

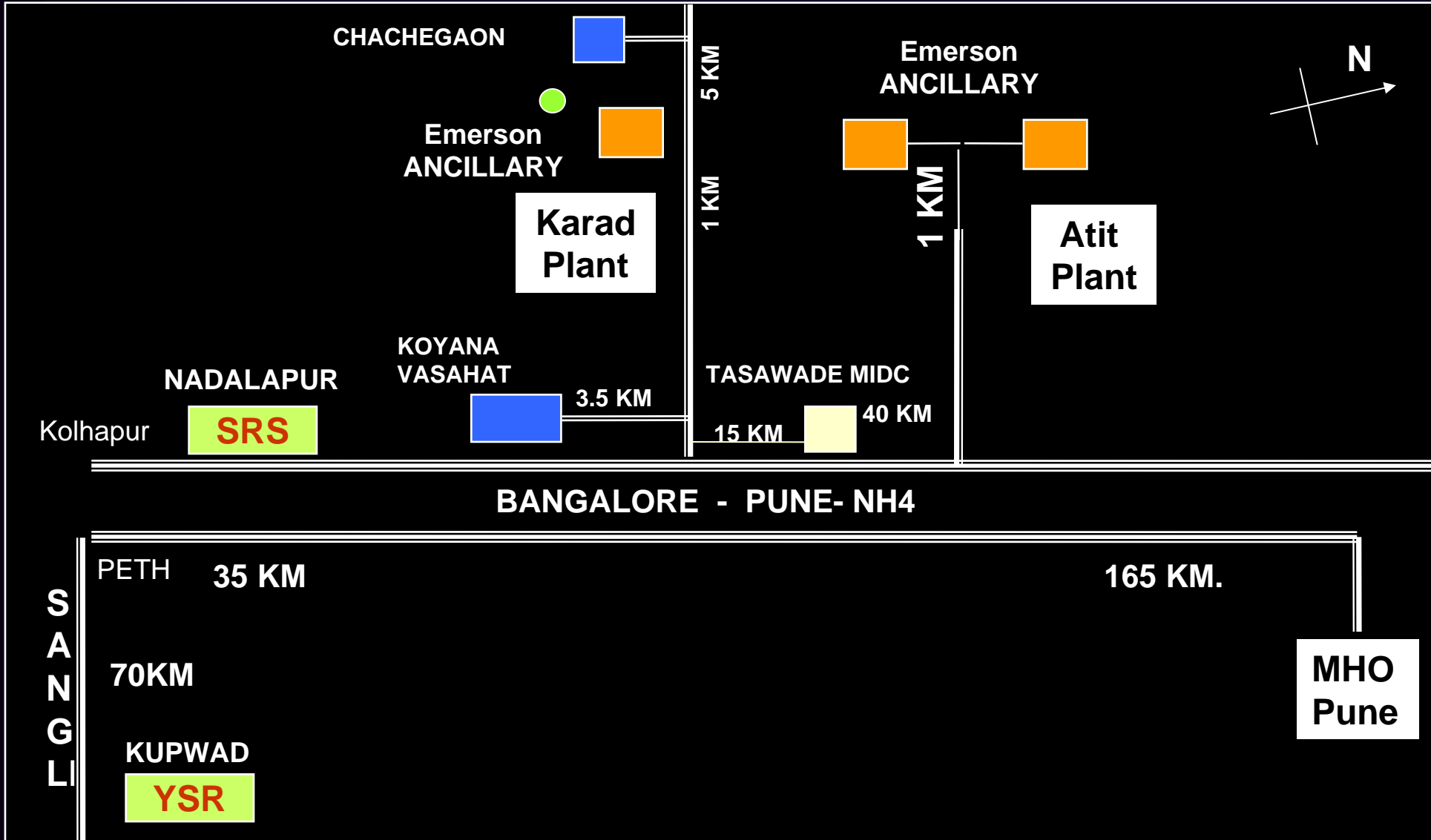
***Bureau of Energy Efficiency (BEE)
National Energy Conservation Award -2008***

***Emerson Climate Technologies (India) Ltd,
Karad - Atit***

Copeland[®]
brand products


EMERSON[™]
Climate Technologies

Manufacturing Locations



Karad & Atit Plant



- ❖ Land - 16 acres
- ❖ Built up - 186,100 Sq. Ft.
- ❖ Investment - Rs. 424 Mn.
- ❖ Annual capacity - 534,600

- ❖ Land - 25 acres
- ❖ Built up - 145,875 Sq. Ft
- ❖ Investment - Rs. 820 Mn.
- ❖ Annual capacity - 644,700 Nos.



Company Outline

Emerson Climate Technologies (India) Limited was formerly Kirloskar Copeland Limited

❁	Vision:	Emerson Climate Technologies, with our partners, will provide global solutions to improve Human Comfort, Safeguard food and protect our environment
❁	Product -	Reciprocating Type Hermetically Sealed Compressors
❁	Product Range	1/4 H.P. to 40 H.P.
❁	Production Capacity	1.0 Mn / annum
❁	Company Turn Over	4348 Mn
❁	Energy Cost	87.4 Mn (2.01 % of Sales Turnover)
❁	Energy Efficient Products Series	Air conditioning Series with 11.1 EER, Refrigeration with 6.2 EER

We manufactures our product under ISO 9001, EMS 14001, & ROHS environment

We Serve Our Customers With Energy Efficient Products



KCE / KCN

275 – 6,000 BTU



KCJ

1,000 – 12,000 BTU



KCG

45,000 – 60,000 BTU



KCH

2,500 – 24,000 BTU



CR6

19,000 – 42,000 BTU



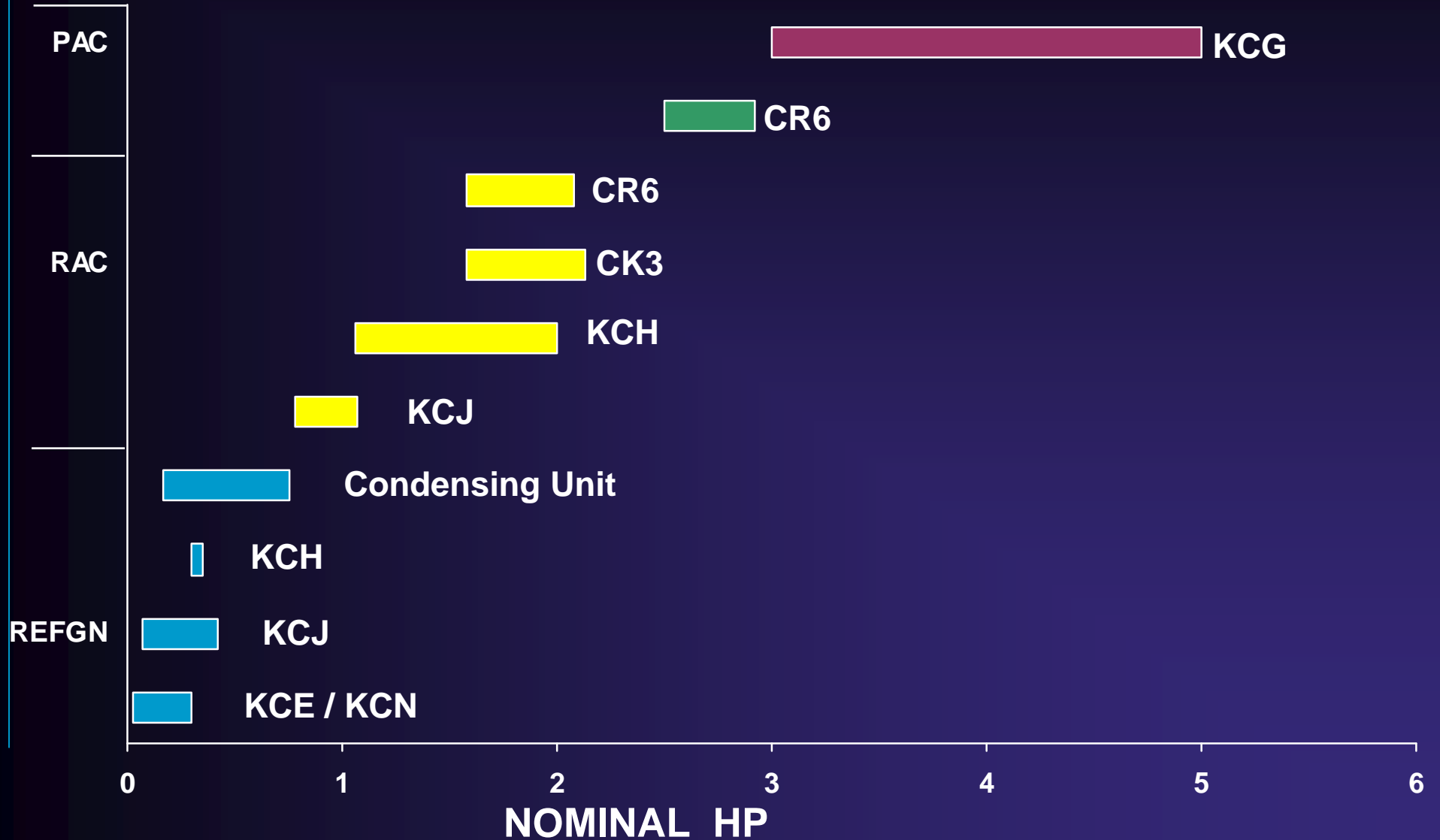
CK3



Condensing Units

600 – 66000 BTU

Product Range (Manufactured)



Energy Conservation Culture

- ❁ Activity Started Since 1988-89 (12 Years Before EC Act 2001) & Is Part Of Quality Management System
- ❁ Strong ENCON Team With Designated Energy Managers
- ❁ Awareness Program To All Employees & Their Participation Thru
 - Encon Kaizen's.
 - Encon Week Celebration -14th To 21st December.
 - Appreciation – Awards & Recognitions
- ❁ ENCON Projects To Vocational Trainees & College Students
- ❁ **Assignments To Individuals Thru Performance Appraisal.**
- ❁ Participation At State & National International Level Competitions.
- ❁ Periodical Audits By External Agencies
- ❁ Energy Management Approach With New Techniques & Technologies
- ❁ **Strong Commitment To Renewable Energy Resources – Wind & Solar.**
- ❁ Countermeasures For The Weakness Like Lean Season Management, Power & Fuel Inflation Etc.

ENERGY POLICY

Achieving optimum use of energy in our operations and bringing about improvements in the energy efficiency of our processes and products will form an important component of the continuous improvement efforts in our organisations.

We shall strive to reduce energy consumption per unit of value added by:

- Minimising Waste
- Using energy efficient processes and equipment
- Conducting periodic energy efficiency improvement studies and implementing improvement measures
- Involvement of employees of all levels in the energy conservation efforts
- Effective dissemination of information
- Establishing norms and initiating programmes to reach these norms.
- Promotion of non-conventional energy usage.

In achieving these, we shall utilise the knowledge and expertise available from various sources including sister organisations, collaborators and outside experts.

We shall make efforts to bring about continuous improvement in the energy efficiency of our products.

Reviewed & Approved 15 Years

ENCON - SWOT Analysis

Strengths:

- Excellent ENCON Culture Since From 15 Years & Leaders In Energy Management
- Two Certified Energy Managers & One Energy Auditor (BEE)
- Use Of Green Energy (Wind Mill/Solar).
- Commitment From Top To Bottom
- Active Participation Of Vendors And Suppliers In ENCON Activity

Opportunities:

- Adopt Energy Efficient Technology
- Explore Opportunity Of Captive Power Generation Further use of Green Power for captive use
- Explore Collaborators Expertise In Manufacturing
- Encash Govt Policies & Incentives

Weaknesses:

- Seasonal Product & Product Mix
- Few Processes With Longer Cycle Time
- No International Bench Marks Comparable

Threats:

- Continuously Rising Inflation In Power & Fuel Segment.
- Poor Quality & Availability Of Grid Power.
- Fossil Fuel Reserves

Renewable Energy Usage

Projects : 05
Saving : 0.65 Mn

Sr. No	Projects	Saving Rs Mn
1	Installation of 2.4 MW windmills (Total Installed Capacity 3.46 MW)	30.6 (per Annum)
2	Solar Water Heating System for Component Washing	0.475
3	Solar Parabolic Concentrator for Steam Generation	0.150
4	Solar Street Lighting	0.015
5	Solar Lantern for Security Lighting	0.010

Wind Mill: 3 x 0.8 MW at Site Panchapatta



Wind Mills–Investment, Location, Capacity

Installation Phase	Wind Mill Capacity		Investment in Rs. Mn.	Expected Annual Generation in kWh Units
Phase I	2 x 230 KW	0.46 MW	30.40	0.90 Mn
Phase II	1 x 600 KW	0.60 MW	36.00	1.10 Mn
Phase III	3 x 800 KW	2.40 MW	114.00	4.80 Mn

Installation Phase	Date of Commissioning	Power Used for self Use at	Location
Phase I	22 nd September, 2001	Karad Main Plant	Matrewadi (35 Kms. From Karad Plant)
Phase II	28 th December, 2001	Karad Main Plant	Varekarwadi (45 Kms. From Karad Plant)
Phase III	30 th December, 2006	55% at Atit Main Plant 45% Karad Ancillary	Panchpatta (420 Kms. From Karad Plant / 75 Kms. From Nasik)

VER Obtained for Phase I & II, CER Under Process for Phase III

Solar Steam Generation



Dishes Installed : 4 Nos
Heat Generation : 1,50,000 kCal/day
kW conversion : 175 kW
Saving achievable : 100 kW per day
(Excess Steam capacity is proposed to be used for Rotor Bluing)

Investment : Rs. 0.564 Mn
Subsidy by MNES : Rs. 0.365 Mn
Annual Saving : Rs. 0.15 Mn
Payback : 2.4 years

Other Benefits :

- First Industrial application in India, appreciated & recognized by MEDA
- Received 35 % subsidy from MNES (Thru MEDA)
- Depreciation benefit being an ENCON project
- Auto Tracking using Solar Power & Maintenance free operation

Appreciation In CII Bulletin

UNEP RISO CENTRE
INDIA, CLIMATE AND SUSTAINABLE DEVELOPMENT

CII
Confederation of Indian Industry

USAID
UNITED STATES OF AMERICA

Energy Efficiency Bulletin

Case Study Bulletins from CII-Sohrabji Godrej Green Business Centre

Bulletin No. 10 Steam Generation Using Parabolic Solar Concentrators September 2007

Company Details

Kirloskar Brothers Limited a leading engineering company in the Refrigeration and Air-conditioning industry in India and Copeland Corporation of U.S.A a subsidiary of Emerson Electric Company, U.S.A, formed a joint venture - Kirloskar Copeland Limited.

Today, Kirloskar Copeland Ltd is one of the leading manufacturers of refrigeration and air conditioning compressors – especially the Reciprocating Type Hermetically Sealed type Compressors of range 1/8th HP to 40 HP, both nationally and internationally. Kirloskar Copeland was the first to make CFC-free compressors. The company has been recently renamed as Emerson climate technologies.

Project details

Against the back ground of dwindling availability of conventional energy sources like coal, oil and gas the plant looked at using Renewable energy for various applications. The plant looked at utilizing solar energy for various heating applications.

Solar concentrators

Solar concentrators are the latest technology to capture the solar radiations as much as possible. As the name implies, concentrators collect the solar radiation from all the direction and concentrates at one point so that the total energy available will be maximum.

Parabolic Dish type collectors are generally used in solar power plants. A mirror, shaped like a parabolic trough, is used to concentrate sunlight on an insulated tube or a heat pipe placed at the focal point, containing coolant which transfers heat from the collectors to the boilers in the power station. Solar concentrators have the potential generate temperatures up to 400°C. These can be used in the normal atmospheric conditions also where the maximum ambient temperatures are around 30°C.

Flat plate solar thermal collectors will generate temperatures only around 60 to 100°C. This system contains of an insulated box equipped with black metal sheet built in pipes is placed in



sun with an over head water tank. Solar energy heats up water in the pipes and it circulates through the tank automatically by convection. It is generally used in hotels and apartment complexes, to generate hot water

Steam generation

Kirloskar Copeland Ltd uses 16 m² area of solar parabolic concentrator dishes to trap the solar rays. The trapped rays are concentrated on one point to generate the heat. The point will be the range of within a circle of 450 mm diameter (at circular receiver), at 5.5 m distance. A high optical temperature above 500-700°C is generated.

Water flowing in the tubes is converted into steam at receiver. Parabolic Panels are designed in such a manner that the focal point of concentration remains fixed. To trap the solar radiations through out the day, these parabolic concentrators have to rotate in the direction of sun. Photovoltaic cells are in operation for providing power supply to these trackers to rotate.

Steam applications

Since the steam generated in this process contains huge latent heat, steam is used as heating media for stator washing. The remaining steam is used for rotor bluing. The total heat content available is equivalent to 1, 50,000 kcal/day. This steam replaces electrical heating to the tune of 175 kWh/day.

Financing of the project

The plant was installed at a total cost of Rs.0.564 million with 35% subsidy from Ministry of Non-conventional Energy Sources (MNES), Govt of India.

System specifications

- No. of concentrators = 4
- Heat generation capacity = 1,50,000 Kcal/day
- Average solar radiation = 750 W/m²
- Efficiency of concentrators = 65%
- Area of each concentrators = 16m²
- Average operating hours = 8 hrs per day
- Equivalent electrical energy = 45 kWh/concentrator
- Total Equivalent electrical energy = 175 kWh/day

Issues faced during implementation

No major issues were faced during the implementation of the project. The maintenance requirements of the system are also few.

Comments from the plant team

The project was implemented by Kirloskar Copeland Ltd, Karad - Atit in the year 2006

The installation of steam generation system was taken up as a part of the initiative to increase utilization of renewable energy in place of using thermal sources like Furnace Oil (FO) and Liquefied Petroleum Gas (LPG).

Results of the project

This is the first industrial application in India. The project was appreciated & recognized by Maharashtra Energy Development Agency (MEDA). Installation of the parabolic concentrators has resulted in reduction of power consumption to the tune of 175 kWh per day.

The annual savings achieved is **Rs 0.15 million (USD 0.004 million)**. The total investment made is **Rs 0.564 million (USD 0.014 million)**. 35% subsidy was availed from the Govt. The simple payback period for the amount invested by the company works out to **30 months**.

Benefits of the project

- Use of renewable energy for steam generation
- Subsidy available

Cost benefit analysis

- Annual savings – Rs 0.15 million (USD 0.004 million)
- Investment – Rs 0.564 million (USD 0.014 million)
- Payback – 30 months

About CII & CII-Godrej GBC

CII is a non-government, not-for-profit, industry led and industry managed organisation, playing a proactive role in India's development process. Founded over 112 years ago, it is India's premier business association, with a direct membership of over 6500 organisations from the private as well as public sectors, including SMEs and MNCs, and an indirect membership of over 90,000 companies from around 350 national and regional sectoral associations.

CII-Godrej GBC is a Centre of Excellence in Energy Efficiency, Green Buildings, Renewable Energy, Water, Environment & Recycling and Climate Change activities in India.

About 3 Country Energy Efficiency

The Project "Developing Financial Intermediation Mechanisms for Energy Efficiency Projects in Brazil, China and India" aimed to substantially increase investments in energy efficiency by the domestic financial sectors in Brazil, China and India.

The project was a partnership between the World Bank, the United Nations Environment Programme (UNEP) through the UNEP Riso Centre on Energy, Climate and Sustainable Development (URC), and institutions in Brazil, China and India. Additional information is available at www.3countryes.org

This Energy Efficiency Bulletin comprises of a series of case studies on successful energy efficiency projects implemented by Indian industry. The bulletin is supported under the "3 Country EE" initiative and by USAID.

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www.greenbusinesscentre.com



Compressed Air

Projects : 07
Saving : 1.82 Mn

Sr.No	Project	Saving Rs Mn
1	Installation energy efficient air guns & nozzles (Silvent Make)	0.320
2	Cold intake to low pressure air compressors	0.015
3	Instillation of VFD and pressure transducer to Low pressure compressor	0.160
4	Auto Control Valves for Compressed Air Grid	0.162
5	Arrest compressed air leakages by permanent piping instead of PU piping	0.654
6	Segregation of High pressure & Low pressure compressed air end user	0.220
7	Use of high pressure air blower instead of compressed air	0.220

Fuel

Projects : 05
Saving : 1.80 Mn

Sr.No	Project	Saving Rs Mn
1	Improve Heat Exchanger Efficiency	0.150
2	Insulation for flanges, valves of TF line	0.180
3	Heat Repellant Paint for Baking Oven	0.050
4	Fuel Substitute - Bio-Fuel Additive For Furnace Oil	0.520
5	Furnace oil emulsification to TP-06 & TP-02 Thermic fluid boilers	0.745
6	Thermic Fluid pipe insulation with Silicon Cloth	0.048
7	Biogas from Canteen waste	0.036
8	Use of Flue Gas Analyzer for Maintaining the Boiler Efficiency	0.117

Process / Productivity Improvement

Projects : 06
Saving : 0.695 Mn

Sr.No	Project	Saving Rs Mn
1	Reduction in Contract Washing Consumption	0.185
2	Conversion Of Calorimeter Rig By Gas Cycle Stand	0.120
3	Auto Switch-off for all CNC machines	0.040
4	Increase batch size of Dehydration oven	0.032
5	Reduce cycle time of Rotor Bluing process	0.310
6	Common Coolant system for Grinding Machine	0.087

New Technology



Projects : 06
Saving : 0.93 Mn

Sr.No	Project	Saving Rs Mn
1	Use of Inverter based DC Welding Rectifier for comp. Shell welding	0.054
2	FRP Fan blades instead of Aluminum Fan Blade	0.057
3	Reduction of Thermo-pack blower consumption using VFD	0.060
4	Use of Energy Efficient lighting	0.146
5	Variable Frequency Drives for Under loaded Motors	0.320
6	Compressor testing cycle reduction by using PID controller & software's	0.293

Waste Elimination



Projects : 07
Saving : 2.14 Mn

Sr.No	Project	Saving Rs Mn
1	Energy Efficient Lighting	0.070
2	Install Stabilizer For Shed No 03 & 04 Shop Street Lighting	0.100
3	Under Loaded Motors Connected To Star	0.050
4	Integrate Two Hydraulic Power Packs	0.280
5	Infrared Human Motion Sensors At Toilets, Offices And Cabins	0.010
6	Power Factor Incentive From MSDCL	1.425
7	Integration Of Old & New Thermic Fluid System In Ancillary	0.213

Waste Heat Recovery

Projects : 05
Saving : 0.835 Mn

Sr.No	Project	Saving Rs Mn
1	Installation of Air pre-heating system on Thermic fluid boiler exhaust	0.114
2	Recovered waste heat from 300 cfm air compressor and used to washing purpose	0.147
3	Utilize paint baking oven exhaust for compressor drying at Pre-treatment plant	0.019
4	Recover waste heat from Exhaust Burn-off zone & used to generate steam for Bluing furnace	0.459
5	Waste heat recovery thru Recuperation of hot fuel gases to reduce fuel consumption of Al. melting furnace	0.096

Innovative Projects – 1

Solar Water Heater for Seven Tank Washing System

Solar Water Heater for Seven Tank Washing System

Background :

- Component Washing Lines (2 No) Of Consists Of 6 Hot Chemical Tanks
- Heating System : Thermic Fluid Heater
- Lines Are & Temperature Ranges Are @ 50-60°C
- Heat Load Of @ 1,00,000 Kcal / Hr Measured.
- Fo Consumption Was 162 Ltrs Per Day.

Alternate To Fuel

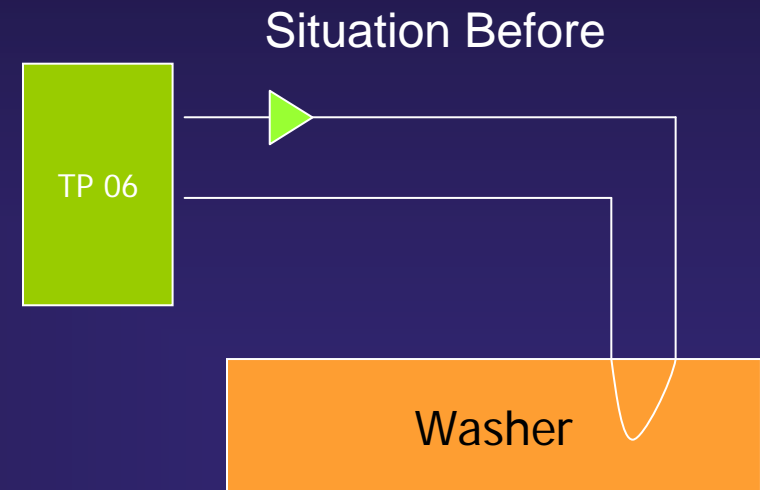
- Use Of Non-conventional Heating : Solar Heating

Constrain

- No Any Evidence Of Such Big Industrial Project

Analysis & Enabling Actions:

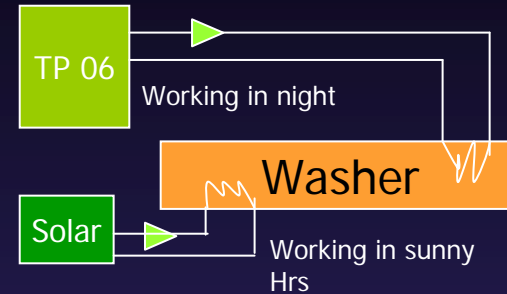
- Solar Tracking Data & Collector Efficiency Study.
- Copper Collector Plate Test Reports From Manufacturer
- Output Efficiency Has Guaranteed By The Manufacturer
- Plate Heat Exchanger Design



Solar Water Heater for Seven Tank Washing System

System Details

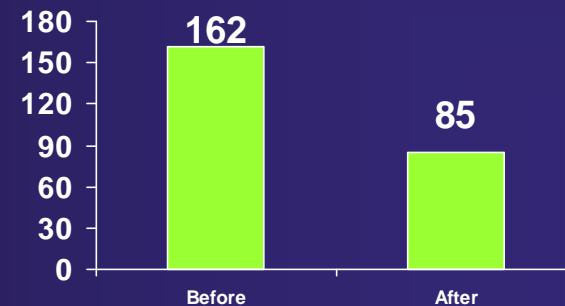
- Solar Heating System Installed For The Tanks Parallel To TF System



- Total 146 Nos. Panels System With 8,00,000 Kcal Output Per Day (8-9 Hrs) In Sunny Days.

- FO Consumption With Solar Heating Reduced To 85 Ltrs Per Day.

FO Consumption per day in Liter



Solar Water Heater for Seven Tank Washing System

Benefits

- Saving Of 75 Liters Of FO Oil Every Day.
- Maximum Benefit Due To Production & Bright Sunny Days Are For Same Period.

Financial Details

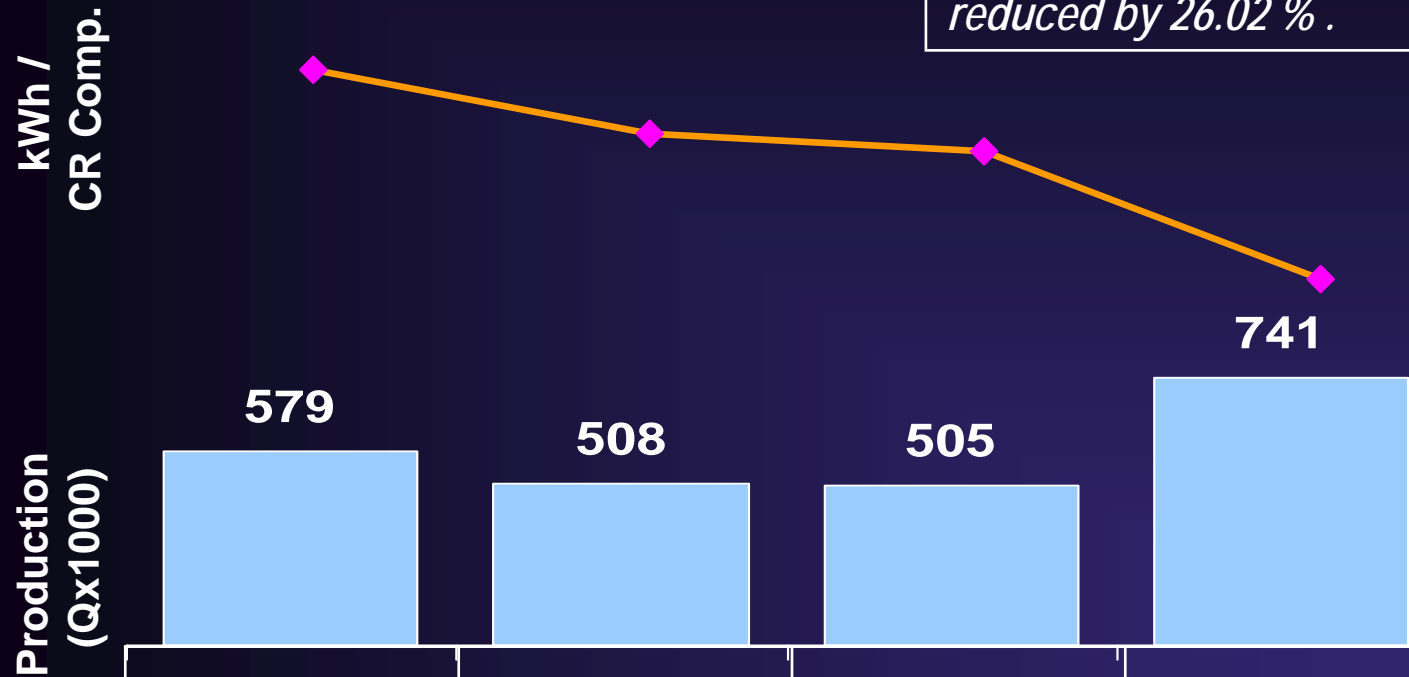
- Investment : Rs 2.358 Mn
- Saving : Rs. 0.475 Mn
- Payback : 5 Yrs (Considering Inflation)

Highlights

- First Project For Industrial Application For Over 100,000 Kcal / Hrs
- Interlocking By Use Temperature Controllers For Automatic Switch Over

Specific Electricity Consumption/Compressor

Over FY'05, Specific Electricity consumption is reduced by 26.02 % .



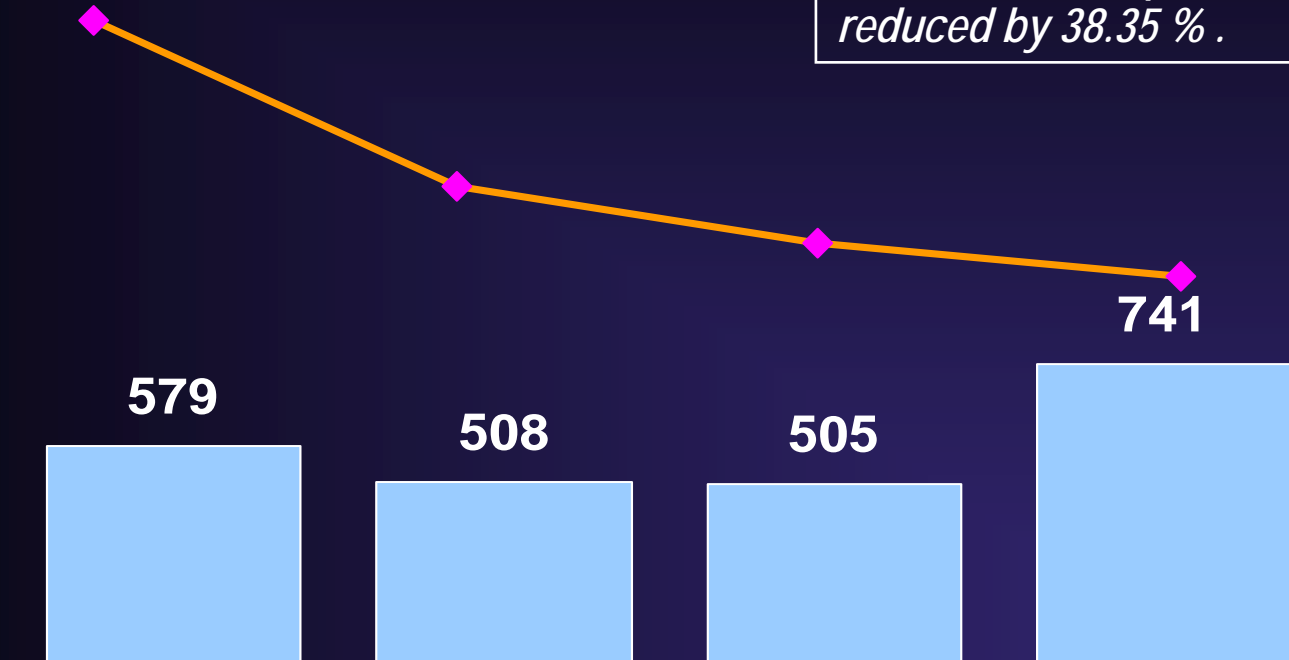
04-05	05-06	06-07	07-08	*New additional load in kW
-	27	-	-	EDC
100.5	-	90	150	Machine Shop
300	68	-	-	Process Shop
515	-	65	25	Ancillary

Specific Fuel Consumption/Compressor

Over FY'05, Specific Fuel consumption is reduced by 38.35 % .

kCal /
CR Comp.-

Production
(Qx1000)



04-05	05-06	06-07	07-08	*New additional load in kCal
-	-	-	-	Paint Shop
40,000	-	-	-	Process Shop
-	-	-	-	Machine Shop

Accolades-Energy Conservation



Inter group (Kirloskar Group) Energy Award for 10 times since from 1994, out of 16 years



2006-07

National Level award "Excellence in Energy Management by CII

"Certificate of Merit" in General Category by BEE by auspicious hands of Dr. A P J Abdul Kalam – President of India on 14/12/2005.

2005-06

National Level award "Energy Efficient Unit" by CII



2004-05

"First prize" award for promotion to Non-conventional Energy Utilization by MEDA

2003-04

"First Prize" at State Level in Energy Conservation by MEDA

"Innovative Project Award" in the Year 2004 for HRU project of Decarb plant by CII.

2002-03

"Second Prize" at State Level in Energy Conservation by Maharashtra Energy Development Agency in Automobile & Engineering Sector

Award for Excellence in Energy Conservation & Management by Institute of Engineers, Pune

2001-02

National Level award "Excellence in Energy Management by CII

2000-01

First National Level award "Excellence in Energy Management by CII

1988-89

Participation in K-group competition

Sustenance Of The Savings

- ❁ Measurement ,Verification & Control Budget Allocation & Control To Departments
- ❁ Training And Awareness To Individuals
- ❁ Displays For The ENCON Activities
- ❁ Use Of QC Tools Like Brain-storming, Scatter Equations, Parato, Fishbone PDCA Etc. Is Part Of ENCON Culture
- ❁ In-house & External Agency Audits – Corrective Actions
- ❁ Periodic Calibration Of Instruments (Meters,gauges Etc)
- ❁ Efficiency Monitoring Of Utility Equipments & Compressed Air System
- ❁ Evaluation By External Consultants
- ❁ Encon Specific Targets In Performance Appraisals To Individuals

Environmental Improvements

- ❁ ISO 14001 For Environment Management System Certified By BVQI
- ❁ Products: Leadership In Launching In 18 Models R-134a Gas Compressors (Eco Friendly) To Support CFC Phase Out (R-12gas)
- ❁ Process : Use Of Non-CFC Chemicals
- ❁ All Products Manufactures With RHOS Complied Material
- ❁ 90 Lacks Liters Capacity Earthen 'Bandhara' For Rain Water Harvesting
- ❁ Effective ETP's As Per Pollution Control Board Norms
- ❁ Achieved Zero Discharge Level By Recycling The Waste
- ❁ Promoting Plantation – More Over 5000+ Plantation Has Carried Out In The Plants & The Vicinity Areas
- ❁ Vermiculture Plant
- ❁ Biogas For Cooking Purpose From Canteen Waste

Environmental Performance Of Plant



**Effluent
Treatment
Plant**

Treats Domestic As Well As Industrial Effluent.
Treated Effluent Used For Gardening



**Biogas
Plant For
Canteen**

Gas Generation : 5.3 Kg / Day, Uses Canteen
Waste & Is Reutilized For Cooking



**Vermiculture
Plant**

Area covered : 1000 Sq Ft, Uses Food &
Garden Waste Fertilizer, Used For Garden



**Rain Water
Harvesting**

Area Covered : 3 Acres, Roof Rainwater
Drain Also Connected To The Ponds

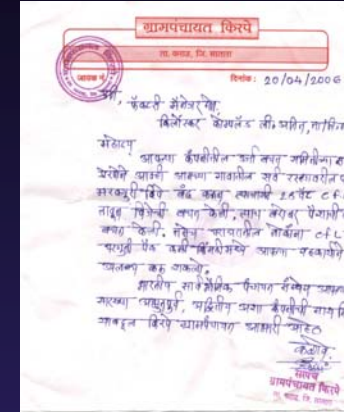
Water Conservation

SN	Project	Benefits
1	Modification Of ETP With Tertiary Treatment Of Sand Filter	Total Treated Water Is Available For Gardening Purpose, Hence Zero Discharge (140 KL/Day In Main Plant & Ancillary)
2	Modification In Water Treatment Plant	Backwash Water Recycled For Pretreatment & Frequency Of Tank Cleaning Reduced Saving Water (20 KL/Day)
3	Optimize Flushing Quantity (Replace 10 Liter Flushing Tanks With 5 Lit)	Wastage & Overuse Controlled (Saving 20KL/Day)
4	Push Cocks Instead Of Simple Taps At Vantage Locations	Wastage & Overuse Controlled (Saving 5KL/Day)

Water saving Rs. 0.185 Mn Liters per day

Extend ENCON Efforts to Society

- ❁ **Exhibition Of Energy Efficient Products For Household Applications At Gramphayat, Taluka & District Places**
- ❁ **Facilitation Of ENCON Projects For Engineering Institutes & Students.**
- ❁ **Documentary Film Covering Day To Day Energy Conservation Tips & Wind Turbine Commissioning**
- ❁ **Distribution Of ENCON Leaflets & ENCON Caps.**
- ❁ **Group Scheme For Energy Efficient House Hold Products & Payment Thru Salary : Solar, CFL & Gas Geyser.**
- ❁ **ENCON Activity Has Promoted In Karad & Nearby Villages With Joint Efforts Of Team & Karad Municipal Corporation**



Awards & Accolades - Engineering

- R & D Recognized By “ Ministry of Science & Technology ” , Government Of India In 2007
- Bry Air Asia 2007 Award For “**Excellence In Product Design Energy Efficiency Improvement In Refrigeration Compressors**” - By President Elect William Harrison , ASHRAE ,USA
- Sound Reduction Through Resonator “Paper Presented In International Congress For Sound & Vibration 2007 , Cairns , Australia
- “Indira Innovation International Summit 2008” Award For “**Innovative & Environment Friendly**” Products
- “**Hermetic Motor Efficiency Improvement**“ Paper Presented In ELROMA 2008 – By IEEMA (India Electrical Manufacturer Association)



What Will Do In Future

Performance Area	FY09	FY10
Reduction of Specific kWh/Eq. CR compressor consumption	12.73	11.75
Reduction of Compressed air Specific consumption kWh.Eq. CR	2.91	2.62
Reduction of Specific Heat kCal/Eq. Compressor	11600	10400
Waste Heat Recovery in kCal	75000	100000
Solar Water Heating System, Installation Capacity kCal/days	200000	300000
Start Additional green energy source from Wind Mill (With CDM Benefits)	-	1.8 MW
Optimization / elimination of Air Conditioning system	5 TR Each	7 TR each
Reduction of Water Consumption k-Liters / Eq. CR	0.22	0.20

Thank You