

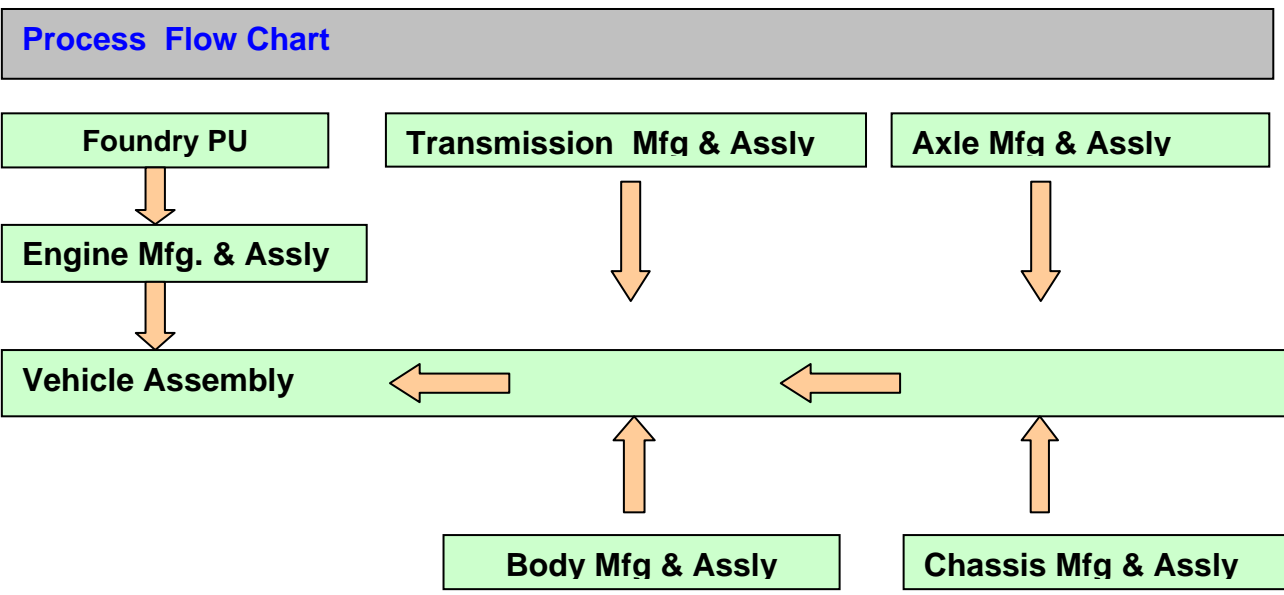
Unit Profile:

Mahindra & Mahindra Limited, Automotive Sector is a major player in the automotive industry in India. It is a part of Rs. 8000 Crores Mahindra group which manufactures Multi Utility Vehicles (MUVs- further classified into soft tops, hard tops and pick-ups) , Light Commercial Vehicles (LCVs) and three wheelers. Over the years, the Mahindra brand of vehicles have to come to represent high quality, ruggedness, durability, reliability, easy maintenance and operational economy. The Automotive Sector has four manufacturing plants three in the state of Maharashtra located at Kandivli, Igatpuri & Nashik and fourth in Andhra Pradesh located at Zaheerabad. The sector is in the process of commissioning its plant at Haridwar in Uttaranchal.

M & M Auto Sector Kandivli, Mumbai plant , received QS (Quality Systems) 9000 certificate in the year 2000. It is certified by ISO –14001 by RWTuV in the year 2003. The plant has received the TPM excellence award from Japanese Institute of Plant Maintenance (JIPM) in the year 2003. The company is the first automobile company to be recommended for TS-16949 certification by RWTuV in the year 2003. The plant is working towards OHSAS – 18001 certification. It is member of Mumbai Hazardous Waste Management Limited for the safe disposal of hazardous waste. The kandivli plant has received ‘ National Energy Conservation Award – First Prize in Automobile Sector ‘ give by the Union Ministry of Power in the year 2003 & 2004 two years in succession. The plant has also received State Level Award for ‘ Excellence in Energy Conservation & Management ‘ given by Maharashtra Energy Development Agency (MEDA) in the year 2004. CII Western region has awarded the Kandivli plant with HR excellence award in the year 2005 ‘ Commendation for significant achievement in HR excellence ‘

Having conquered a substantial portion of India's semi-urban and rural markets, the division has in recent years secured significant success in urban regions following the introduction of premium MUVs like Bolero, and Scorpio. Scorpio is M&M's first indigenously developed Sports Utility Vehicle - an off road vehicle with car like comforts. The Scorpio was launched in June, 2002 and has been universally acclaimed. It was declared to be the "Car of the Year" by CNBC Autocar, BBC Wheels and Business Standard Motoring in the year 2003.

The company has entered into various new export markets including South Africa, Uruguay, UAE and Malaysia. In this global competitive market Mahindra has sustained because of more customer focus and Energy Management for reducing the operational & energy cost. Various Small groups has been formed with senior executive as a facilitator to identify & implement the Energy conservation projects.



Energy Consumption:

By implementing various energy conservation projects there has been a consistent decrease in the specific Electrical and Thermal Energy Consumption.

DESCRIPTION	UNIT	2002-2003	2003-2004	2004-2005
Annual Eq. Vehicle production	Nos.	42508	52184	66589
Total electrical energy consumption /annum	Lacs kWh	269	310	358
Specific energy consumption – Electrical	Units/Eq. Vehicle	632	594	538
Total Thermal(Fuel) Consumption/annum	MKCals	17774	20592	23939
Specific energy consumption – Thermal (Fuel)	MKCals /eq. Vehicles	0.420	0.390	0.359

YEAR	ELECTRICITY		THERMAL (FUEL)	
	Consumption (kWh / Eq. Vehicle)	% reduction over 2002 -2003	Consumption (MKCals/ Eq. Vehicle)	% reduction over 2002 – 2003
2002-2003	632	-	0.420	-
2003-2004	594	7%	0.390	7%
2004-2005	538	15%	0.359	14%

Energy Conservation Commitment, Policy and Set Up

We at Mahindra & Mahindra Ltd, Auto Sector Kandivli plant, considers Energy Saving as a multi disciplinary approach. Even the smallest cost reduction is going to add directly to our profits in bottom line. Our energy profile consist of Electricity, Gas, Oil, Light Diesel Oil , High Speed Diesel Oil , Kerosene and Water.

Budget provisions are made exclusively for Energy conservation management. (ECON) Energy conservation plans, policy and structure are reviewed periodically. We have conducted In house seminar on ' Energy Conservation' with external faculties like National Productivity Council , Atlas Copco, Enercon, Croma Engg and Thermax which was attended by participants from all plants of Auto Sector. Senior executives have attended ' Energy Conservation Meet' organized by CII and visited Reliance Industries, Godrej, ICICI Towers to share energy conservation ideas. Energy Conservation week is celebrated every year from 14th December to 21st December. Poster and slogan competition on Energy saving was conducted in every year.

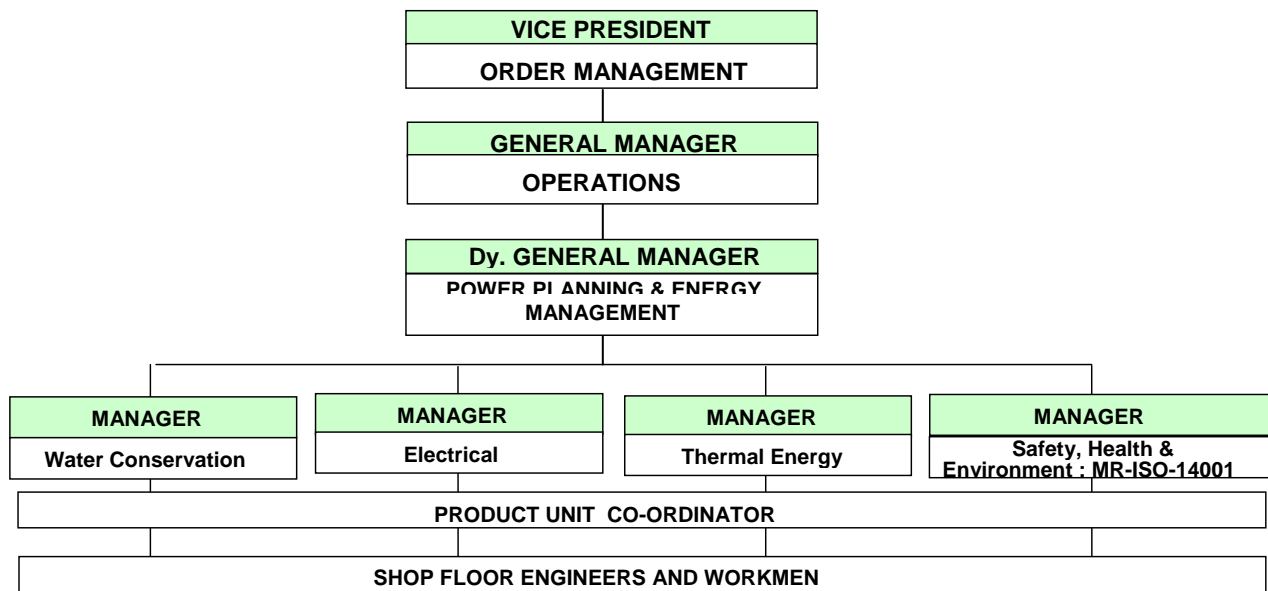
Energy Management policy is displayed every where in the plant for creating the energy conservation awareness. (**Policy Attached**).The company has formed cross functional teams for cost reduction through Energy savings. Each team comprises of Senior Executives as facilitators with members from each product units.(**Cell Structure enclosed**) Safety and Environment Department is also closely attached with Energy Conservation Cell. Top management like president, vice- president, General managers actively participate in the energy conservation program and support the energy conservation plans by providing the necessary budgetary and morale help.

The importance of energy conservation was emphasized through various forums and TPM (Total Productive Maintenance) methodology. By using TPM methodology we have implemented more than 200 kaizens (small improvements) like: -Removal of unwanted motors, Continuous to intermittent operating of motors , Timer for Blowers / Heaters , Providing air pressure regulators, Stopping idle running of motors, Photo cell control for lighting, Combining activities etc.

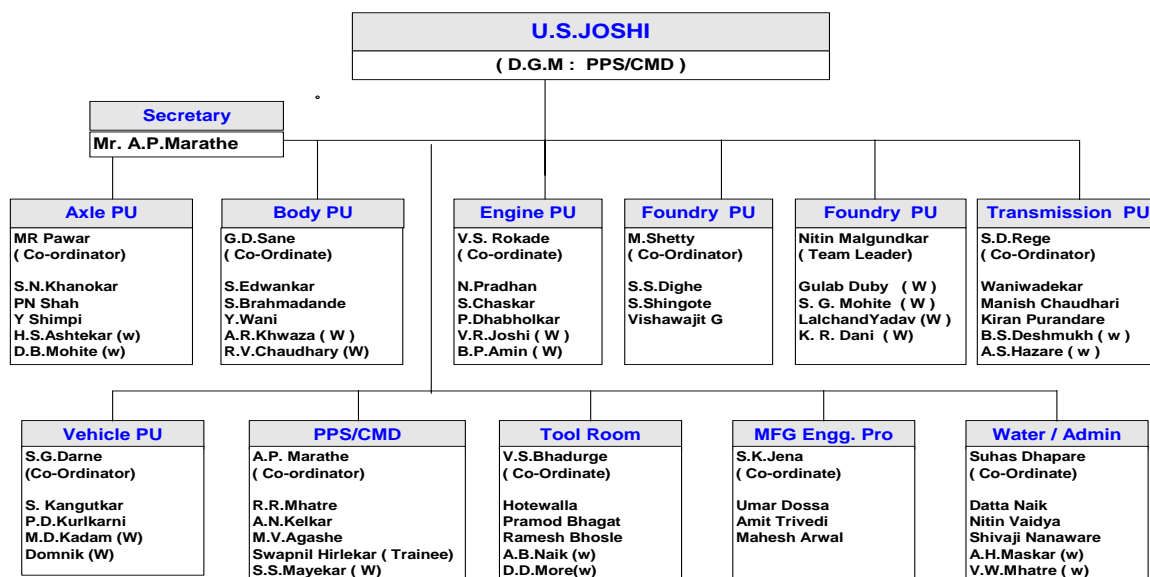
Energy management policy

- Promote Energy saving and conservation of resources.
- Bench mark specific energy consumption with National & International standards, and setting up systems to achieve them.
- Increase use of non-conventional sources of energy & alternate fuel sources.
- Comply with the Energy Legislation and other regulations.
- Conduct regular Energy Audits to reduce energy wastage in all areas.
- Promote awareness among all employees through leaflets, seminars, competitions and company visits.
- Recognise energy conservation initiatives taken by employees and award them.
- Reduce waste generation and promote disposal, reuse and recycling in an Environment friendly manner.
- Make an effort to reduce the cost continuously every year by adopting effective "Energy Management System".

ECON CELL STRUCTURE



Small Group Activities



(W : Workmen)

PPS/CMD : A.D.Kandivli

Energy Conservation Achievements:

During the period between 2003-2005 Mahindra & Mahindra Ltd. has implemented around 320 proposals through Engineering initiatives, workmen's suggestion schemes, Auditors recommendations and TPM methodology resulting into total saving of Rs 589 lakhs with an investment of Rs 143 lakhs. This has resulted in a reduction of 15% in specific electrical energy consumption and 14% in specific thermal energy consumption.

a) Electrical Saving – (Compressed Air)

1. Screw Compressor with Variable Frequency Drive



Before Installation :

For 2200 cfm output compressed air requirement, we were running four compressors having total motor capacity of 630 hp.

Motor Capacity	= 630 hp
Power Consumption per Annum	= 25.32 Lacs kWh
Operating Cost	= Rs. 107.63 Lacs / Annum

After Installation:-

Screw compressor with VFD running in combination with existing compressors having total motor capacity of 516 hp .

Motor Capacity	= 516 HP
Power consumption per annum	= 20.79 Lacs kWh
Operating Cost	= Rs 88.35 Lacs / Annum

Saving = Rs. 19.20 Lacs / Annum

2 . Provided Pressure regulator to supply 75 psi air pressure instead of 95 psi.



Before :

Used of High Air pressure of 95 psi for engine testing for Nut runner and cleaning purposed

After :

Provided low pressure air of 75 psi instead of 95 psi by providing air pressure regulator.

Saving in Units = 9596 units / annum

Saving in Rs = 0.41 Lacs / annum

3. Use of air booster to increase the air pressure for Makino Machine.



Installed Air Booster at Makino Machine in Transmission PU

Before = Supply of Air Pressure - 100 psi
Electrical Consumption = 8964 units/ annum

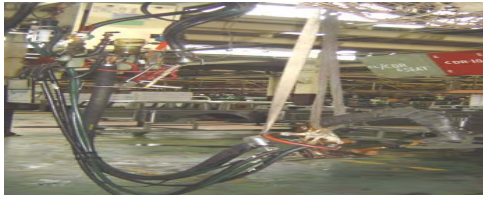
After = Supply of Air Pressure - 75 psi
and increased upto 100 psi by Air Booster only near the m/c

Saving in Electrical consumption = 1,792 units / annum

Saving in Rs = 7,616 per annum (For two Makino machines)

b) Electrical Savings Measures :

1. Integrated (IT) gun in place of Conventional gun for Spot Welding.



Before - Use of conventional spot welding m/c gun

Power Rating :- 150 KVA

Electrical Consumption :- 0.72 Lacs / annum

After- Use of Integrated gun (IT Gun)

Power Rating :- 33 KVA

Electrical Consumption :- 0.16 Lacs / annum



Installed 6 nos of IT Guns.

Total Saving :- 3.37 Lacs KWH / annum

Rs. 14.32 Lacs / annum

2. Installed Steffa Control valve for Optimum utilization of Chilled water in Central AC Plant



Installed Steffa Control Valve for optimum utilization of chilled water at Central Air Conditioning Plant.

Saving :- 3579 KWH / annum

Rs. 0.15 Lacs / annum

3. Conversion of Core baking over from Electrical to PNG in Foundry



Foundry Core Baking Oven which was running on Electrical firing converted to PNG firing by installing fuel efficient burners.

Before :- Electrical Heating

Electrical Consumption – 3.45 Lacs KWH / annum

Cost :- Rs. 14.69 Lacs / annum

After :- PNG Heating

Thermal Consumption – 1.06 Lacs SCM / annum

Cost :- Rs. 9.09 Lacs / annum

Saving :- Rs. 5.60 Lacs / annum

c) Thermal saving & Heat Recovery

1. Conversion of Thermopac from LDO to PNG with Heat Recovery



Before :- Thermopac used for heating of Thermic Fluid
Previously was running on LDO.

LDO Consumption – 415 Lts / day
Cost of LDO – Rs. 25.17 Lacs / annum

After :- Thermopac used for heating of Thermic fluid
Converted to PNG firing with Heat Recovery System.

PNG Consumption – 798 SCM / day
Cost of PNG – Rs. 20.50 Lacs / annum

Saving :- Rs. 4.67 Lacs / annum

2. Heat pump using atmospheric heat for washing machines



Before - Use of 66 kw electrical heaters for water heating in washing machine.

After – Heat Pump using atmospheric heat to rise the temperature of water from 32 ° to 60 ° for washing machine avoiding electrical heaters.

Saving = 1.77 Lacs KWH / annum

= Rs. 7.51 Lacs / annum

3. Reduction in diesel consumption by Supplying Preheated water for Engine.



Reduction in diesel consumption during Engine testing by Supplying of Preheated water thereby reducing cycle time.

Before : Engine testing cycle time 25 Mins

Diesel Consumption / engine :- 3.5 Ltrs

After : Engine testing cycle time 15 Mins

Diesel Consumption / engine :- 2.2 Ltrs.

Saving : 1.3 Ltrs / engine

: Rs 21.63 lacs /annum

d) Process Change

1. Induction heating with press quenching of NGT synchro sleeve eliminating gas Fired muffle furnace.



Before - Heating of NGT synchro sleeve at gas fired muffle furnace & quenching at dunking tank in Heat Treatment Transmission PU.
Operating Cost :- Rs. 8.76 Lacs / annum
(Cost of PNG,quenching oil)



After-Induction heating & press quenching of NGT synchro sleeve at induction quench press 7059 instead of gas fired muffle furnace.

Operating Cost :- Rs. 2.23 Lacs / annum
(Cost of Electricity & polymer)

Saving - RS 6.54 Lacs/ annum

2. Elimination of Baking operation for Cylinder head by using Cold setting Glue .



Before : Hot Setting Glue

More energy consumed in vertical oven for Cyl Head Assy baking Operation.
Baking time :-100 Min.
Baking Temp:-200 Degree C.



After : Cold Setting Glue

Changed in process resulted in elimination of baking Operation.
Replaced Cold setting gum with Cold setting glue.

**Saving :-Electrical 17142 KWH / Year.
PNG :- 55152 Kgs/Year**

Total saving :- Rs.6.00 Lacs /Year

e) Water Conservation

1. Rain Water harvesting in Engine testing pond.



Use of Rain water instead of Municipal water in rainy season.

Provided pipeline from shop floor roof to Engine testing pond along with filter to avoid contamination of water.

Annual saving = 30 days x 10 kl per day x Rs 40

SAVING : 300 KL
: Rs. 0.12 Lacs / annum.

2. Softening of bore-well water and used for sand cooling in Foundry.



Before- Municipal water used for sand cooling in Foundry PU.

Qty. 1440 KL / annum

Cost :- Rs. 0.56 Lacs / annum

Hardness of water:- 40 ppm

After- Borewell water is used for sand cooling after being treated in softening plant.

Qty. 1440 KL / annum

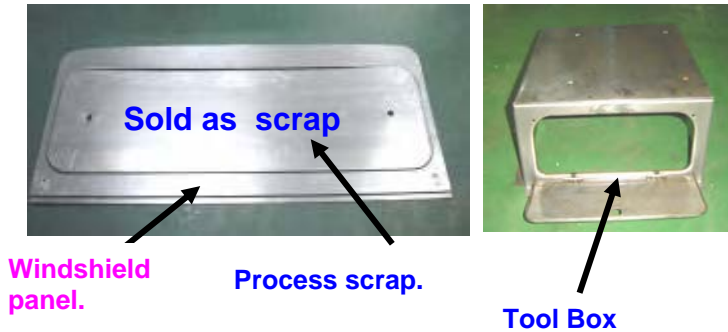
Cost :- Rs. 0.20 Lacs / annum

Hardness of water:- 6 ppm

Total saving : Rs. 0.36 Lacs / annum.

F) Waste Management

1. Made Tool box from Windshield panel Cut out scrap (Scrap Cut out recycled to make smaller part)



Steel cutout of 5.34 Kg is generated in Windshield panel cutting operation

Before : Cut out from Windshield panel is sold as scrap.(1400 mm x 405 mm)

After : Cutout recycled to make smaller parts like tool box.

Scrap weight reduce from 5.34 Kg to 0.34 Kg

Saving : Rs 1.01 Lacs per Annum.

2. Molding Of Paving Blocks From Foundry Waste



Foundry Waste consisting of Iron, Nickel , Manganese etc. was disposed earlier.

Presently mixed with cement and other concrete aggregates to make paving blocks used for road repairing.

Benefits:-

- Utilization of waste material.
- Increased compressive strength of blocks upto 30 N / sq.mm
- Cost of paving blocks from Rs. 30 / sq. feet to Rs. 18 / sq. feet.
- Disposal cost avoided.
- Used for road repairing in other plants.

3. Oil Extractor for Recovering Oil From Chips



Before : Chips with oil wasted.

After : Provide Oil Extractor for Separating the Oil From Chips

Oil Recovery 180 Liter per day = Total Saving Rs. 4.0 Lacs / Year

1. Turbine Air Ventilation System



Roof Extractor provided for ventilation purpose is normally operated by an electrical motor.
Replaced by Turbine air ventilator which rotates on wind velocity.

Before Installation :

Roof Extractor: Electrical Consumption / Annum = 0.11 Lacs kWh

After Installation:-

Turbine Air Ventilator : Electrical Consumption : Nil

Investment : 0.18 Lacs (2 Nos.)

Saving = Rs. 0.44 Lacs / Annum

2. Solar Photovoltaic Street Light installed as non conventional energy source at Kandivli Plant.



Solar Photovoltaic Street Light installed as non conventional energy source at Kandivli Plant. The system consists of Photovoltaic cell with Inverter and battery set.

Installed 2 nos of 22 watts Solar Street Lights.

Saving : Rs. 673 / annum.

Other projects implemented during 2004-2005

- Variable frequency drive for Body top coat Exhaust blower in paint shop.
- Automatic power factor controllers.
- Continuous to intermittent motors by modifying the circuits or using Programmable Logic Controls.
- Online Diesel dispenser system
- Stopping idle running of motors.
- Higher HP Motor to Lower HP Motor.
- Automatic Star Delta Converter.
- Flat belts instead of ' V ' belts for blowers.
- Boosters for High Pressure Compressed Air in machine shop.
- Use direct heating avoiding indirect heating.
- Effective Insulation for Paint Shop Ovens.
- Air pressure regulators.
- Recycling & Reuse of Waste Material.
- Turbine Air Ventilation System.
- Building Management system for effective air conditioning.

Energy Conservation Plans and Targets:

Energy Conservation Measures (Planned)	Anticipated savings In Energy (Rs. lakhs)	Approx. Investment (Rs. Lakhs)	Project commencement & completion year
Centralization of compressor house at utility compressor house	25.00	75.00	2006
Fuel Cells for Power & Heat generation	104	650	2006
Install waste heat recovery for CGC 2 furnace and preheat quench oil	7.72	10.00	2006
Replacing open type Burners by close type burners at SAC Furnace	2.85	4.5	2006
Heat pump for washing machine	8.00	15.00	2007
Vapour Absorption System for air conditioning in Transmission PU.	4.20	21.00	2007
Variable Frequency Drives for Gray Primer Booth Exhaust Blowers in Paint Shop.	10.00	6.28	2007
Solar Water heating system for washing machine	10.00	17.50	2007

All other initiatives like Kaizens, Suggestions will continue and achieved saving to the tune of Rs. 260 Lacs. by the year 2007

By adopting the above energy conservation measures, M & M will be able to achieve the set target of 484 KWH / Eq.vehicles & 0.32 MKCAL / Eq. Vehicle by the year 2007.

1. To reduce the thermal consumption by replacing open type to close type burner at SAC Furnace- Heat Treatment

•BEFORE : Open type burner

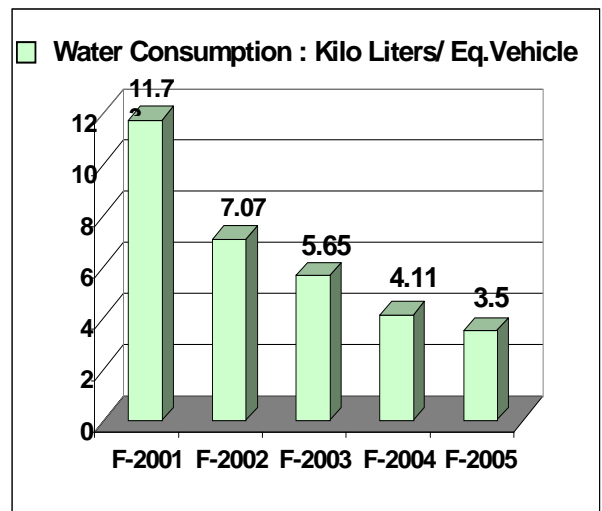
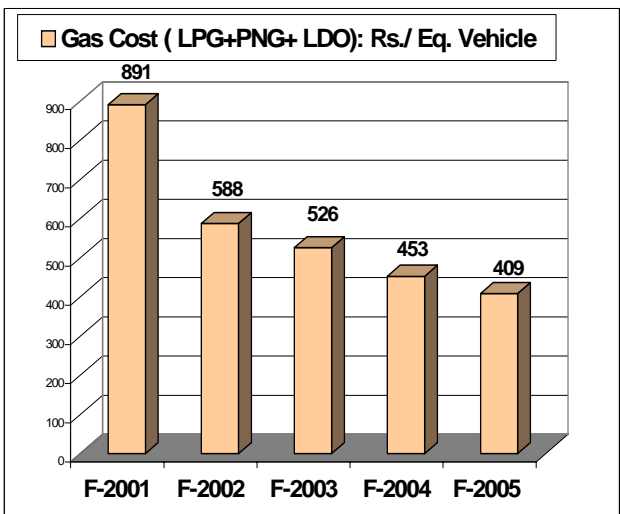
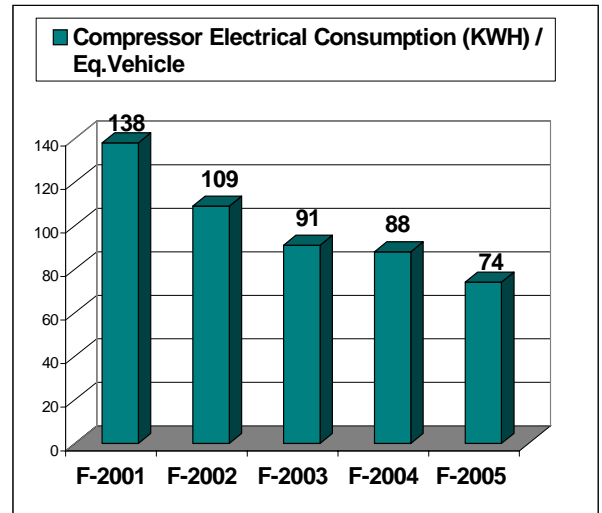
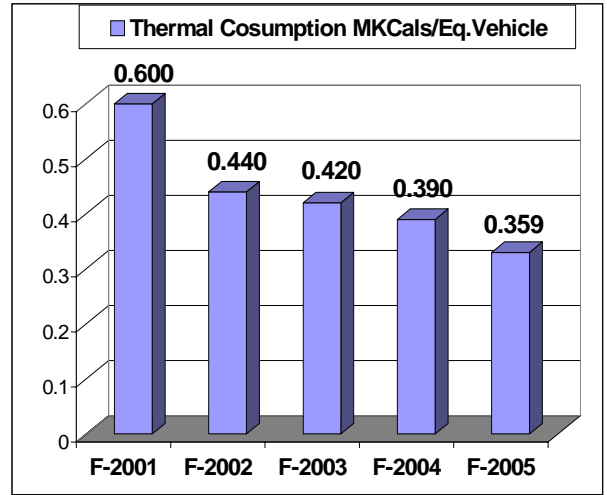
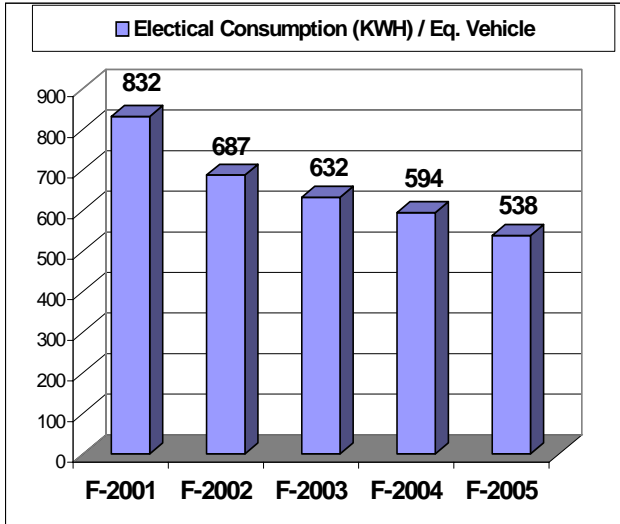
- Open type burner
- No pre Heating of Air
- Old Technology
- Flue gases exhausted to atmosphere.

•After : Closed type burner

- Close Type Burner
- Preheating of air with Recuperator(waste heat recovery from flue gas)
- New Technology
- Multi tube design deliver fuel saving upto 30%
- High spin Flame Geometry provide clean combustion and temp. uniformity
- Easy Maintenance

2. Fuel Cells for Power & Heat generation

3. Compressor with Spiral Control Valve for Variable out put control



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