18th National Award for "Excellence in Energy Management – 2017" Confederation of Indian Industry

Presentation by ,

Kirloskar Oil Engines Limited (KOEL)
Kagal, Kolhapur Plant

Content of the Presentation

- Company profile
- Energy Saving Projects
- Innovation in projects implemented
- How close to Global best In SEC
- % Reduction in SEC w.r.t. previous years
- Involvement of employees, monitoring and reporting
- GHG Inventorisation
- Utilization of Renewable energy
- Utilization of waste as a fuel
- Amount of replication arising out of Best Practices implemented on energy front in Green Supply Chain
- Implementation of corrective / preventive actions from ISO 50001, ISO 14000 & ISO 9000 certification

GreenCo – "Gold" Certified Plant


CII - Sohrabji Godrej Green Business Centre

hereby certifies that

Kirloskar Oil Engines Limited, Kagal

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 Gold
April 2015

Jamshyd N Godrej, Chairman, CII-Godrej GBC
Pradeep Bhargava, Chairman, GreenCo Rating System
L S Ganapati, Chairman, GreenCo Assessor Panel
S Raghupathy, Executive Director, CII-Godrej GBC

IGBC – "Gold" Certified Building


Indian Green Building Council (IGBC)

hereby certifies that

Administration Building - 2
Kirloskar Oil Engines Ltd.
Kagal, Kolhapur

has successfully achieved the Green Building Standards required for the following level of certification under the IGBC Green Existing Buildings O&M Rating System

IGBC Green Existing Building Gold
March 2016

This certification is valid for the next 3 years

Gurmit Singh Arora, Chairman, IGBC Green EB O&M Rating
Dr Prem C Jain, Chairman, IGBC
S Raghupathy, Executive Director, CII-Godrej GBC

Accolades Energy & Environment

CII - National Award for "Excellence in Energy Efficient Unit 10-11, 11-12 , 13-14,14-15 & " Energy Efficient Units" 12-13 & 15-16



KOEL won for "Parivartan Corporate Sustainability Stewardship Award" for their efforts in Resource Conservation 2 times 10-11 & 13-14

Kagal Plant also bagged 2nd Excellence Award for year 11-12 and "Certificate of Excellence" award for 15-16 in State Level Energy competition by MEDA in Engineering Sector

Accolades Energy & Environment

Kirloskar Group Inter-competition Awards by auspicious hands of Eminent Personalities in Energy Sector


About Kirloskar Oil Engines Ltd

Incorporated in 1946 as a part of the Kirloskar Group of Companies, KOEL is an engineering conglomerate, founded by the late Mr. Laxmanrao Kirloskar. KOEL is involved in the manufacture of internal combustion engines, generating sets and parts, which are used for various applications, such as agriculture, industrial, stationery power plants and construction equipment, among others.

Manufacturing locations and field offices

LOCATION	BUSINESS GROUPS	ACTIVITY
Pune	All business groups	Corporate functions, marketing and R&E
Kagal	· Agri · Industrial · PGBG · Export	· Engines and Gensets manufacturing · Spares warehouse · Manufacturing of farm mechanisation equipments

About Kirloskar Oil Engines Ltd

Manufacturing locations and field offices contd.

LOCATION	BUSINESS GROUPS	ACTIVITY
Rajkot	· Agri · Export	· Engines (Agri) manufacturing · Spares warehouse
Nashik	LEBG	· Large Engines and Gensets manufacturing · Spares warehouse
FIELD OFFICES	**CATER TO BUSINESS GROUPS**	**LOCATIONS**
Regional and area offices	All business groups	State Capitals in India
Overseas Offices		Kenya, Nigeria, South Africa, Dubai, Indonesia

Kirloskar Oil Engines Ltd-Kagal plant

Kagal (Kolhapur) Plant →

- Total Employees as on date - 1181
- Managers (TL, GL & UL) - 191
- Operators (Team Associates) - 990

Initiatives

TPS

5S

QMS, EMS & OHSAS

ENCON

Kaizen & POKA YOKE

Autonomous Maintenance

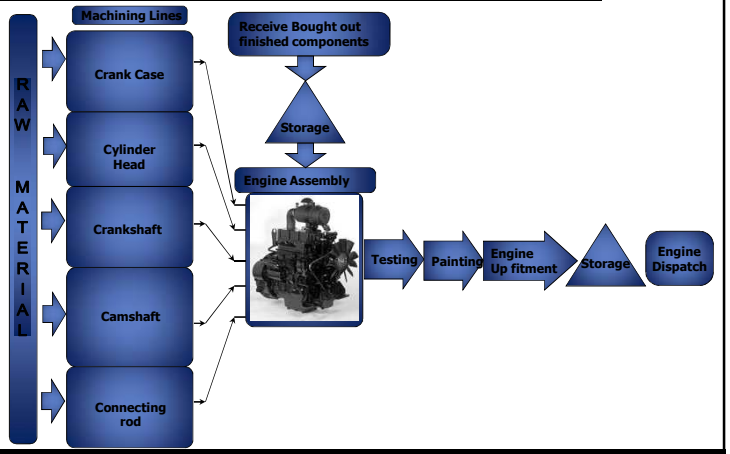
Six Sigma, QC Activities

Standardized Work

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

Our Values, Vision and Promise 2021

Production Process at Kagal



KOEL adopted CII program Mission for Sustainable Growth - 2007

Specific Energy And Water Consumption
- Reduce by 3-5% every year over next ten years.

Use Of Renewables Energy
- Increase by 5% every year over next ten years.

Recyclable And Enhance Recyclability Of Resources
- Increase use of resources embedded in the product.

Life Cycle Assessment Criteria For New Products.
- Incorporate Life Cycle Assessment in alternative technologies and products.

Product Stewardship Program
- Promoting and managing Product Stewardship Program, By forging partnership with business and communities.

Specific Generation Of Waste & Waste Going To Land Fills
- Reduce by 3-5% every year over next ten years

GHG Emissions And Other Process Emissions
- Reduce by 3-5% every year over next ten years

Share Of Harvested Rainwater In The Overall Annual Use Of Water
- Increase by 5% every year over next ten years

Adopt Green Purchase Policy
- Adopt Green Purchase policy & incorporate clean technologies at design stage

Depletion Of Natural Capital
- Reduce by 5% every year over next ten years

KOEL- Energy Policy

Executiv
Kirloskar signed Energy Policy -
indicates
Top Management towards
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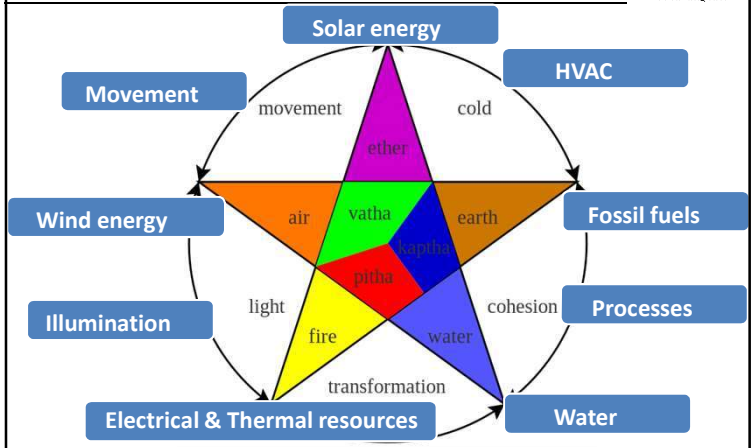
Key Highlights of Policy

- Benchmarking of products with the regional and national best.
- Procurement of high energy efficient products and technologies
- Eliminating wastage of energy and promoting reuse and recycling of resources
- Promoting and increasing use of renewable energy resources, within and outside
- Adopting New Building Norms
- Involving all stake holders in the energy conservation
- Sharing and enriching our experiences on energy conservation within & Outside group

Doshas in Ayurveda and Pachmahabhutas

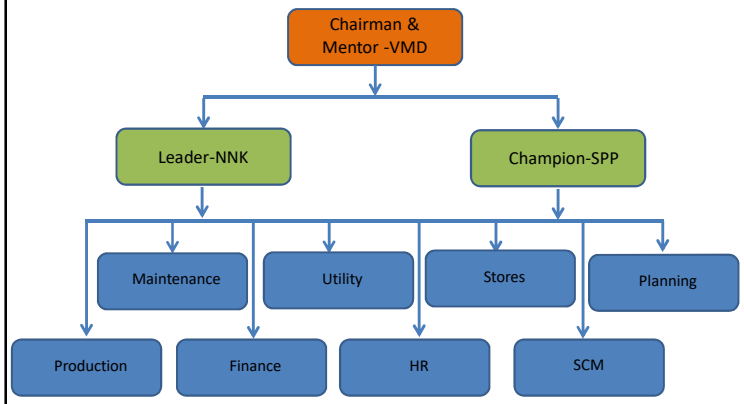


Employee Involvement

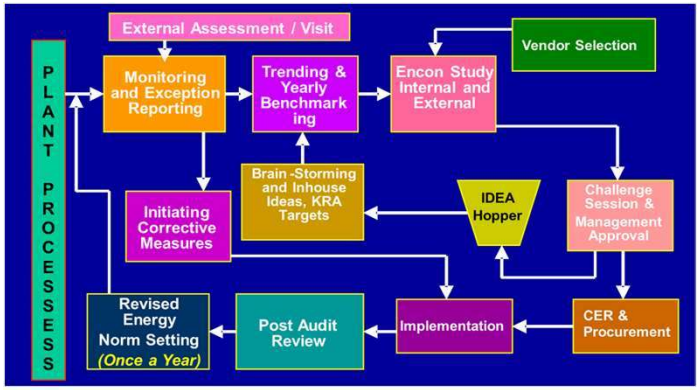
Energy and Environment

- ✓Environmental & Energy Policy.
- ✓ ISO 14001:2015 Certification for Environmental Management system.
- ✓GreenCo Gold Certification
- ✓Green Building.
- ✓Energy Conservation.
- ✓Renewable energy.
- ✓Water Conservation.
- ✓Rain water Harvesting
- ✓Waste Recovery.
- ✓Hazardous Waste Management.
- ✓Online Energy Monitoring.
- ✓Carbon foot Print Reduction.
- ✓Sustainability Reporting.

ENCON Team



Energy planning-Idea Generation



Employee Involvement & ENCON Capacity Building Programs

SN	Training Program	Faculty	Date of Training	Duration (Hr.)	No of participants	Training Man-hrs.
1	CII- 14th National Energy Conservation Award Hyderabad	CII Hyderabad	19th& 20th August 14	16	5	80
2	MEDA 9th State Level Award	MEDA Pune	20th January 14	4	5	20
3	ISO 50001 Lead Auditor Course	BSI Pune	7th April to 11th April 14	45	2	90
4	IEX Power Trading	MCCIA	9th May 13	3	5	15
5	Parivartan Sustainability Award	Sustainability Outlook New Delhi	17th October 13`	9	2	18
6	GreenCo Summit, Chennai	CII GreenCo team	26th& 27th Jun 14	16	3	48
7	GreenCo Meeting Pune – TATA Motor Visit	CII GreenCo Pune Chapter Team	13th June 14	4	3	12
8	One day workshop Renewable energy & energy efficiency	MEDA Kolhapur & Department of Energy , Shivaji University	13th February 14	6	5	30

Employee Involvement & ENCON Capacity Building Programs

SN	Training Program	Faculty	Date of Training	Duration (Hr.)	No of participants	Training Man-hrs.
9	EMS & OHSAS Awareness	Mr.Nilesh Upankar	12-Sep'13	3	32	96
10	Six Sigma Green Belt	Mr.Shailendra Rahigude	19-20-Feb '14	8	46	368
11	Six Sigma Green Belt	Mr.Shailendra Rahigude	19-20-Mar' 14	8	70	560
12	Green Building Rating Systems	CII	28-29-Nov' 13	16	2	32
13	EMS Legislation	Mr.Sachin Rahalkar	09-Jul' 13	4	22	88
14	OHS Legislation	Mr.Sachin Rahalkar	10-Jul'13	3	22	66

Total man Hrs. 1897

Energy Efficiency

Celebration ENCON WEEK Every Year (14 Dec. to 20 Dec.)


KIRLOSKAR OIL ENGINES LIMITED

Energy Efficiency

Celebration ENCON WEEK Every Year (14 Dec. to 20Dec.)

Tree Plantation


Competition Response From Employees 16-17

Poem Competition -213	
Encon Gallery competition - 8	
Poster Competition – 120	
Opportunities – 11	
Encon Projects - 46	
Slogan Competition - 1322	
Encon Project - 100	
Suggestions - 58	

Total 1878 Entries

Award Function



KIRLOSKAR OIL ENGINES LIMITED 22

Creating Sustainable Future

Mass Tree Plantation





This year 1251 Trees are planted on the occasion of World Environment day .

Till date @ 7000 Trees are well grown up in the Plant premises

KIRLOSKAR OIL ENGINES LIMITED 23

Energy Efficiency

Celebration World Environment Day

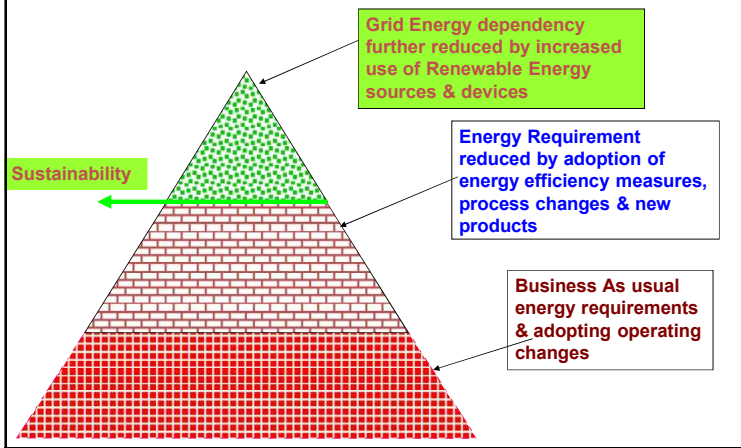





Celebration of World Environment Day

KIRLOSKAR OIL ENGINES LIMITED

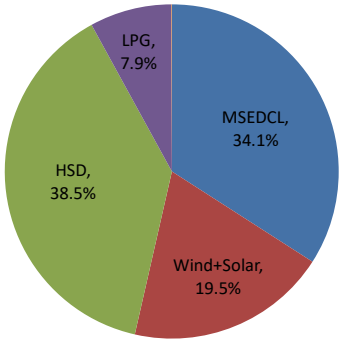
Energy Pyramid for Efficient use and adoption of renewable energy



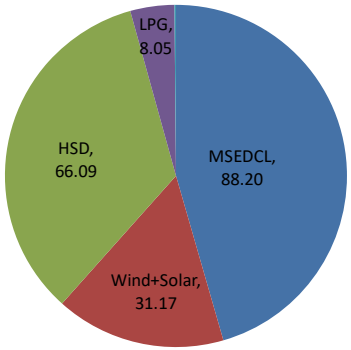
Energy …A Resource

Power & Fuel 2016-17

Share of various energy sources

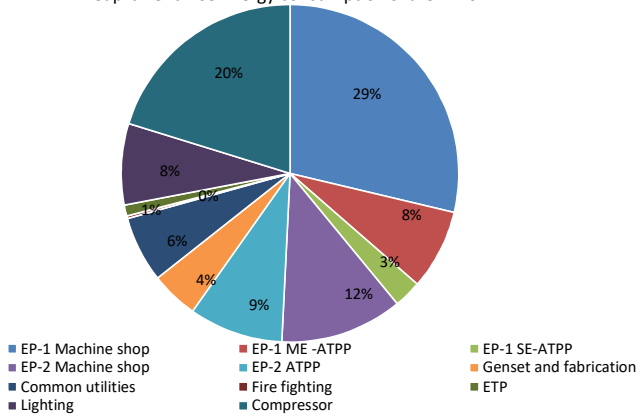


Cost of energy, Rs.M



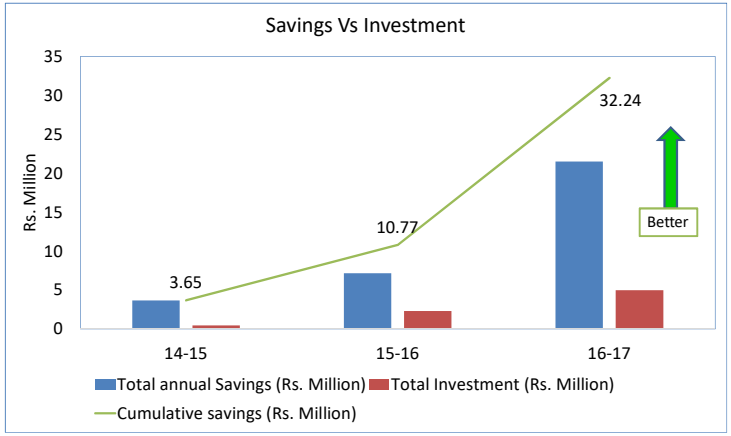
Power & Fuel 2016-17

Deaprtmentwise Energy consumption share FY16-17



Energy Conservation Activities

Savings VS Investment FY 14-17



Project Summary
Energy Saving from FY 2014-15 to 2016-17

- Numbers of ENCON Projects: 138
- Total Cost Saving: Rs.322.4 Lakh
- Annual Energy Savings (million kWh): 2.2
- Annual Fuel Saving (million kcal): 13.68
- Investment Rs. 76 Lakh
- Simple Payback 3 Months

Project Summary
Energy Saving from FY 2014-15 to 2016-17

- Low Investment projects (Rs. M 0-1) Total -72 Savings, Rs. M- 7.83
- Moderate Investment projects (Rs. M 1-5) Total -58 Savings, Rs. M- 11.63
- High Investment projects (Rs. M 5 and above) Total -8 Savings, Rs. M- 12.78

List of projects

M/C Shop - ENCON Project

Sr. No.	Project Title	Line Name	Possible Cost Saving in Lac.
1	To Provide electrical switch/autosenses near to the core plug pressing station on DV-Cylinder Head Line on OP-80 station	DV Cyl. Head Line	0.08
2	To save electrical power cost by providing separate hydraulic motor ON/OFF system on OP40/50 Pressing machine & also provide only one hydraulic system for two m/c in single piece flow On R810 Cylinder head line	6R 6K Cyl. Head Line	1.37
3	To save electrical power cost by activating hydraulic motor in power saving mode instead of continuously running in idle condition with in house modification in PLC logic on op-80 WIDMA m/c on 6R6K Cylinder head line	6R 6K Cyl. Head Line	0.087
4	To save electrical power cost by use 250 kg crane against 500 kg at input conveyor (component wt only 8 kg)on SL-90 Cy.head line	SL90 Cyl. Head Line	0.03
5	Reduce HA Crankcase line power consumption from 14.59 Units/Cyl. to 13 Units/Cyl.	HA Crankcase Line	6.69
6	Reduce HA Crankcase line Air(power) consumption cost	HA Crankcase Line	0.9
7	To save electrical power cost on Micromatic (OP 70) m/c	Common Camshaft Line	0.5
8	To save electrical power cost on Toyoda (OP 80A) M/c	Common Camshaft Line	0.5
9	To reduce power consumed in tool magazine indexer(OP50/60/80)	DV Crankcase Line	0.86
10	To use the washing machine coolant at room temperature instead of hot coolant which is heated up to 55 to 60 degree Celsius	DV Crankcase Line	18.12
11	To reduce power consumed in heaters at OP130 final washing machine	DV Crankcase Line	0.91
12	To reduce power consumed by hydraulic motor at cam bush pressing machine (OP110)	DV Crankcase Line	1.37
13	To save 50% electrical power cost by Utilize all washing stations by using second chamber & start to wash at time two component in single cycle (op-70)	R810 Cyl. Head Line	0.85

M/C Shop - ENCON Project

Sr. No.	Project Title	Line Name	Possible Cost Saving in Lac.
14	To reduce power consumption on rough washing machine on 6R/HA6 Crankshaft line	6R/HA6 Crankshaft Line	0.47
15	To reduce power cost by reducing cycle time of washing machine	DV Cambox Line	0.2
16	To reduce power cost by stopping hydronic unit of Op.40 machine at idle condition	DV Cambox Line	0.47
17	DV CON ROD- Maintain line power consumption below 23kwh per component	DV Conrod Line	3.6
18	To reduce cycle time of Intermediate washing machine OP40 by 8 mins and to eliminate heater	HA6 Crankcase Line	0.39
19	To eliminate heater of continuity test machine OP140	HA6 Crankcase Line	0.43
20	Reduce air consumption On r1040 crankcase line	R1040 Crankcase Line	0.32
21	Air consumption to be reduced when APG not in use	R1040 Crankcase Line	0.67
22	Power Consumption Saving on OP150 A , SL90 Lapping M/c	DV Crankshaft Line	0.052
23	Power Consumption Saving on OP50, Fortuna M/c	6R/HA6 Crankshaft Line	0.039
24	Power Consumption Saving on OP140, Balancing M/c	6R/HA6 Crankshaft Line	0.072

ENCON (Q1) Cost Savings FY16-17– Rs.38.98 Lac

M/C Shop - ENCON Project

Sr. No.	Project Title	Line Name	Possible Cost Saving in Lac.
1	To Reduce power cost by disconnecting mist collector on Op-85	HA Cyl. Hed Line	0.48
2	To reduce washing M/C power cost by reducing frequency of component washing	DV Cambox Line	0.68
3	DV CON ROD- Maintain line power consumption below 23kwh per component	DV Conrod Line	3.60
4	Optimize Heating temp. (OP- 80) for Final Washing on Camshaft line	Camshaft Line	0.60
5	To save electrical power cost on Streightening (OP 40), Micromatic (OP 70), Toyoda (OP 80A) & Washing (OP 120) M/cs	Common Camshaft Line	1.80
6	To save electrical power cost by eliminating dirty tank coolant transfer	Common Camshaft Line	1.15
7	To save Compressed air cost on Horizontal Induction Hardening (OP 20), Landis (OP 50), Micromatic (OP 70), & Radial Drilling (OP 100) M/cs	Common Camshaft Line	0.08
8	To reduce power consumption of OP100 by keeping machine in power saving mode	HA6 Crankcase Line	1.07
9	To reduce power consumption of OP70 by rearranging tools inside the magazine in their operation sequence	HA6 Crankcase Line	0.08
10	Reduce power cost of RCH line by using single power pack for both Valve seat & valve guide pressing on op-80	R1040 Cyl. Head Line	1.50
11	Make separate ON/OFF Switch for Marposs Gauge	Crankshaft Line	0.25
12	Power consumption saving on OP180 , Final Washing m/c	DV Crankshaft Line	0.76
13	Power consumption saving on OP100, TAL M/c	6R/HA6 Crankshaft Line	0.03
14	To Reduce Power consumption of hydraulic motor on OP80 WIDMA machine	6R 6K Cyl. Head Line	0.09
15	To Reduce Power consumption of hydraulic motor on v/s & v/g pressing machine	R810 Cyl. Head Line	1.37

M/C Shop - ENCON Project

16	To Reduce Power consumption of on OP80 washing machine	R810 Cyl. Head Line	0.85
17	To Reduce Electrical Power consumption on SL90 cylinder head line by changing man-machine work combination with cell wise time study	SL90 Cyl. Head Line	1.64
18	To Reduce Electrical Power consumption on R810 cylinder head line by changing man-machine work combination with cell wise time study	R810 Cyl. Head Line	0.51
19	To optimize compressed air flushing time on primary washing machine & save compressed air cost with ZERO investment	SL90 Cyl. Head Line	0.97
20	To Provide electrical switch/autosenses near to the core plug pressing station on DV-Cylinder Head Line on OP-80 station	DV Cyl. Head Line	0.08
21	To save electrical power cost by use 250 kg crane against 500 kg at input conveyor (component wt. only 8 kg)on SL-90 Cyl.head	SL90 Cyl. Head Line	0.03
22	To run the hydraulic motor for the time period of its actual component clamping time only. For rest of the time the motor should stop running	6R 6K Cyl. Head Line	0.80

ENCON (Q2) Cost Savings FY16-17– Rs.18.42 Lac

M/C Shop - ENCON Project

Sr. No.	Project Title	Line Name	Possible Cost Saving in Lac.
1	Hot cure tank cleaning & DM water changing frequency is changed from once in a month to twice in a month	HA Cyl. Hed Line	0.16
2	To Reduce Power consumption cost by reducing cycle time of OP120	HA Cyl. Hed Line	1.10
3	Optimize Heating temp. (OP- 80) for Final Washing on Camshaft line	Camshaft Line	0.60
4	To reduce power consumption cost from Rs.11.5 per cylinder to below Rs.10 per Cylinder, on R14040 Crankcase line	R1040 Crankcase Line	3.63
5	To save electrical power cost on (OP 130) Gear heating machine	Common Camshaft Line	0.50
6	To eliminate chatter mark problem on cams for FIP camshaft	Common Camshaft Line	0.50
7	To reduce electrical cost by switch off the hitters while machine keep in emergency mode on op-70 (Final washing) R810 cylinder head line	R810 Cyl. Head Line	0.25
8	To reduce the Electrical power cost on OP-40 washing m/c on DV Cylinder head line	DV Cyl. Head Line	0.72
9	To reduce the Op40 Cycle time by optimization of cutting parameters	DV Cambox Line	2.33

ENCON (Q3) Cost Savings FY16-17– Rs.9.79 Lac

Maintenance- ENCON Project

Maintenance ENCON Projects

S. N.	Project Description	Area	Annual Cost saving Rs. In lakhs
1	Energy Saving through Hydaulic power pack optimization at Toyoda Top center - R1040 Crank case line & Crank shaft line	EP1 M/C Shop	14
2	Power saving of hyd motor when EMG.pressed	EP2 M/C Shop	0.11
3	Power saving of HYD power pack in idle mode machine1	EP2 M/C Shop	0.24
4	Power saving of HYD power pack in idle mode machine2	EP2 M/C Shop	0.26
5	Veturi effect air nozzle fitted for air saving machine1	EP2 M/C Shop	0.5
6	Veturi effect air nozzle fitted for air saving machine2	EP2 M/C Shop	0.7
7	Veturi effect air nozzle fitted for air saving machine3	EP2 M/C Shop	0.1
8	Veturi effect air nozzle fitted for air saving machine4	EP2 M/C Shop	0.6
9	Instead of two hyd motor run all HYD ckt shifted to one power pack .	EP2 M/C Shop	0.67
10	Soft start of washing motor	EP2 M/C Shop	0.2
11	Interface pneumatic foot operated foot switch to flow air to gauging system	EP2 M/C Shop	0.2
12	Instead of two 18 watt CFL bulb , 11 watt LED bulb id fited to reduce power cost .	EP2 M/C Shop	0.05
13	6R Paintbooth water tank level optimisation	Painting	2
14	Varsha Paintbooth water tank level optimisation	Painting	1.5

Maintenance- ENCON Project

15	LADDER modification on 2974 Doosan m/c for spindle cooler on /off	EP2 M/C Shop	0.2
16	LADDER modification on 2977 Doosan m/c for spindle cooler on /off	EP2 M/C Shop	0.2
17	Instead of two power pack only ne will be used to save the energy on 4r head valve seat press	EP2 M/C Shop	0.86
18	Reduce the power consumption of HYD. MTR when Machine is in ideal condition for more then 10 min at widma m/c 6r head line	EP2 M/C Shop	0.17
19	Energy Saving through Hydaulic power pack optimization at OP-170 at Crankshaft line	EP1 M/C Shop	0.3
20	Reduce power cost of RCH line OP 40 by modification of PLC logic.	EP1 M/C Shop	0.14
21	Reduce power cost of RCH line OP 30 by modification of PLC logic.	EP1 M/C Shop	0.18
22	Energy saving by optimize Hydraulic power on Pressing machine RCH Op80	EP1 M/C Shop	1.4
23	LADDER modification on 2974 Doosan m/c for hydraulic cooler on /off	EP2 M/C Shop	0.06
24	Power saving of hydraulic motor when lever go to normal position	EP2 M/C Shop	1.48

Utility- ENCON Project

S. N.	Project Description	Area	Annual Cost saving Rs. In lakhs
1	Energy efficient lighting	Total Plant	29.19
2	Solar roof top pumping system	ETP	2.5
3	Bio gas generator	ETP	0.6
4	Rainwater Filitation plant	ETP	3.15

Innovative Projects

1. Biogas generator

Biogas generator

- Make- KOEL
- Rating - 15 KVA
- Voltage – 230V
- Current – 62A
- Better Aesthetic
- Cost effective controller
- Connected load – EP1 and Genset All Street lights

Snapshots

Biogas Generator

In house controller

In house changeover

Highlights

- Project completed within a record time of 3 days
- In house manufacturing of controller
- All street lights of EP1 and Genset plant will be powered by Biogas Generator

- Approximate Electricity generated per annum – 7200 kWh

Total carbon offset during lifetime*

86 tons of CO2

Note: *- considering a life of 15 years

2. Water filitation plant to reuse percolated and harvested rainwater

Project background

- Available Natural water resource
- Water sample tested
- Need filitation arrangement
- 100% percolated water use for EP-II
- 100%Eliminating MIDC water for EP-II plant
- Average water consumption of EP 2-70 meter cube per day
- MIDC water cost for EP-II per day Rs.1050 per day & yearly 3.15 lakhs

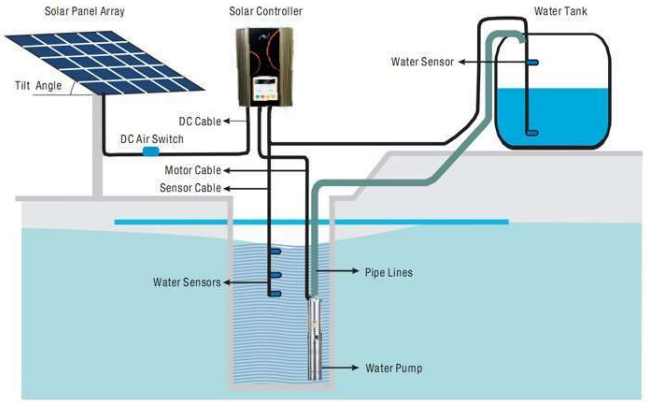
Details

- Cost of Filitation plant Rs.6 Lakh
- Capacity-15m3/hr
- Contains Sand filter, carbon filter and softener
- pH, TDS, Turbidity and total hardness of water will be within allowed limits
- Saves water cost of Rs. 3.15 Lakhs /Annum
- ROI less than 24 months

Snapshot

3. Solar Roof top pump sets

Details-Schematic



Details

- 3 No of Solar PV Powered 5HP Submersible Pumps - Lifting Percolated water, Lifting treated effluent through drip irrigation, ETP plant airobix blower
- 14600 Wp Solar PV multi crystalline module
- System with Jalverter, Controller and Insurance
- First year AMC –Free of charge
- 5 Years Warranty against manufacturing defect for Pump and Controller
- Total Investment with discount – Rs. 16.11 Lakhs

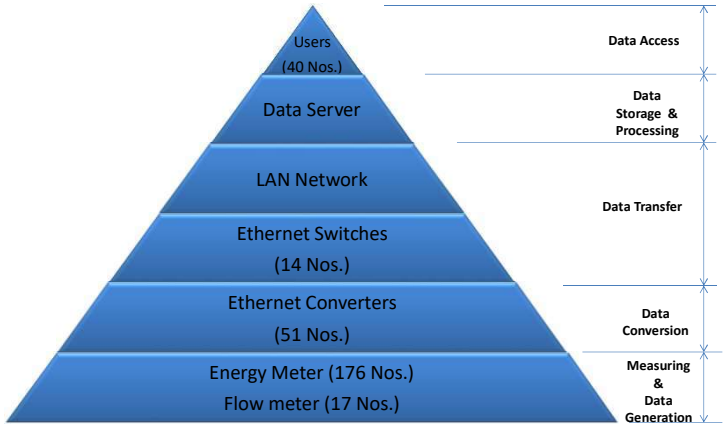
Cost-Benefit Analysis

Modules wattage to be use	4800 to 5100	Wp
No. of Unit	3	nos.
Per day Avg. clear Sunlight	5.5	hr.
Required Area	1323	Sq. ft.
Electricity Generation (per year)	29510	Units
Project cost	1611000	Rs.
Accelerated Tax depreciation @ 80%	1288800	Rs.
Cost of energy generated per year @ Rs. 8.50	250837	Rs.

- Electricity generated per annum – 29510 kWh
- Life of System -15 years
- **Total carbon offset during lifetime 376 tons of CO_2**

Specific Energy Consumption (SEC)

Energy Monitoring System-Infrastructure



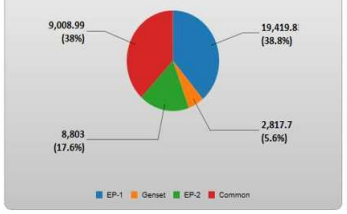
Energy Monitoring System

System Outcomes & Reports

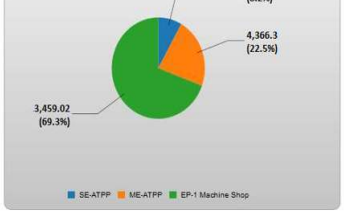
kWh Consumption % share

Select Date 2015-08-26 Shift All Shifts.Alls

Unit wise kWh

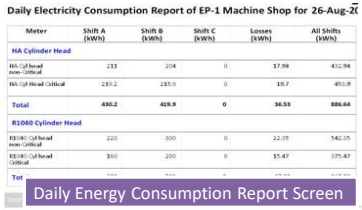


Department Wise kWh

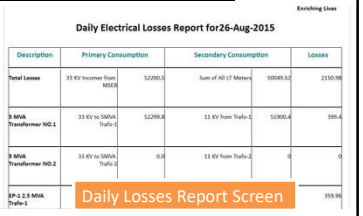


KIRLOSKAR OIL ENGINES LIMITED

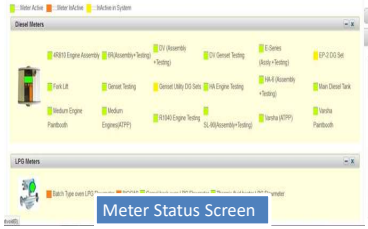
Energy Monitoring System



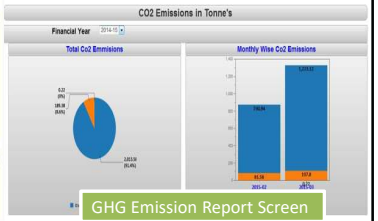
Daily Energy Consumption Report Screen



Daily Losses Report Screen



Meter Status Screen

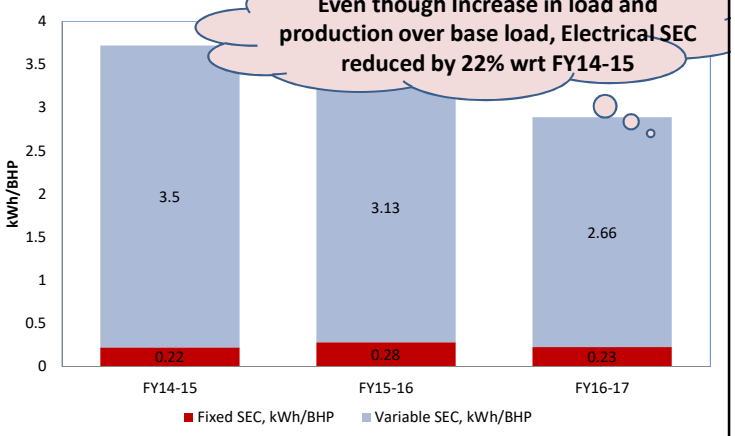


GHG Emission Report Screen

KIRLOSKAR OIL ENGINES LIMITED

Specific Electrical Energy Consumption (kWh/BHP)

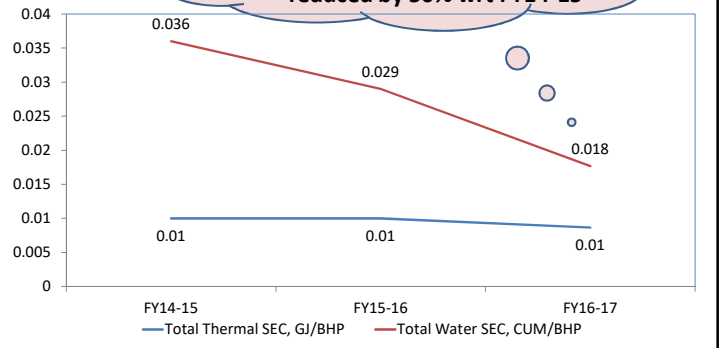
Even though Increase in load and production over base load, Electrical SEC reduced by 22% wrt FY14-15



KIRLOSKAR OIL ENGINES LIMITED 59

Specific Thermal Energy Consumption (GJ/BHP)

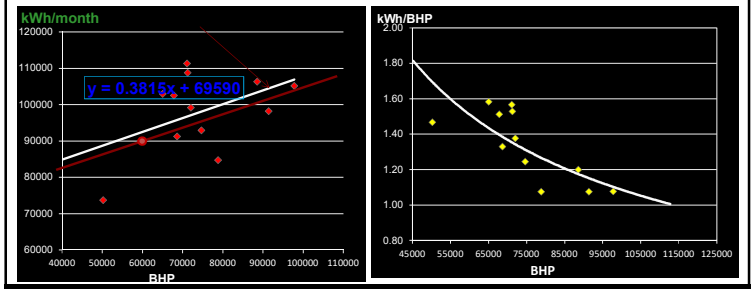
Even though Increase in load and production over base load, Water SEC reduced by 50% wrt FY14-15



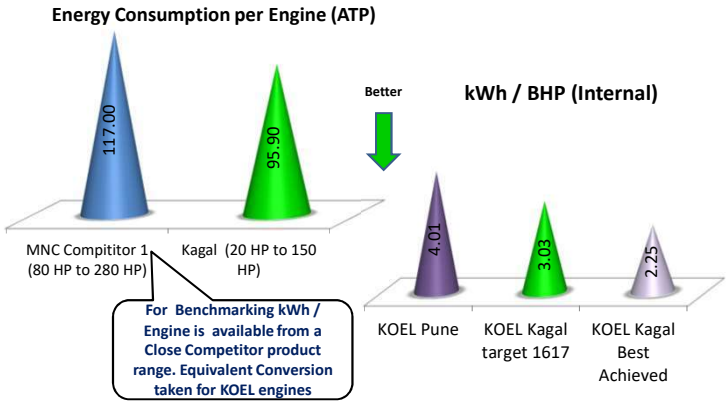
KIRLOSKAR OIL ENGINES LIMITED 60

Method of arriving at SEC Target

- Practice of regression analysis followed in fixing energy consumption and SEC targets.
- Help in forecasting, monitoring, targeting energy and other resources planning.
- Decision of continuing or stopping production based on fixed and variable energy consumption can be justified

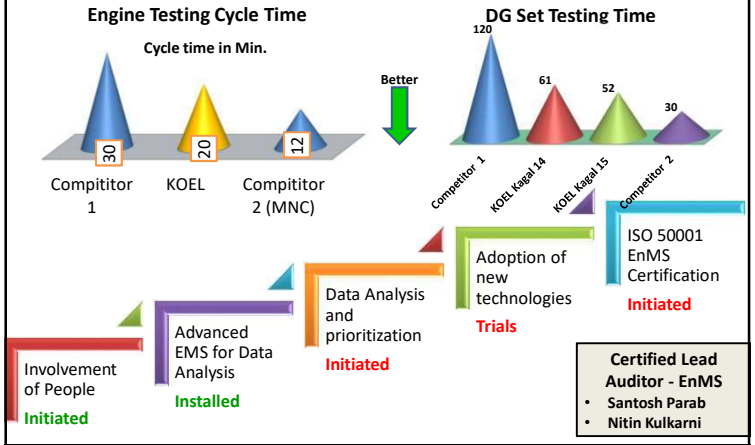


Benchmarking (National)



* Source Data : MEDA

Benchmarking (International)



Renewable Energy

Offsite Renewable (Green) Projects

Windmill and Solar Units	Renewable Energy Used (FY 13-14)	Renewable Energy Used (FY 14-15)	Renewable Energy Used (FY 15-16)	Renewable Energy Used (FY 16-17)	Target FY17-18
kWh Units	6,069,197	1785625	36,88,500	58,07,286	50%
% of total Energy consumption	51.01 %	11.50 % SEM Meter Installation	23.00% SEM Meter Installation	36%	

The share of renewable energy in total electrical consumption for FY 1617 – 36%

This has resulted into tremendous saving of Rs. 50.74 Lakhs

On-Site Renewable (Green) Projects

Solar Steam Generator for Canteen – On Site

Capacity: 350 kg / Day @2 bar pressure

No of Dish : 8
Area : 315 Sq. Meter

Alternative for Conventional Cooking
Equivalent LPG Consumption Reduction : 25 kg / Day

1 kW Solar PV Panels with LED Lamps for ETP – On Site

Bio gas Plant for Kitchen Waste – On Site

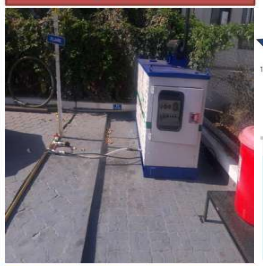
Plant Capacity
- 25-30 CUM/ Day

Biogas Generation
- Approx. 15 CUM/day

Manure Generation
- Approx. 10 kg / Day

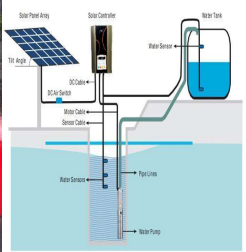
On-Site Renewable (Green) Projects

Biogas Generator



Capacity: 12 KVA
- All street lights of EP1 and Genset plant will be powered by Biogas Generator

Solar Rooftop pumping system



Capacity: 3 Nos of 5HP Pumps
- Lifting Percolated water, Lifting treated effluent for drip irrigation, ETP plant airobix blower

Capacity: 15 CUM/hr
- System uses harvested and percolated Rainwater, filters it and used for processes

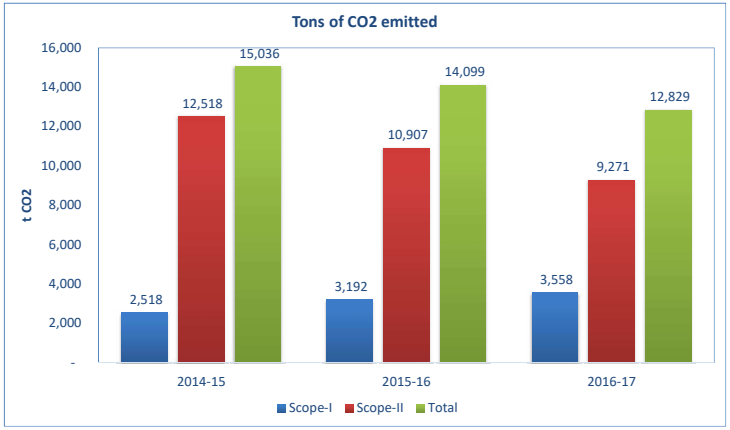
GHG Inventorisation

Kagal Plant – Analysis

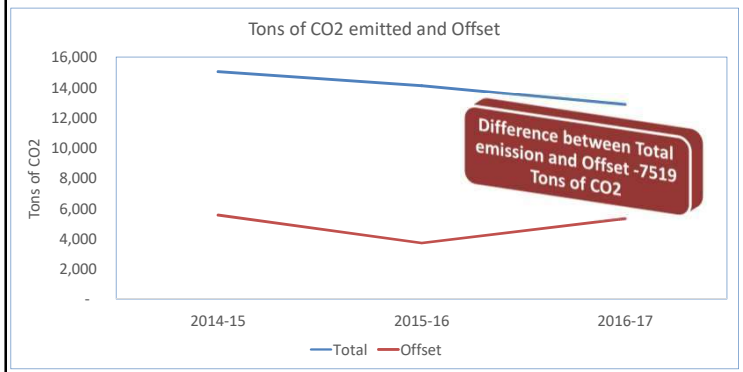
Carbon Foot Print Report Data - **Kagal-1** Plant

Sr. No.	Source	Scope	Unit	Consumption			GHG Emission (tco2)		
				FY14-15	FY15-16	FY16-17	FY14-15	FY15-16	FY16-17
1	HSD	1	kl	728.00	972.00	1,139.00	1,911.44	2,552.08	2,990.56
2	LPG	1	kg	175,228.00	184,870.00	162,478.50	525.68	554.61	487.44
3	FO	1	kl	27.00	28.73	26.77	80.43	85.59	79.76
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 =						**2,518**	**3,192**	**3,558**
	Scope 2								
1	Electricity Purchased	2	kWh	13,720,094	11,954,222	10,161,709	12,518	10,907	9,271
	Total Scope 2 =						**12,518**	**10,907**	**9,271**
	Offset								
1	Electricity Renewable		kWh	1,785,625	3,688,500	5,807,286	1,629	3,365	5,299
2	Biogas		m3	5,423	5,494	6,327	10	10	12
3	Solar		kg of steam	20,105	28,361	31,906	0.00	0.00	0.00

Kagal - GHG Emission (tCO2)



Kagal – Total emission VS Offset



✓ The manufacturing facility at Kagal has shown 9.36% reduction in CO2 emissions compared to year FY15-16. This positive impact is a result of renewable energy purchase through open access .

Waste Reduction, Reuse And Recycle

Reduction in specific raw material consumption.

Enriching Lives

Weight reduction of Crank Case (VAVE) .

BEFORE

AFTER

Material saved: Casting 3241 Tons

Weight reduction of crankcase 15 %

Cost saved: Rs. 16.84 Cr.

Average weight of flat face crank case was approx. 107 kg.

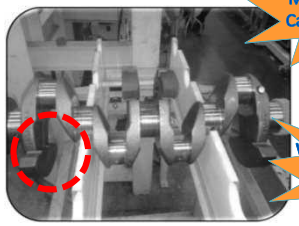
VAVE crank case introduced & Weight reduced up to 88 kg.

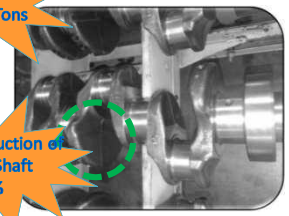
Reduction in specific raw material consumption.

Enriching Lives

BEFORE

AFTER





Material saved: Casting 255 Tons

Weight reduction of Crank Shaft 5 %

Cost saved: Rs. 2.44 Cr.

Crank shaft with balance weight used for Power Generation Engine series.

Integral Crank shaft introduced for all PG Engine series.

Reduction in specific raw material consumption.

Enriching Lives

REDUCTION IN STRUCTURAL STEEL

Before

After

Material saved: Steel 1573 Tons

Weight reduction of 34 %

Cost saved: Rs. 1.6 Cr.

MPI Building 165 m x 210 m : Structural steel excluding gantry girder for crane consumed was 2740 MT. it's a 49% of construction cost. Structural steel consumption 7.35 kg/sq. ft.

EPII Building 125m x 180 m : Structural steel consumed is 1167 MT. Structural steel consumption 4.82 kg/Sq. ft. It's a 35.7% of construction cost.

Reduction in specific raw/hazardous material consumption

Enriching Lives

1.Sealant Project

Material saved: Loctite 6.2 Tons

A .Reduce Wastages

1.By Eliminating purging cycle

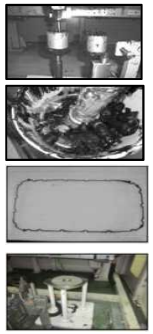
2.By eliminating Excess Wastage in Sealant Bucket.

B .Optimization By Six sigma Method

1.Reducing Bid size .

2.Converting Manual Application Method to Machine

Cost saved: Rs. 1.09 Cr.



Replacement of raw materials by recycled material or reused material

Reduction of 'K' Cool Coolant using W ter Base Chemical.

5000 lit / month of coolant need to be transported.

Material saved:
Water -65000 Lit
Coolant-65000 Lit

Geo-Guard chemical introduced which required only 50 lit / month

Cost saved:
Rs. 40.5 Cr.

A n of the project we reduced the tra well ETP processing elimination.

Recyclability / Biodegradability of the product.

Use of Treated Oil

Cost Saved:
Rs 4.87 Cr.

Recyclability / Biodegradability of the product.

Use of Recycled Hydraulic Oil

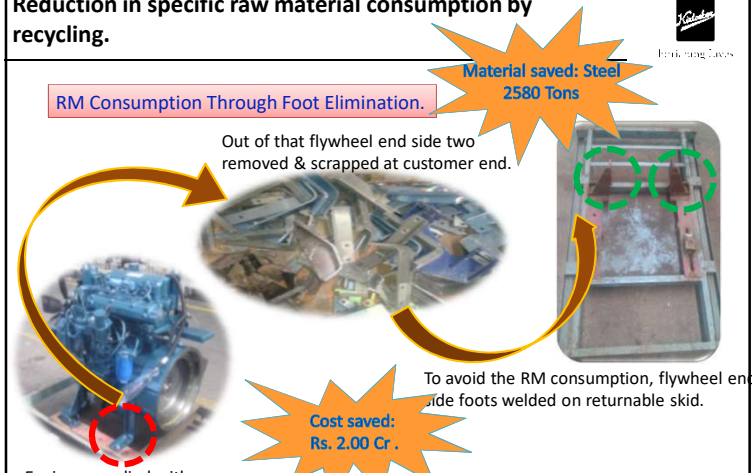
Cost Saved:
Rs 0.65 Cr.

Reduction in specific raw material consumption by recycling.

RM Consumption Through Foot Elimination.

Material saved: Steel 2580 Tons

Out of that flywheel end side two removed & scrapped at customer end.



To avoid the RM consumption, flywheel end side foots welded on returnable skid.

Cost saved:
Rs. 2.00 Cr .

Engines supplied with four transportation foots.

Initiatives taken to reduce the consumption of packaging material

Enriching Lives

Initiatives taken to reduce the consumption of packaging material

Enriching Lives

Material saved: Wood 1095 Tons.

Before

Varsha Engines supplied with Wooden Packing which was disposed.

Cost saved: Rs. 1.42 Cr.

After

Varsha Engines supplied with Corrugated box packing.

Enriching Lives

Government rebates

Government rebates

Enriching Lives

Government incentives and Other cost reduction initiatives					
Parameter	UOM	Saving			Saving
		FY 14-15	FY 15-16	FY 16-17	FY 2017-18 Till July'17
PF Rebate	Rs Lakhs	78.58	74.15	61.04	14.62
Prompt Payment discount	Rs Lakhs	11.41	10.23	8.02	1.94
Kagal OA Benefit	Rs Lakhs	1.64	18.44	50.47	22.97

Replication arising out of best practices on Green supply chain

Closely Working with Associates – Seminars for improving their Ecological Performance

- Treating internal group companies as our associate
- Formed internal energy and water audit teams at individual location
- Completing bi-annually energy and water audits at each location
- Status for FY 16-17
  - ✓Total no of projects identified-30
  - ✓Approximate savings potential- Rs. 60 Lakhs
  - ✓Approximate investment required- Rs. 12.5 Lakhs

Energy Audits of Associates for improving their Energy Performance

Sr. No	Supplier Name	Audit Name	Conducted in year	Duration (Hr.)
1	KMW Kagal	Energy Audit	2016-17	8 Hr.
2	KOEL Nashik	Energy Audit	2016-17	8 Hr.
3	Jadhav industries	Energy Audit	2016-17	8 Hr.
4	Sound castings Pvt. Ltd.	Energy Audit	2015-16	8 Hr.
5	Victor Enterprises	Energy Audit	2015-16	8 Hr.
6	Sanmati CNC Engg. Works	Energy Audit	2014-15	8 Hr.
7	K & K Foundry	Energy Audit	2015-16	8 Hr.
8	Shriram Foundry	Energy Audit	2014-15	8 Hr.
9	Alpha Founders	Energy Audit	2014-15	8 Hr.
10	Suyash Iron & Steels Pvt. Ltd	Energy Audit	2016-17	8 Hr.

Empowerment to Supplier Partners

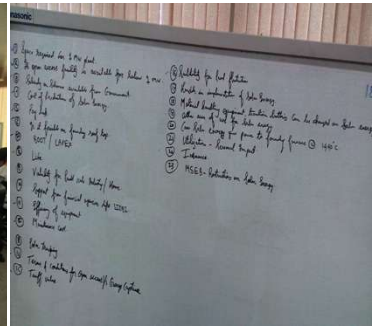
Session on Importance of Solar and need of time elaborated by Mr. Suresh Patil, Sr. Manager, SCM, KOEL, Dated:- 18/08/2016, Attended by 34 Participants

34 Nos. Of Participants from 15 Suppliers

External Faculty on Board….

Mr. Unmesh Jagtap, MS (Solar Energy), University of Florida, Gainesville, USA
& Mr. Navin Singh, Director, Finance - Ino-Solar elaborated the technical aspects of Solar Power

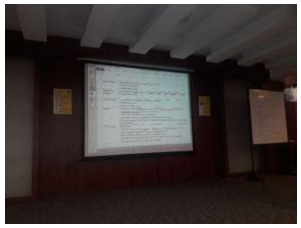
Remedies for expectations of Supplier Partners



Expectations of the Supplier Partners from the Session were listed out at the start of session, which were addressed during the interactions and resolved to the fullest

Closely Working with Associates – Seminars for improving their Ecological Performance

Creating Awareness of Society on Different Environmental Aspects



Creating Awareness of Society on Different Environmental Aspects

- ***Kirloskar Vasundhara Film Festival***

Program is conducted every year where presence of Kirloskar Plant. Every year, new Program Theme is decided & entire program based on the said Theme.

FY 17-18 - "Save River, Save Life"

FY 16-17- "Smart and sustainable –It's my city"

- ***Sustainability reporting***

Sr. no.	Year	Frequency	Guiding Principles	Status
1	Sustainability Report 2009-10	Annually	GRI G3	Published
2	Sustainability Report 2010-11	Annually	GRI G3	Published
3	Sustainability Report 2011-12	Annually	GRI G3.1	Published
4	Sustainability Report 2012-14	Biannually	GRI G3.1	Published
5	Sustainability Report 2014-16	Biannually	GRI G4	Published
6	Sustainability Report 2016-17	Annually	GRI G4	Will be published by Sept. 17

Results – Associate's Energy Performance

- JMD highlighted the concern of energy audits at vendors
- Selected based on energy consumption
- Best Practices Implemented to Associates (Foundries) – Thru Energy Audits
- Average 10-12% reduction in energy and cost
- Internal competitions for vendors to be organized by KOEL FY17-18

Environmental Projects

Environmental Performance

Sr. No.	Analysis report of Treated Effluent	UOM	MPCB Consented Limits	Actual values			
				FY 14-15	FY 15-16	FY 16-17	FY 17-18 Till July-17
1	PH	-	5.5-9.0	7.60	7.43	7.09	7.39
2	Suspended Solids	mg/lit	100	15.49	27.17	16.08	16.80
3	Chlorides	mg/lit	600	182.35	214.17	134.47	171.02
4	Sulphates	mg/lit	1000	17.48	14.30	26.49	19.14
5	TDS	mg/lit	2100	776.25	685.33	721.67	707.00
6	BOD	mg/lit	100	13.71	16.61	10.8	7.78
7	COD	mg/lit	250	64.72	70.67	57.19	44.68
8	Oil & Grease	mg/lit	10	<5	<5	<5	<5

New Expansion Buildings with Energy & Environmental Improvements

Natural Daylight utilization

Air Compressor with HT motor

Oil free and low loss Transformers

Low loss Electrical Panels

Energy Saving Lighting Transformer

In built power factor controller with New panels

New Expansion Buildings with Energy & Environmental Improvements

Compressor Suction Filter Outside Room For Higher Efficiency

Localized Lighting, where High Level Lux Requirement

Eliminates Usage Of Chemicals For Cooling Towers By Ulita Sound

LED illumination

Low Pressure Drop Air Dryers With Zero Air Loss Condensate Drains

Energy saving Intelligent air flow controller

Certifications

Integrated Management System (ISO 9001, 14001 & 18001) Audit Summary

ISO 9001:2015		ISO 14001:2015 OHSAS 18001 :2007	
Clause Number	Numbers of Observations	Clause Number	Numbers of Observations
5.3	1	4.3.1	2
6.1	2	4.4.2	1
6.1.1	3	4.4.6	3
7.1.4	1	6.1.2	3
7.2	2	7.2	1
7.4	1	8.1	3
7.5	2		-----
7.5.3	3		-----
7.6	1		-----
8.1	3		-----
8.5.2	1		-----
9.1.1	3		-----
9.2.2	1		-----
9.3.3	1		-----

There were no NC's related to any Environmental or Energy Program. All minor NC's & OFI's are related to Documentations improvement in respect to Integrated Management System which we have adopted.

Encon Way Ahead

Energy Forecasting FY 17-18

Energy forcasting FY 201718 Kagal 1 Plant

ITEM	Apr 16	May 16	Jun 16	Jul 16	Aug 16	Sep 16	Oct 16	Nov 16	Dec 16	Jan 17	Feb 17	Mar 17	Total
Genset BHP	58,785.50	61,282.00	51,077.50	59,137.50	62,316.00	67,433.50	55,227.00	71,046.50	66,442.50	71,767.00	62,602.50	116,987.00	804105
Specific Electricity Consumption kWh/BHP	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	
Genset Kwh	152842	159333	132802	153758	162022	175327	143590	184721	172751	186594	162767	304166	2090672
Medium Engines BHP	274,645.00	279,328.50	258,570.50	278,275.00	275,342.00	290,851.00	278,837.50	308,804.00	305,624.50	348,270.00	335,188.50	390,204.00	3623941
Specific Electricity Consumption kWh/BHP	3.19	3.19	3.19	3.19	3.19	3.19	3.19	3.19	3.19	3.19	3.19	3.19	
Medium Engines Kwh	876118	891058	824840	887697	878341	927815	889492	985085	974942	1110981	1069251	1244751	11560370
Small Engines BHP	10639	9844	7700	9537	12097	9704	9600	10983	9776	11177	14310	15561	130928
Specific Electricity Consumption kWh/BHP	5.64	5.64	5.64	5.64	5.64	5.64	5.64	5.64	5.64	5.64	5.64	5.64	
Small Engines Kwh	60004	55520	43428	53789	68227	54731	54144	61944	55137	63038	80708	87764	738434
EP II BHP	132,977.40	142,565.40	123,041.20	148,008.40	145,391.40	150,514.40	142,832.40	160,562.40	164,219.40	199,860.40	195,256.80	234,816.60	1940046
Specific Electricity Consumption kWh/BHP	1.99	1.99	1.99	1.99	1.99	1.99	1.99	1.99	1.99	1.99	1.99	1.99	
EP 2 Kwh	264625	283705	244852	294537	289329	299524	284236	319519	326797	397722	388561	467285	3860692
Fixed Energy kWh	129815	133962	108742	102150	102215	98798	95514	99184	94808	100313	106519	131006	1303126
Total kWh KP1	1483404	1523578	1354663	1491930	1500134	1556194	1466976	1650453	1624534	1858649	1807806	2234972	19553294
Open ACESS UNITS (kWh)	552379	552379	552379	552379	552379	552379	552379	552379	552379	552379	552379	552379	6628553
MSEDCL units (kWh)	931024	971199	802284	939551	947754	1003815	914597	1098074	1072154	1306270	1255427	1682593	12924740
MSEDCL Unit Rate (Rs/Unit)	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	
Open Acess Unit rate	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	
Electricity AOP for KP1 in Rs.	12327798	12669148	11233933	12400243	12469945	12946272	12188219	13747159	13526933	15516131	15084137	18713623	162823543

ENCON Projects FY 17-18

Sr	Title of project	Trial	Vendor selected	PO raised	Material received	Installed	Completed
1	Installation of Air ventilation system at the place of conventional AC	■					
2	Occupational sensors for offices	■	■	■	■	■	■
3	Replacement of old inefficient motors of AHU with energy efficient motors	■					
4	Maximize share of renewable energy to 50% through OA	■	■	■			
5	Light pipes to maximize daylight usage						
6	Compressed air leak audit	■	■				
7	Replacement of PL streetlights with LED	■	■				
8	50 KWp Roof top building integrated PV plant	■					
9	2MWp Solar PV captive plant						

Trials of New Innovative projects

- Battery operated forklift
- Plastic waste to Fuel oil conversion
- Additives for fuel
- Elimination of Heaters for Washing machines
- ISO 50001 implementation
- Load rescheduling to avail TOD benefit
- Implementation of energy efficient ventilation system in place of conventional air conditioning units

Thank You……

Sustainability@Kirloskar.com