kirloskar
Oil Engines

National Award for “Excellence in Energy Management – 2021”

Kirloskar Oil Engines Ltd., Kagal-Kolhapur

Presented by:
Mr. NN Kulkarni-Corporate Energy Manager
Mr. VM Deshpande-Sr. GM, Maintenance & Utilities
Mr. SP Parab-AGM, Utilities

Kirloskar Oil Engines Ltd-Kagal plant

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

Kagal (Kolhapur) Plant →

- **Total Employees as on date**
  - 1200
- **Managers (TL, GL & UL)**
  - 210
- **Operators (Team Associates)**
  - 990

Initiatives

TPS

- *5S*
- *QMS, EMS & OHSAS*
- *ENCON*
- *Kaizen & POKA YOKE*
- *Autonomous Maintenance*
- *Six Sigma, QC Activities*
- *Standardized Work*

Product	Product Name	Capacities (2 Shifts Basis)	Range	Application
	Generating Sets with air cooled and liquid cooled engines	1650 / month	5 KVA to 625 KVA 1010 KVA	Domestic & Exports 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

Content of the Presentation

Kirloskar Oil Engines

- Company profile
- Impact of COVID-19
- Specific Energy Consumption (Last 3 years 2018-21)
- Information of Competitors, National and Global Benchmarks
- Energy Saving Projects implemented in last 3 years
- Innovative projects implemented
- 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 Green Co rating
- Learning from CII energy award 2020 or any other award

Impact of COVID-19

- Affected drastically as a manufacturing hub
- First month of FY 2020-21 (Apr-20), was a complete shutdown and next 2 months partial operation
- Only fixed energy consumption for Fire fighting system, Water pumping system, Gardening and Lighting
- Partial/ under loading of machineries, Man/Material vehicles and auxiliaries like HVAC, lighting etc.
- More usage of Water for disinfection and sanitization purpose
- Resulted into increase in Specific Energy Consumption (SEC)
- Herculean task to credit Over injected generated units from Solar Power Plant

Consumption Vs Production

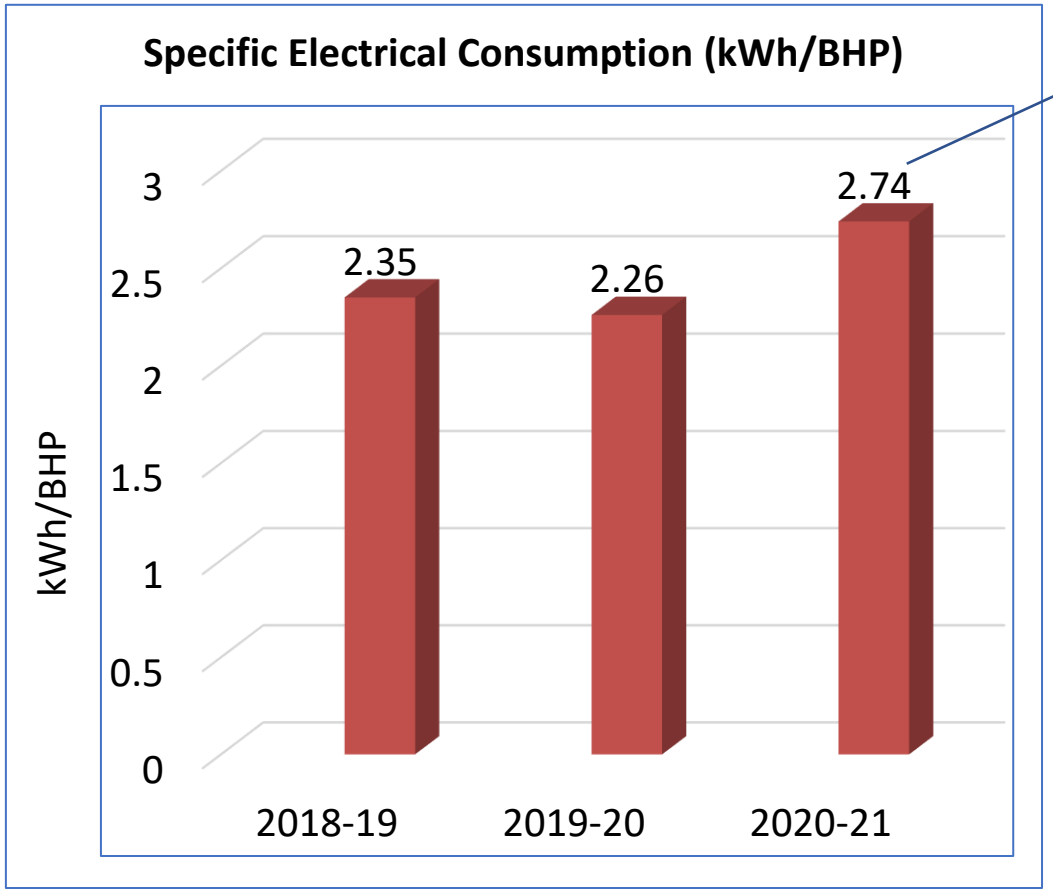
ELECTRICAL

Year	Variable consumption in kWh	Production in BHP	kWh/BHP
FY18-19	16846287	7172622	2.35
FY19-20	14410478	6365615	2.26
FY20-21	14712926	5372482	2.74

THERMAL

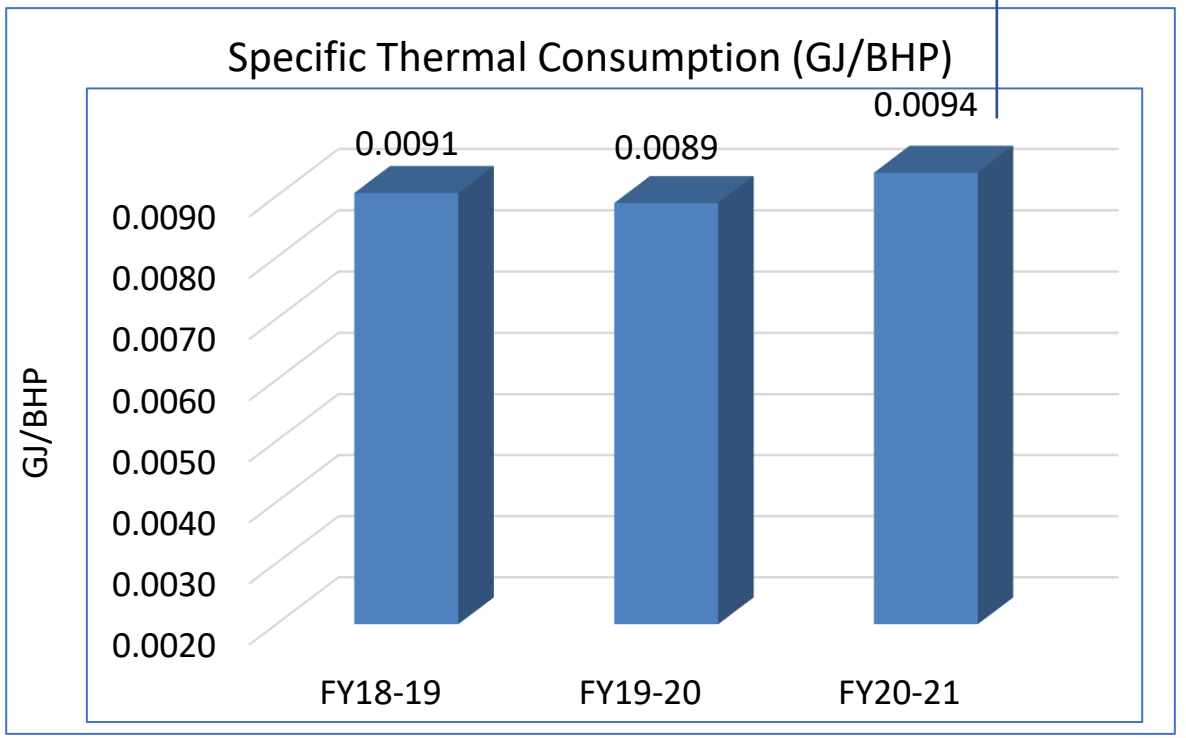
Year	Thermal Consumption GJ	Production in BHP	GJ/BHP
FY18-19	64920	7172622	0.0091
FY19-20	56570	6365615	0.0089
FY20-21	50405	5372482	0.0094

Specific Energy Consumption (SEC)



16.6% increase in SEC over FY 19

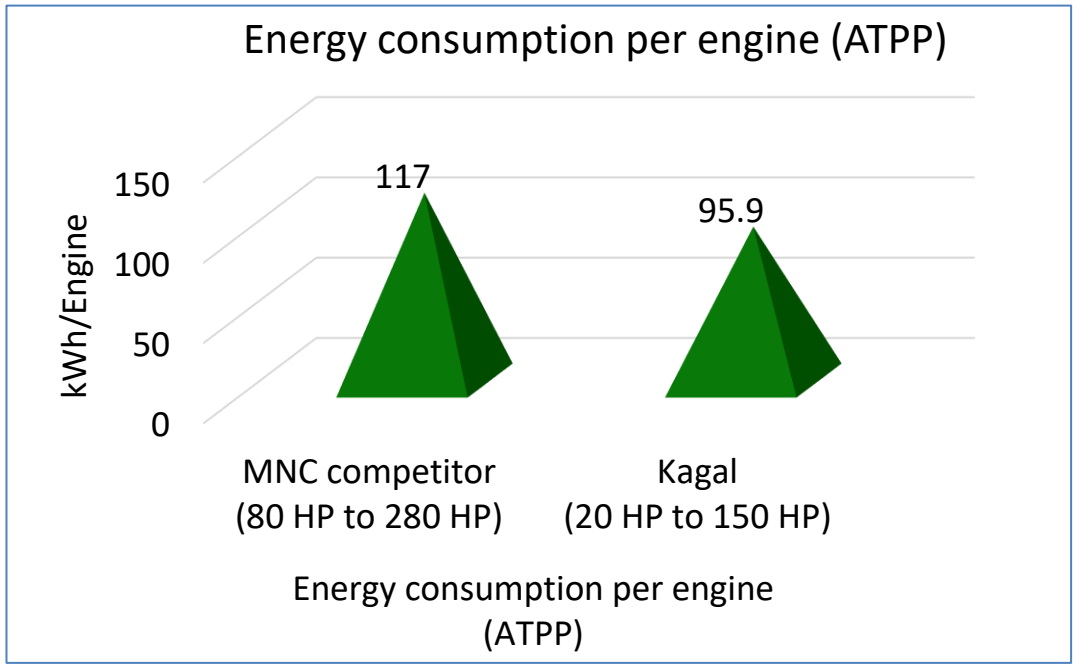
Constant

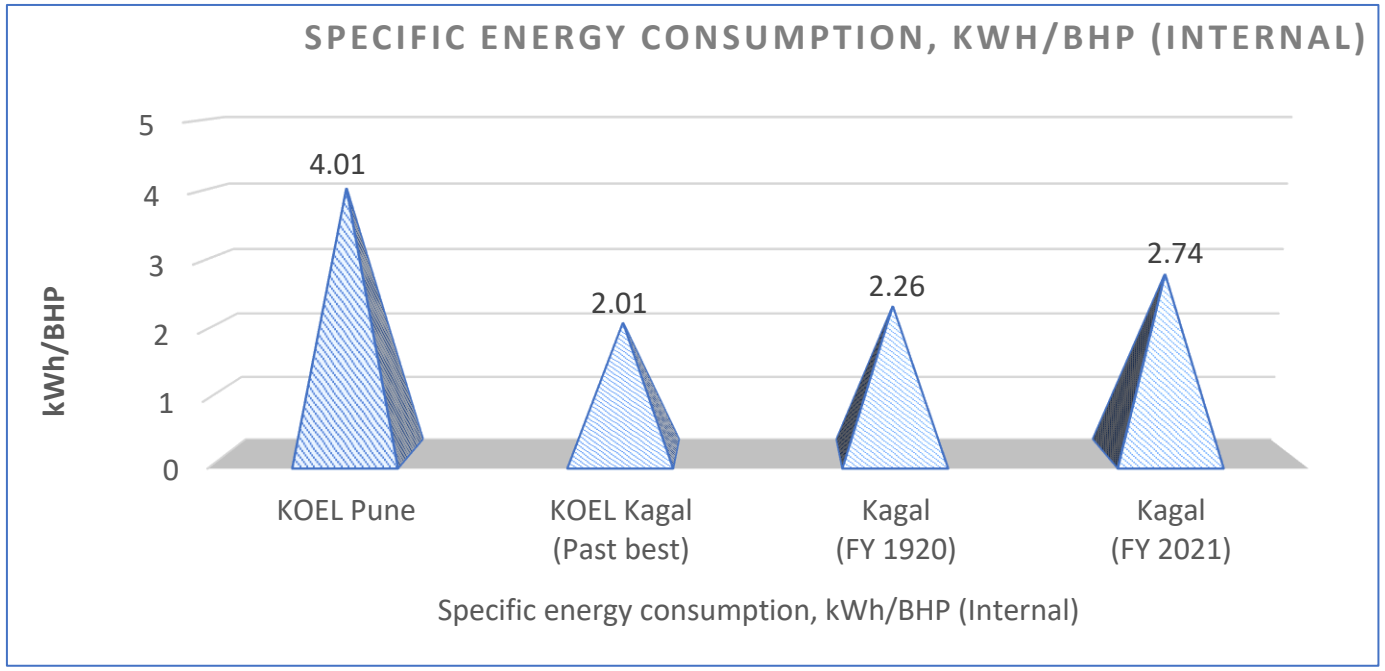


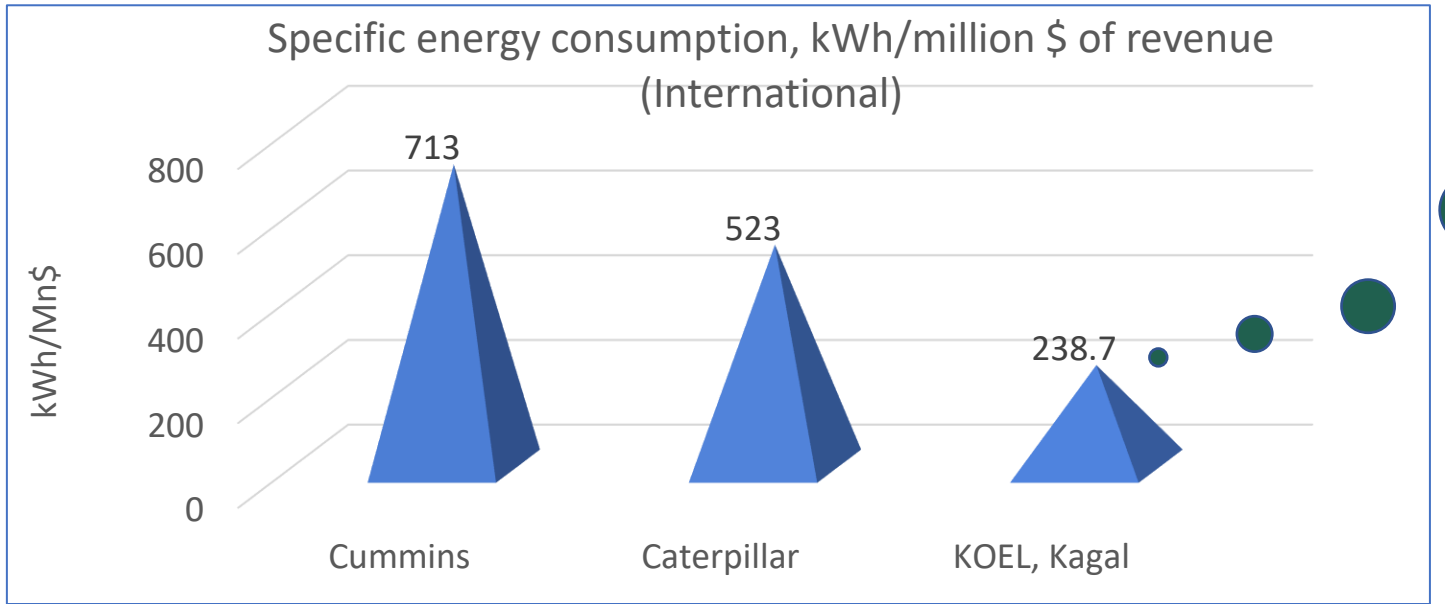
Reasons for change in Specific Energy Consumption (SEC)

- Partial/ under loading of machineries, Man/Material vehicles and auxiliaries like HVAC, lighting etc. for initial 3 months of FY 2020-21 due to COVID-19 pandemic
- Only fixed energy consumption for Fire fighting system, Water pumping system, Gardening and Lighting for initial 3 months of FY 2020-21 due to COVID-19 pandemic
- Individual component loading instead of batch loading due to marketing/peer pressure
- Customer demand for prolonged testing of Engine and Genset
- Proto type engine assembly and testing
- Breakdowns

Benchmarking-SEC



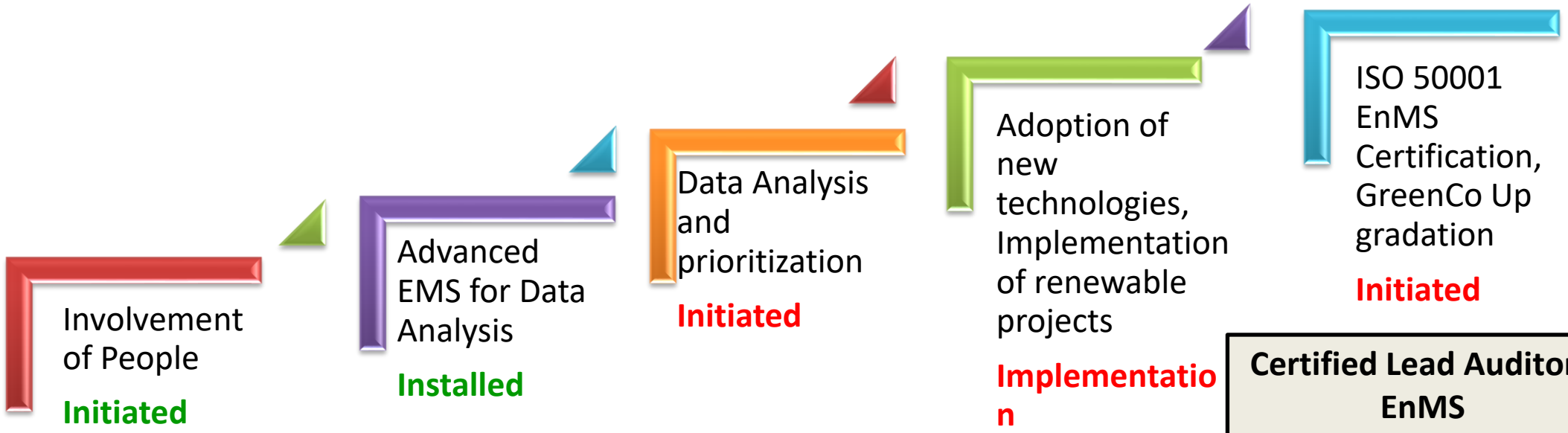




Best at International and National level

Target SEC and Roadmap to achieve SEC

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	FY23
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)



Certified Lead Auditor - EnMS

- **Santosh Parab**
- **Nitin Kulkarni**

List of major ENCON projects planned in FY 2021-22

Name of the project	Units saving In lakh kWh	Fuel saving lakh Kcal	Cost saving in Rs. Crs	Investment in Rs.Crs
Replacement of LPG at 11 tank process through waste heat recovery from Engine testing	-	19660	0.84	1
Installation of wind turbines 0.5 MW capacity	-	-	0.7	1
Expansion of 5.5 MW Solar Power plant by another 2.68 MW	-	-	3	12
Installation of lighpipes in assembly area	0.86	-	0.2	32.7
Adoption of 100CFM compressor for low air flow requirement during offs	0.5	-	0.05	0.1
Arresting compressed air leakages	2	-	0.2	0.2

Energy saving projects implemented in last 3 years

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Year	No. of projects	Units saving In lakh kWh	Fuel saving lakh Kcal	Cost saving in Rs. Lakhs	Investment in Rs.Lakhs
FY18-19	24	8.02	0	63.9	13.9
FY19-20	12	4.03	722.52	89.9	16.5
FY20-21	26	1.62	0	13.9	2.3
Total	62	13.7	722.5	167.7	32.7

Innovative project implemented

Name- Installation of waste plastic to fuel conversion plant

1. Waste plastic to fuel plant

Enriching Lives

Installed and commissioned "Waste plastic to Fuel Conversion plant" with a yield of almost 70%. The output fuel is having similar characteristics that of Diesel and can be utilised as an alternate fuel.

KIRLOSKAR OIL ENGINES LIMITED

1.Waste plastic to fuel plant

Yield

Enriching Lives

Outcomes-

15 to 20% Generate flammable gases

10 to 15% Fine powder

65% condensate that is liquid (Diesel)

Process Yield is about 65-70 %

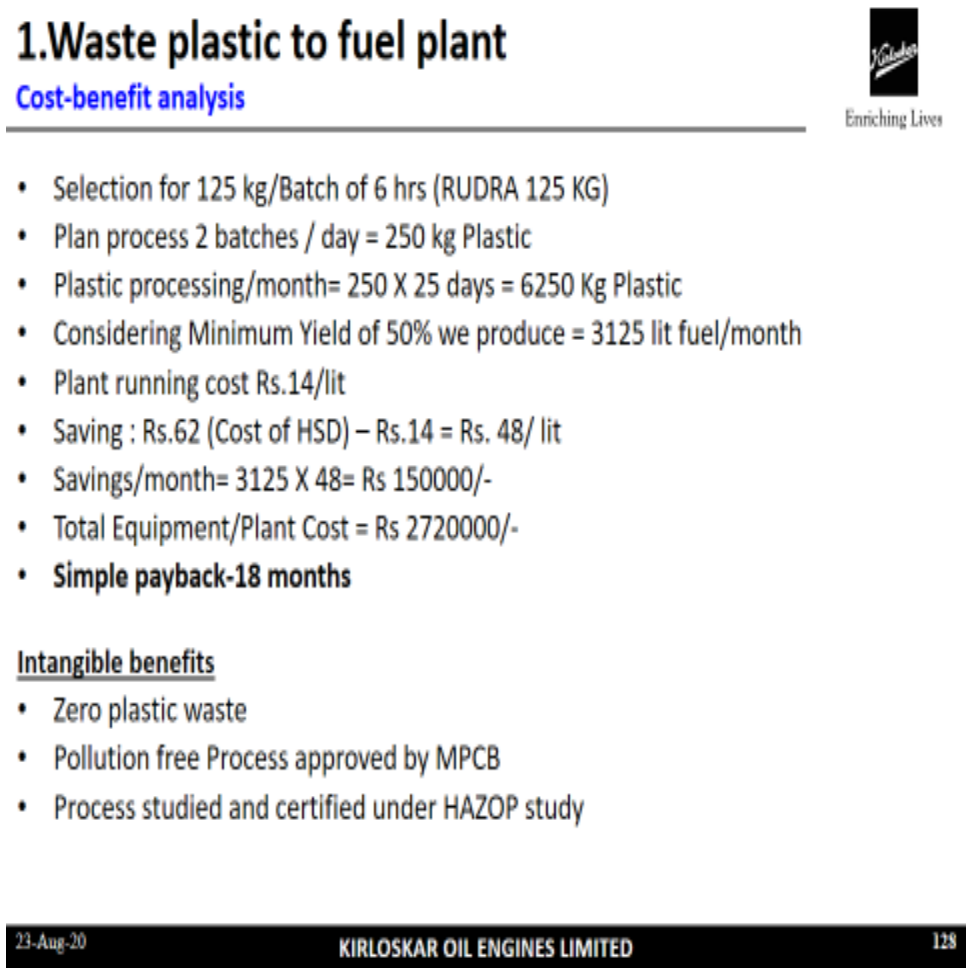
Comparison of parameters

Properties of oil produced:	Parameters Values	
Characteristics	Plastic Fuel	Diesel
Density (Approx. Kg/lit at 15 Deg. C)	0.85 – 0.97	0.74-0.83
Flash Point (Deg. C)	70 - 82	68-94
G.C.V. (Kcal/kg)	10600	10800
Sediment % Wt. Max.	0.22	0.25
Ash % Wt. Max.	0.15%	0.10%

23-Aug-20 KIRLOSKAR OIL ENGINES LIMITED 127

Innovative project implemented

Name- Installation of waste plastic to fuel conversion plant



Trigger- Stringent norms to disposal and use of plastic

Replication potential- Yes, can be horizontally deployed.

Contribution from plant team-

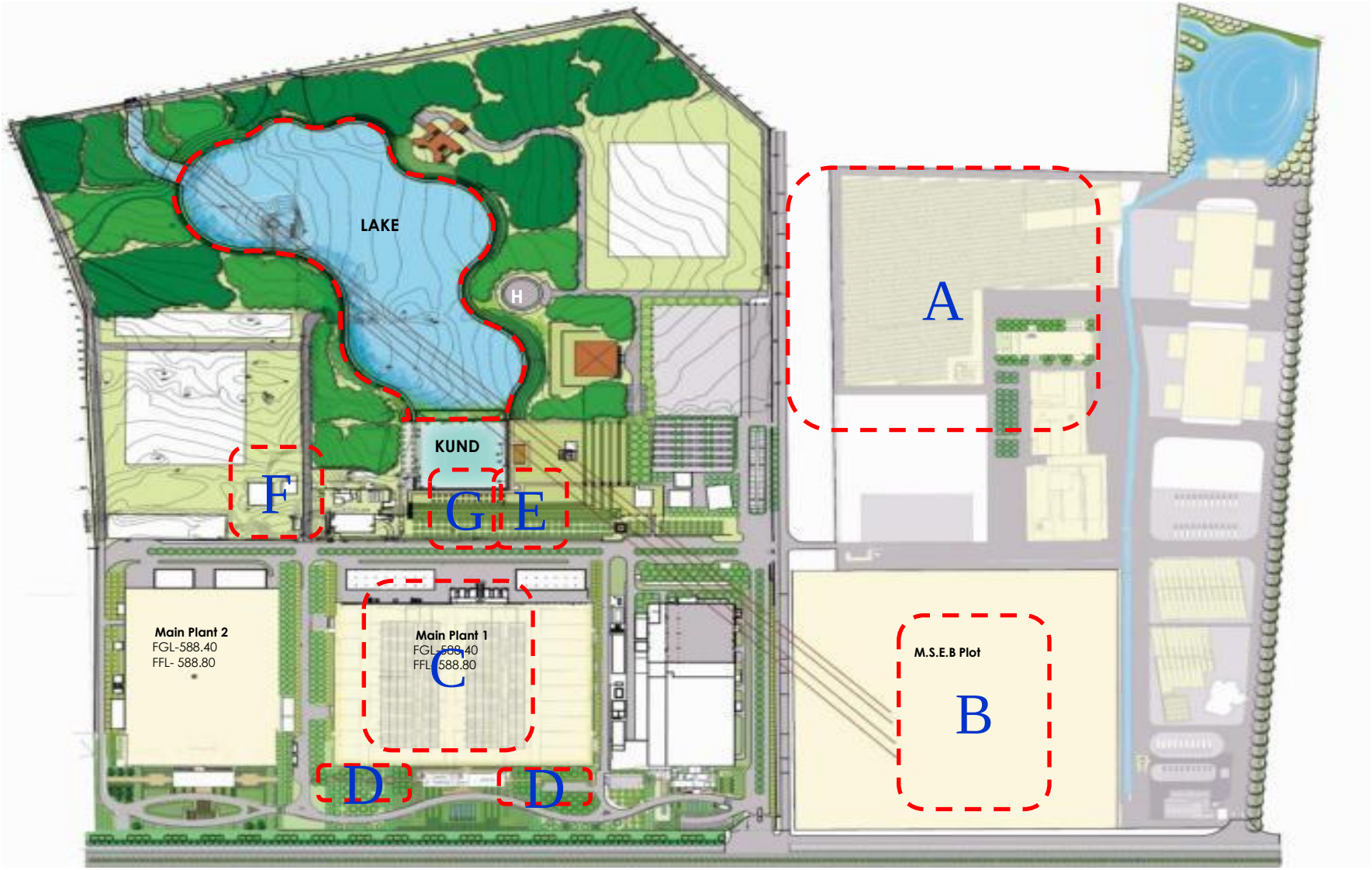
- ✓ Detailed analysis of Dioxin and Furans before purchase of plant
- ✓ Approvals from State pollution control boards
- ✓ Shredding and segregation of plastic waste
- ✓ Use of residue in road/brick formation

Impact created-

- ✓ The plant is well appreciated by State pollution control board
- ✓ Local NGO's adopted the concept and implemented at City
- ✓ Suppliers also implemented the same at their premises

Utilization of Renewable Energy Resources

Onsite Installations at Kagal premises



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 - 0.082 MWp

E – Solar Parabola Steam Generator – 350 Kg/Day

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

G – Biogas Plant and Biogas Generator – 30 Cum / Day 15 KVA Generator

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

Utilization of Renewable Energy Resources

Solar & Windmill Units	Renewable Energy Used (FY 18-19)	Renewable Energy Used (FY 19-20)	Renewable Energy Used (FY 20-21)	Target FY21-22
kWh Units	65.45,401	73,20,542	62,28,410	60%
% of total Energy consumption	37%	48%	50%	

Roadmap to Maximize share of Renewable Energy

Projects to achieve the Target	Units to be substituted in lakh kWh	% Contribution	Financial Year				Status
			2018	2019	2020	2021	
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%**					

Utilization of Renewable Energy Resources

Onsite generation –

- ✓ 5.5MWp Captive Solar Power Plant
- ✓ Biogas Plant and Biogas Generator, capacity 30 Cum / Day and with 15KVA generator
- ✓ Solar Hot water System for Paint Booth, capacity 1500 LPD
- ✓ Solar Parabola Steam Generator, capacity 350 Kg/Day
- ✓ 1 KW Solar Lighting and
- ✓ 15 KW Solar Pumping System
- ✓ Upcoming 2.68MWp Captive Solar Power Plant

Investment made, capacity addition and power generation in last three years (FY 2018-21) –

Year	Capacity addition, MW	Investment made, Rs.Crs.
2018-19	5.5	23
2019-20	0.016	1
2020-21	2.68	12
2021-22	0.5	1

100% of above capacity is used at Kagal plant

Waste utilization and Management

- Analysis Report received for co processing (Using alternate fuel) of paint sludge, ETP sludge, Phosphate sludge and Cotton waste which are our major Hazardous Wastes generates from processes at M/s Ambuja Cement Works which is clearly indicating that above wastes can be co- processed.
- We are awaiting for financial proposal from the waste co- processing agency.

35% Hazardous Waste Can be Co-Processed

Sr. no	Waste name	Category	Generation Quantity TPM	Moisture Content %	Gross CV cal / gm	NCV (Cal/gm) Calculated	Ash content %	Sulphur %	Chlorides %	pH(5% sol)	Observations & comment
1	**Paint Sludge**	21.1	3.5	38	2560	2163	24.39	0.27	0/03	6.67	**Waste can be co-process in cement kiln.**
2	**ETP sludge**	34.3	8	78.43	388	NIL	12.52	0.02	0.003	7.7	
3	**Phosphate sludge**	12.5	0.8	73.27	39	NIL	21.5	0.002	NIL	3.85	
4	**Cotton Waste**	5.2	1	7.75	6094	5623	3.2	0.28	0.09	8.3	

- Pre and post kitchen waste, Garden waste is utilized at Bio-gas plant.
- Further the Biogas is utilized for Cooking and powering street lights through Biogas generator.
- For FY 2020-21, 1174m^3 of Biogas is utilized.

GHG Inventorisation

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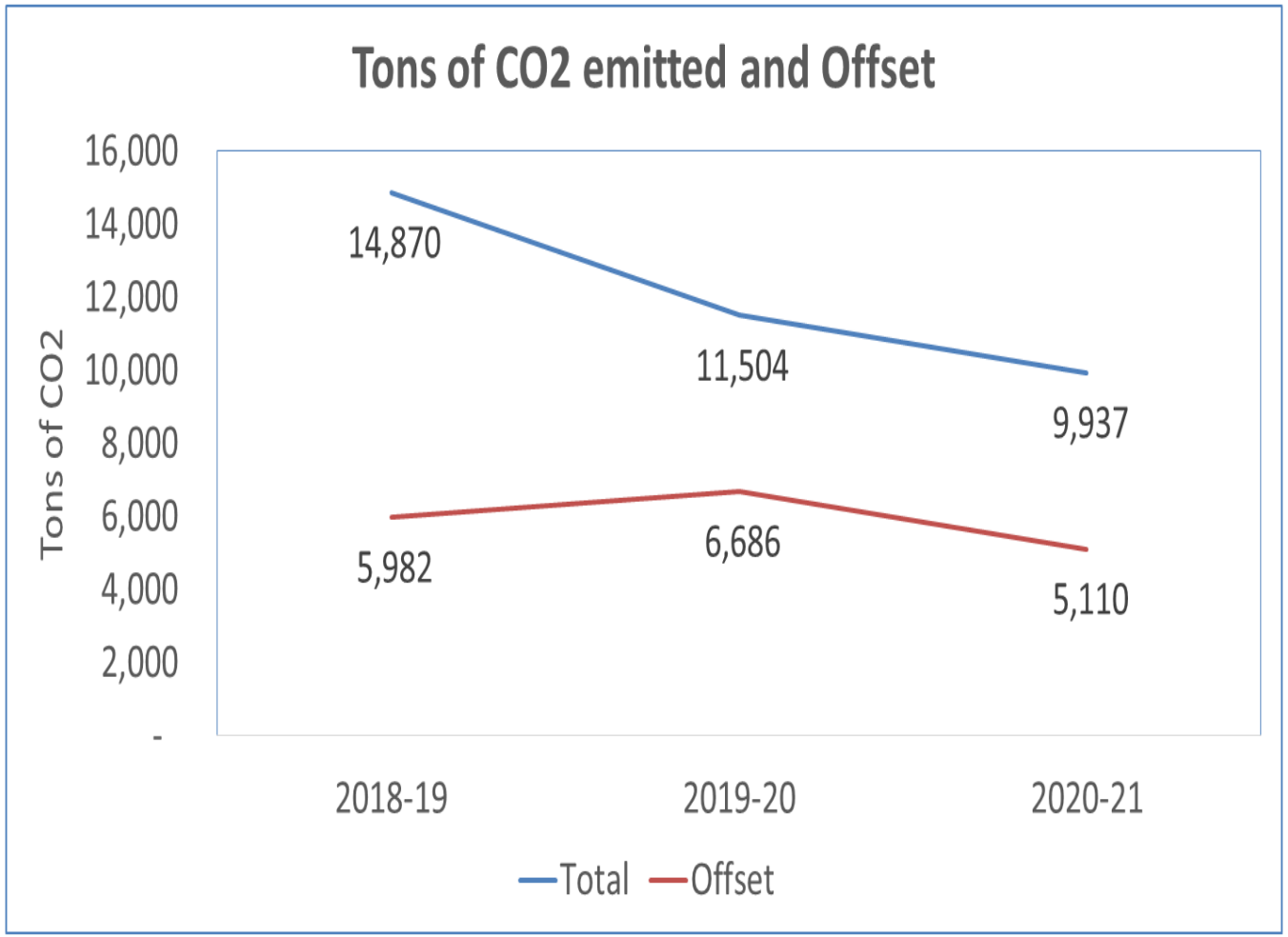
Carbon Foot Print Report Data - Kagal-1 Plant

Sr. No.	Source	Scope	Unit	Consumption			GHG Emission (tco2)		
				FY18-19	FY19-20	FY20-21	FY18-19	FY19-20	FY20-21
1	HSD	1	kl	1,440.50	1,272.00	1,081.50	3,782.18	3,339.76	2,779.46
2	LPG	1	kg	2,02,435.50	1,86,143.50	1,56,461.50	607.31	558.43	458.43
3	FO	1	kl	50.36	16.91	73.14	150.02	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 =						**4,540**	**3,949**	**3,470**
	Scope 2								
1	Electricity Purchased	2	kWh	1,13,22,237	82,80,590	78,87,434	10,330	7,555	6,468
	Total Scope 2 =						**10,330**	**7,555**	**6,468**
	Offset								
1	Electricity Renewable		kWh	65,45,401	73,20,542	62,28,409	5,972	6,679	5,107
2	Biogas		m3	5,585	3,794	1,174	10	7	2
3	Solar		kg of steam	19,558	7,277	4,381	0.00	0.00	0.89

GHG Inventorisation



Tons of CO2 emitted		BHP		kgs of CO2 emitted/BHP	
FY 19-20	FY 20-21	FY 19-20	FY 20-21	FY 19-20	FY 20-21
11504	9937	6365614	5372481	1.8	1.8

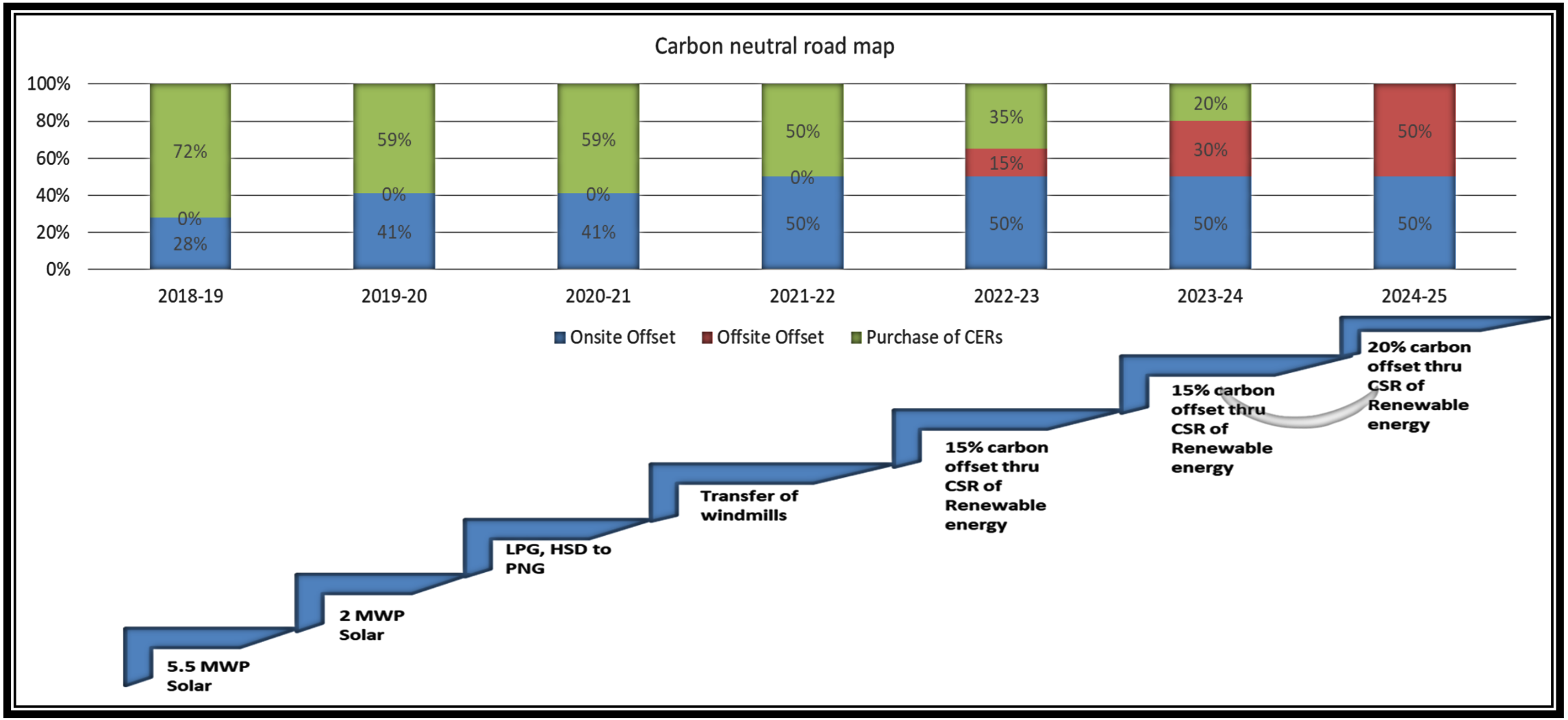
✓**Even under part loading of plant, increasing trend of fixed energy consumption and frequent change in shift schedules and manpower during COVID-19 pandemic KOEL Kagal facility retained the Specific Carbon Emission (SCE) to a tune of 1.8 kgs of CO_2 as of last year.**

Difference between total emission and Offset -4827 tCO_2

Roadmap – Carbon Neutrality

KOEL, Kagal certified as "Carbon Neutral" for FY 2018-19 and in process for FY 2019-20.

KOEL Planned to become "Net zero Carbon emission" and roadmap has been laid as below-



Green supply chain management

Supply Chain Policy

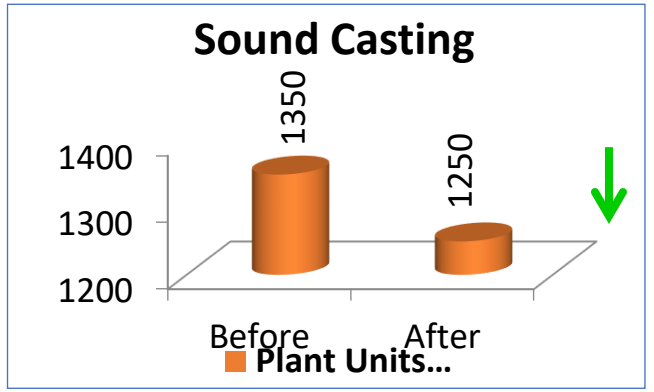
Make or Buy	Supplier Base	Supplier Quality	Supplier Engagement	Commodity Strategy

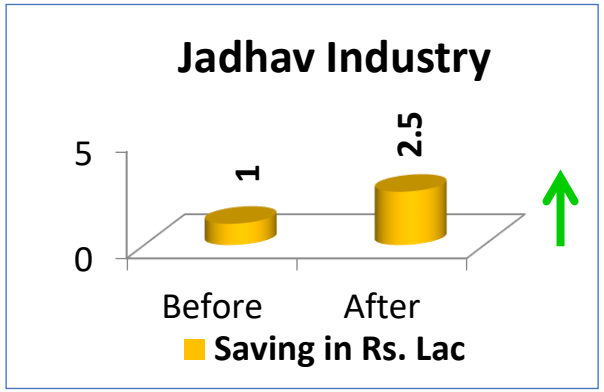
• Decision on Product Platform
• Outsourcing of Components
  • Sub Contracting
  • Finished parts
• O/S of Products
• O/S of In House Parts
	• Location
	• Certification
	• Infrastructure
	• Technology
	• Payment Terms
	• Freight
	• After Market
		• PPM reduction
		• Supplier Processes Improvements
		• 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

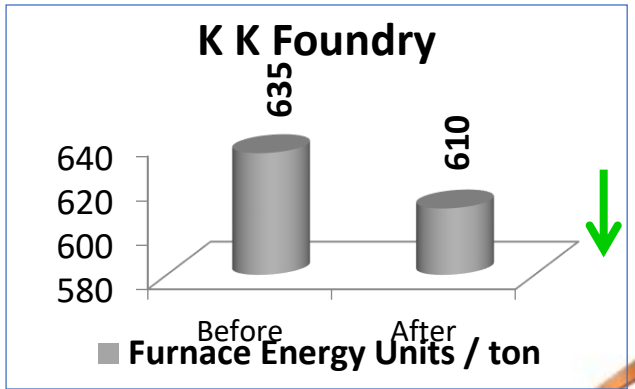
• KOEL Investment • Amortization • Capitalization • Upkeep & Maintenance	• Price Approval Process • 8 Levers of Cost Reduction • Capturing Cost Reduction	• Material Planning • Ordering • TOC-Consumption based Procurement • Material Handling • Packaging • Milk Run	• Requirements at Supplier end • OSHAS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

37

Activities at Supplier End

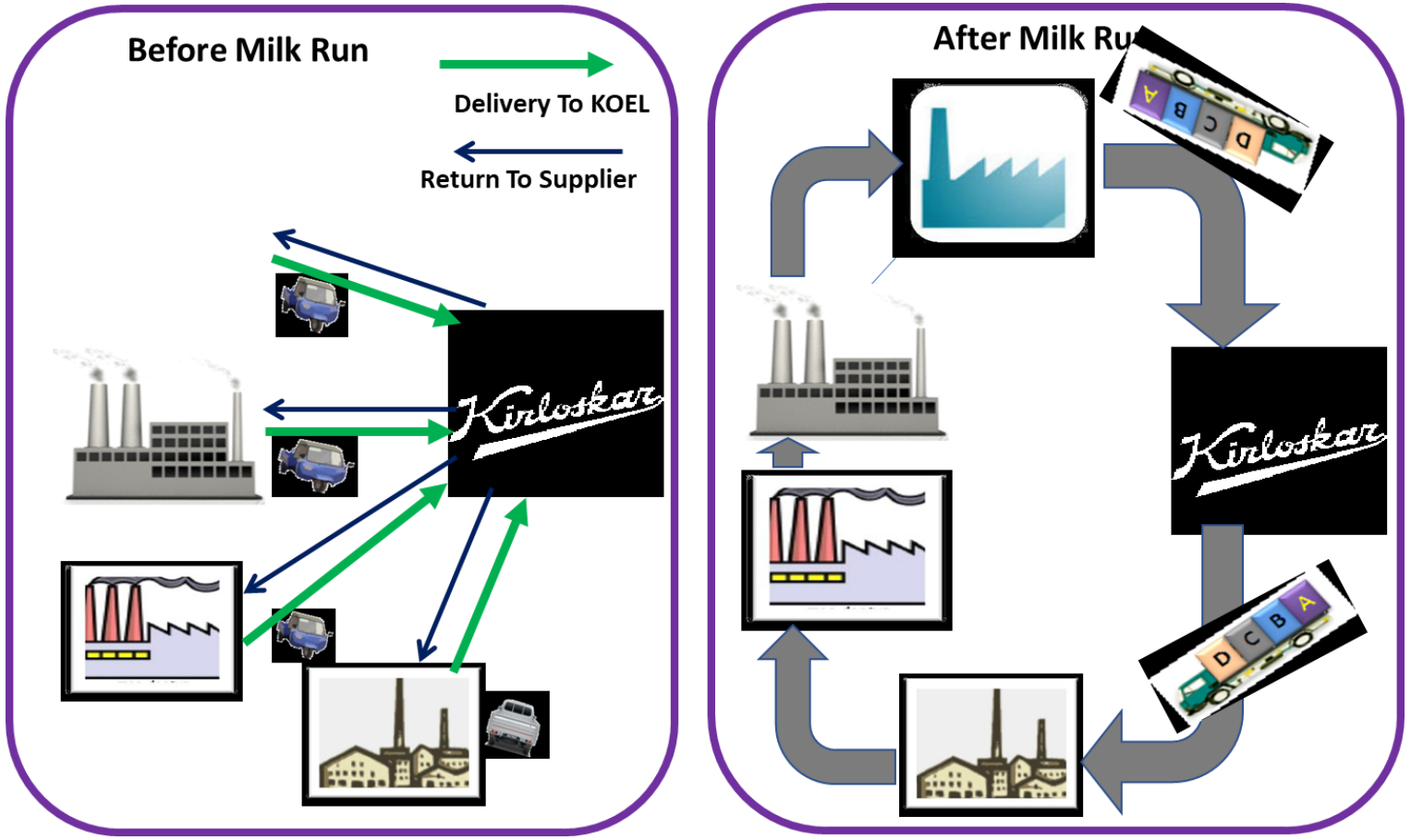






Green supply chain management

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 .

Teamwork, Employee involvement and monitoring

- ✓ 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

Implementation of ISO 50001/Green Co/IGBC rating

CII - Sohrabji Godrej Green Business Centre

hereby certifies that

Kirloskar Oil Engines Limited

Kolhapur

has successfully achieved the standards as required for the following level of certification under the GreenCo - Green Company Rating System which is valid for a period of 3 years

GreenCo Platinum

June 2019

Jamshyd N Godrej — Chairman, CII-Godrej GBC

Pradeep Bhargava — Chairman, GreenCo Rating System

L S Ganapati — Chairman, GreenCo Assessor Panel

K S Venkatagiri — Executive Director, CII-Godrej GBC

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 — Chair, IGBC Green EB O&M

V Suresh — Chairman, IGBC

S Raghupathy — Deputy Director General, CII

K S Venkatagiri — Executive Director, CII-Godrej GBC

Green Co "Platinum" Certified Plant

Implementation of ISO 50001 planned in FY 2021-22

IGBC" Platinum" Certified admin. building

Learning from CII Energy Award 2020 or any other award program

- **Adoption of new energy efficient technologies-**
  - ✓Vaayu
  - ✓Axial blowers and fans
  - ✓Heat pump
  - ✓Solar Light pipe
  - ✓Optimization in TAKT time
- **Horizontal deployment of best practices**
- **Green CO and IGBC certification**
- **National and International benchmarks**
- **SWOT analysis of Organization**

Major achievements

"Golden Peacock Award for Energy Efficiency" by the Institute of Directors (IOD) in adherence to its Energy Efficiency drive.

"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.

Thank You

- **Presented by:**
- **Mr. NN Kulkarni-Corporate Energy Manager**
- **Mr. VM Deshpande-Sr. GM, Maintenance & Utilities**
- **Mr. SP Parab-AGM, Utilities**

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