First Prize *Consumer Goods*

CARRIER AIR-CONDITIONING & REFRIGERATION LIMITED

Kherki Daula, Gurgaon (Haryana)

Unit Profile

Carrier India was incorporated in1986 to meet the growing demand of air-conditioning appliances in Indian market. It started its commercial production for compressors and window air conditioners in 1988. Carrier India has its own Design, Development and Manufacturing facility of Residential and Light commercial Air Conditioners and Chillers with focus on energy efficient products. CARL has total of 585 employees. With growing competitions & Energy awareness Carrier India had set goals for manufacturing cost reductions and EER improvement for its entire product range. To achieve these goals CARL formed a core team in 2002 and implemented various successfully initiatives in its Development & manufacturing operations.

Leadership and Involvement

Following are some Energy conservation initiatives in which CARL have demonstrated their commitment towards Natural Resource Conservation through leadership and involvement:

- Set Energy & Water conservation goals with various initiatives & periodically reviewing these goals & initiatives in Quarterly EH&S oversight committee meets.
- Each production cells given energy & water reduction targets as a part of ACE waste elimination activities in 2000.
- Continues enhancement of awareness among staff & employees on energy & water conservation through trainings & regular communications programs.
- Adopted some best practices in energy and water conservations.
- Enhanced contract demand from 950 KVA to 1900 KVA resulted in reduction of Diesel Generators running. SEB (State Electricity Board) is 43 % cheaper then captive generation.
- Optimum utilization of State Electricity Board (SEB) power by distributions optimization & Periodic Maintenance.

Engineering Leadership and Involvement

- Developed WRAC (Window Room Air-conditioner) with 5% EER improvement without any input cost. The commercial production had been started from March15, 2004. Savings is 1.61KWh/day/WRAC (10 hour/day running). For 180-day summer period this would translate to 40.5 million units of electricity by taking 140K WRAC sold up to 2006. For the life of WRAC (10 years) this change would mean 370 MWh saving to the customers of worth USD 33Million
- Developed new Chassis & coil surface area to optimize Air-conditioning cycle for 18 K WRAC which result in power consumption reduction from 2000W to 1800W.Saving is 1.5 KWh/day/WRAC by assuming 10 hours operation. For a 180-day summer period this would mean a saving of 6.75 million units of electricity or $600K by taking 25K High ambient WRACs sale in 2006.

For the 10 year life of WRAC this change would mean 67.5 MWh saving to the customers. (USD 6 Million)

- Optimized compressor size in ducted split by replacing 5.8 TR (5850W) compressor with 5.5 TR (5350W) in 8.5 Ton with an improvement in EER.
- Developed new Residential & Premium Duct Free Split range with 1 to 4 star rating. Carrier India is the first air-conditioning company in India who has applied to Bureau of Energy Efficiency for 22 products for Bee Star Labeling.

Energy Conservation

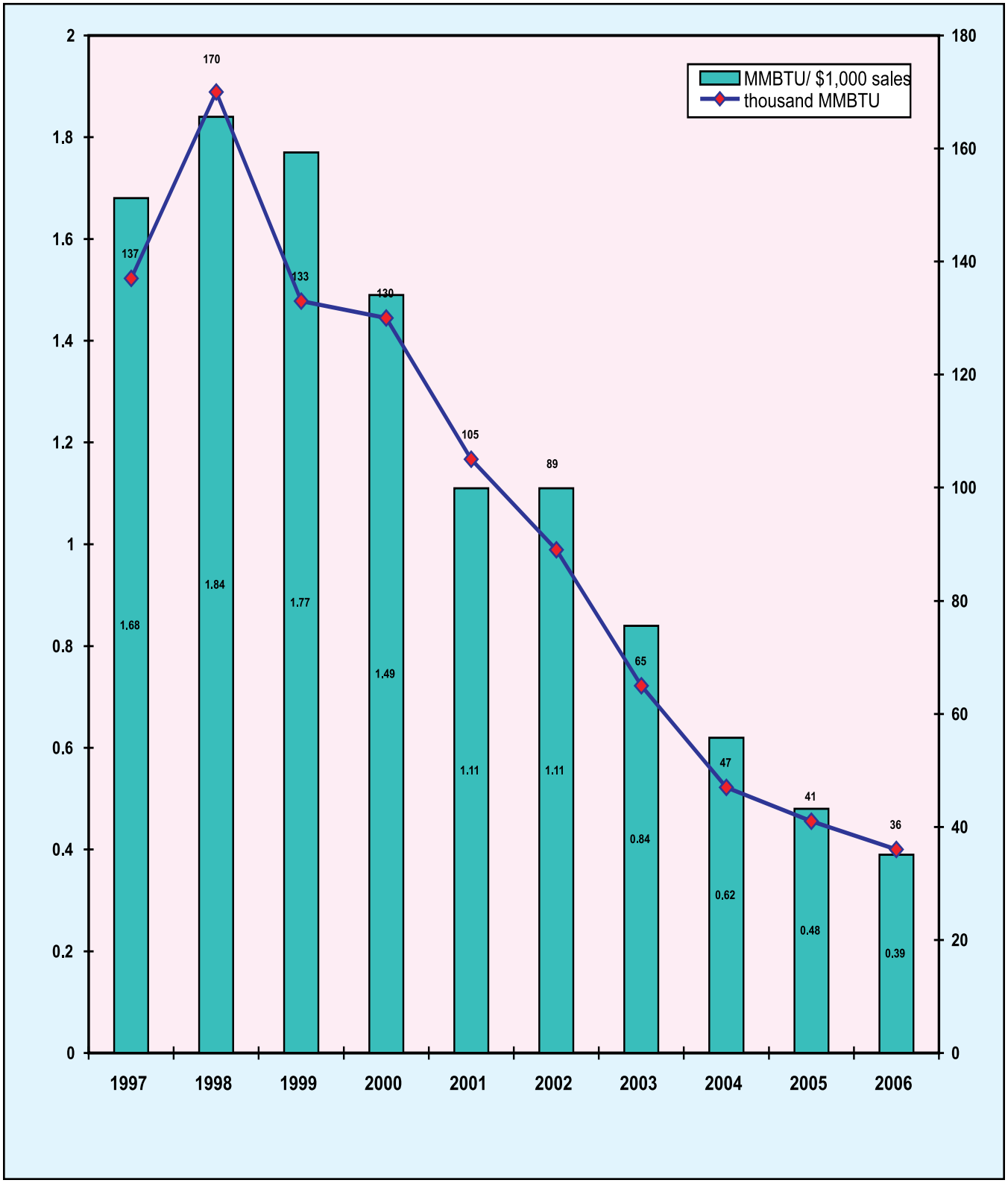
Projects/Actions that contributed to Energy Conservation are summarized below:

Energy Management

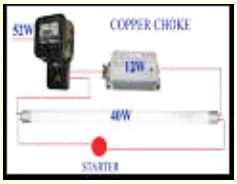
73% Energy Reduction (MMBTU / $ 1000 sales) from 1.68 in 1997 to 0.39 in 2006

- Maximum utilization (18% in 1997 to 60 % in 2006) of State Electricity Board (SEB) Power to reduce running of Diesel Generators that is 75 % higher than SEB.
- Installed 62.5 KVA DG & 50KVA D.G.Set for lighting & Waste Water Treatment Plant during Holidays to prevent running of 400KVA D.G.Set.
- Automatic control of lights by using photo sensors.
- Natural sunlight utilization by providing clear acrylic sheets on roof.
- Individual energy meters to monitor electric consumption for all shops & office.
- Introduced electronic chokes (40% saving) to replace ordinary chokes.
- Individual diesel flow meters in D.G for close Monitoring of fuel consumption.
- Fuel saver kit in thermopac to reduce 5 % reduction in fuel consumption.
- Scheduled Maintenance of all Diesel Generators to achieve 5% more efficiency.
- Temperature controller for cooling towers to intermittently running of fan motor.
- Optimize load distribution for effective utilization of D.G.
- Power free Eco-ventilator in place of Exhaust fans.
- Low power CFL(25W) in place of high power lamp (160W)for street lights.

CARL - Energy Usage - 73 % Reduction In Energy From 1997 Base Line



Energy Management

Before		After	
	• Exhaust fan ventilation. • Energy Consumption 100 KWH/Day		• Wind operated Eco-ventilator. • Energy Saving100 KWH/Day • More day lightening
	• Lightening fixture 40W. • Ordinary blast 52W		• Electronic blast. • 33% energy saving
	• Air-cooling plant. • Energy Consumption-2100KWH/Day.		• Electronic Cyclic Timer to stop on idle hours. • Energy Reduction-150KWH/Day.
	• 400KVA D.G. for off hours. • Fuel consumption-45 LPH.		• 62.5KVA D.G. for off hours. • Fuel consumption-10 LPH.
	• 90 KW compressors motor. • Idle running during unloading		• Energy Saver • 90 KWH/day energy saving during unloading
	• Continues running of 2.2 KW motor of cooling towers.		• Temperature controller for intermittent running of cooling tower fans.

CONCLUSION: Natural Resource Conservation is a core value in plant business operations as important as employee safety. CARL believes that energy conservation is everyone's moral responsibility. Since the unit is committed to achieve UTC environmental goals & keeping in views the national interest towards protecting our natural resources, every employee in CARL is responsible towards achieving the goals.

Energy Conservation Achievements

- YTD 2006: 73% reduction in absolute energy usage
- YTD 2006: 100,882 MMBTU energy reductions. Cumulative saving US$ 4 million.
- YTD 2006: 40% reduction in absolute water consumption.
- YTD 2006: 16 Million US Gallon Water consumption reductions. Cumulative saving US$ 12.7K
- 2006: Develop Residential & Light Commercial Air-conditioners' with power reduction from 2000W to 1800W.
- 2006: Develop new range of Duct Free Split with high efficiency & star rating.
- 2006: Develop new range of ducted split with power reduction from 5850W to 5350W.
- 2004: Develop Residential & Light Commercial Air-conditioners with 5% EER (Energy Efficiency Ratio) improvement.

Environment and Safety

- YTD 2006: 87% reduction in Air Emissions and 62% reduction in Recycle Waste
- YTD 2006: 6.66 million hours without a lost time incident;
- YTD 2006: 98% reduction in the Total Record able Incident Rate
- 2001: UTC assurance audit score 75.
- 2002: Certified with OHSAS 18001:1999.

LG ELECTRONICS INDIA PRIVATE LIMITED

Pune (Maharashtra)

Unit Profile

LG Electronics India Private Limited, a wholly owned subsidiary of LG Electronics, South Korea was established in January, 1997 after clearance from the Foreign Investment Promotion Board (FIPB).

The trend of beating industry norms started with the fastest ever-nationwide launch by LG in a period of 4 and 1/2 months with the commencement of operations in May 1997. LG set up a state-of-the art manufacturing facility at Greater Noida, near Delhi, in 1998, with an investment of Rs 500 Crores. This facility manufactured Colour Televisions, Washing Machines, Air-Conditioners and Microwave Ovens. During the year 2001, LG also commenced the home production for its eco-friendly Refrigerators and established its assembly line for its PC Monitors at its Greater Noida manufacturing unit.

In 2004, LGEIL also up its second manufacturing unit in Pune, Maharashtra that started its operations in Jun 2004 with an investment of Rs 250 Crores. Covering over 50 acres, the facility manufactures Color Televisions, Air Conditioners, Refrigerators, Washing Machines, LCD TV sets, Optical storage devices and GSM phones. The Pune manufacturing unit line has been designed with the latest technologies at par with international standards at Korea & LG Noida and is one of the best unit amongst all LG manufacturing plants in the world.

LG Electronics India is the fastest growing company in the consumer electronics, home appliances and computer peripherals industry today. LG Electronics is continually providing superior technology premium products & value for money. The company has achieved a turnover of Rs 7895 crore in 2006~07.

Energy Consumption

By Continuous innovation and implementation, the unit has been able to reduce its energy consumption drastically.

Description	Units	2004-05	2005-06	2006-07
Total Electricity Consumption	Lakhs Kwh	36	47	81
Annual Prod Quantity	Lakhs	5.65	12.34	48.9
Specific Energy Consumption -Electrical	kWh/prd	6.37	3.8	1.66
Total Thermal Energy	M Kcal	962	1173	1390
Specific Energy Consumption -Thermal	M Kcal/prd	0.006	0.0074	0.0034

Year	Electrical		Thermal	
	Specific Energy Consumption- Electrical	% reduction Over 2004-05	Specific Energy Consumption - Thermal	% Reduction Over 2004-05
2004-05	6.29	------	0.006	------
2005-06	3.78	40%	0.0074	-23%
2006-07	1.66	73%	0.0034	43%

Energy Conservation Policy and Set up

LG Electronics has maintained a steady growth in terms of turnover, profits as well as its march towards becoming the number one consumer durable company in the country. A good part of the profits is dedicated to the cause of energy conservation.

The top management commitment is shown through various activities like EESH Award, Six sigma , FRP award, weekly best suggestion , innovation award are made to ensure its success.

Energy conservation is a salient pillar in the forums like WE-10 (Waste Elimination), Fi-10 (10 pillars of Factory Innovation), CI review (Cost Innovation i.e. savings) which are reviewed by the management along with the middle management every month.

Further, every department Team Leader has energy conservation as their performance evaluation criteria. The management insists on audit by external experts as well as overseas energy audit teams. Their recommendations are used as guidelines for further improvements.

The commitment for energy saving is regularly demonstrated by each & every employee by not only giving suggestions but also rigorously following the norms set from time to time. Induction for new joiners has a special feature on Energy Conservation and the norms to be followed. This is supported by visuals all over the factory and sets trend from the first day. This is also carried forward by the routine internal audits by managers, especially at night for auditing equipment / air leaks while the machines are idle etc.

Energy Conservation Achievements

LG Electronics has been actively pursuing the process of energy conservation since its inception. Over the period between 2004 ~2007, the Pune Plant has aggressively implemented major as well as minor projects like stating of project with energy efficiency equipments, bench marking LG Noida for Energy conservation. There are many proposals, workmen's innovations, overseas benchmarking exercise, BEE guidelines, Benchmarking other major institutes through common platform provided by CII energy audit, etc resulting into total saving of over Rs 50 lakhs with an investment of Rs 38 lakhs. This has resulted in a reduction of 30% in specific electrical energy consumption and 43% in specific thermal energy consumption over the period.

1) Energy Savings Projects

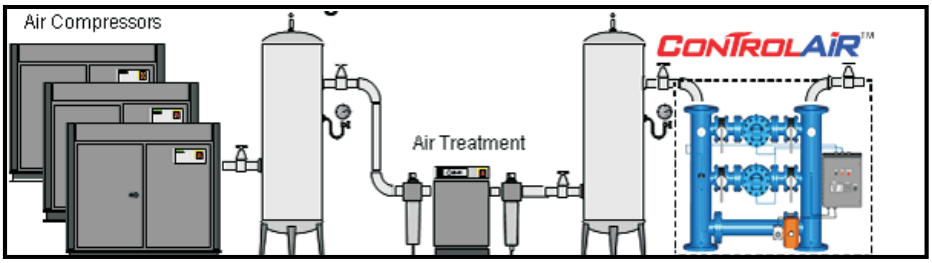
a) Conserve Air for Energy Conservation

Before Status: No control for Air pressure and setting is high at 8.2 bar to maintain pressure of 6.0 bar at user end. So frequent Loading /Unloading & power consumption is high

After Status: Compressor Power Consumption reduction by using Control Air to stabilize the supply of Constant air pressure and reduction and optimization of supply air at 6.5 bar.

Investment: Rs .: **6.43 lakhs**

Savings /Annum: Rs **6.85 lakhs**



b) VFD for Hot water Generator Circulation Pump

Before Status: Excess pressure due to use of High Head pump in Hot water circulation

After Status: Control of Pump speed & pressure of Circulation Pump with a VFD for Pump motor

Investment: Rs.: 1.46 lakhs

Savings /Annum: Rs.:2.22 lakhs

c) VFD panel for Cooling tower Pumps

Before Status : Excess pressure due to use of High Head pump in water circulation & no control for temp feedback

After Status: Provided temp feedback Pump and Fan operation optimization for cooling tower pumps and fans

Investment: Rs.: 5.52 lakhs

Savings / Month: Rs.:2.22 lakhs

Energy Conservation Plans and Targets

Energy Conservation Measures Planned	Anticipated Approx Investment – Rs Lakhs	Savings Approx per annum- Rs Lakhs	Commencement & Completion year
Operation of Hot water Generator in Duel Fuel - conversion from HSD to LPG	25	10	Yr 2008
Lighting Control transformer for B building Lighting Load with ES-25	3.88	1.85	Yr 2008
VFD for Trimming Press -2 and Other Ref line Hydraulic equipments	2.64	0.45	Yr 2008
Conversion of Electrical Heating in STLT & ELT into Thermal Heating	2	1.5	Yr 2008
Centralized SCADA system for Utility system Monitoring & Control	3.5		Yr 2008
VFD or Soft starter for Compressors	15	7.14	Yr 2008
Centralized SCADA system for Office AC system	4.5	2.34	Yr 2008