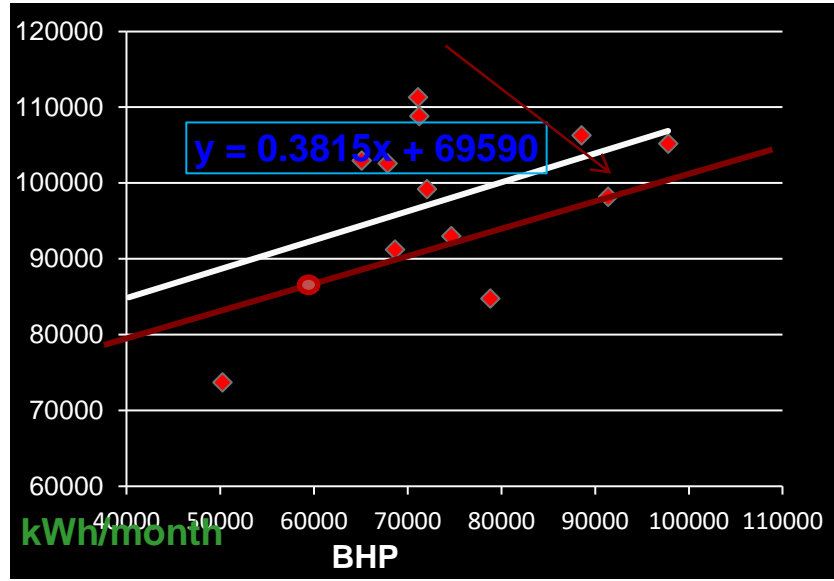
“Platinum” certification in IGBC existing building certification category for Ep- 1 office building.



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



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

E-mail- nitin.kulkarni@kirloskar.com