

TATA MOTORS Limited
Jamshedpur

Unit Profile

Tata Motors, which is India's only fully integrated automobile company with multi-location plants, has product offerings spanning Medium and Heavy Commercial Vehicles, Light Commercial Vehicles, Multi-Utility Vehicles and Passenger Cars. The Commercial Vehicle Business Unit (CVBU) of Tata Motors is India's largest and world's fifth largest commercial vehicle manufacturer. Enjoying nearly 60% overall market share in commercial vehicle sector the company had a turnover of Rs. 24004 crores during 2005-06. As an important part of CVBU of Tata Motors, the plant at Jamshedpur manufactures Medium and Heavy Commercial Vehicles from 7 to 40 ton gross vehicle weight. Having an installed capacity of 66,000 vehicles, the plant produced 83111 vehicles during the year 2005-06. Having acquired the Daewoo Commercial Vehicle plant at South Korea and Hispano Carrocera, a reputed bus manufacturing company in Spain, as also initiating a JV with Marcopolo of Brazil, Tata Motors is set to expand its product range and presence in international market very substantially. Working on TBEM (Tata Business Excellence Model) and integrating its initiatives of Six-sigma, Kaizen, SDT, TPM, WCM, ICR and ISO/TS 16949, the unit is moving fast on track to globalization.

The Automobile unit at Jamshedpur has captive Forge and Foundry divisions which meet its requirement of all critical steel forgings and alloy iron castings. The unit also has a very decent township for its employees and supports community services as a part of its social responsibility towards its employees and local community.

Energy Consumption

Energy Conservation measures are implemented systematically and the Specific Energy Consumption of all areas - Auto, Forge and Foundry divisions has been consistently declining. Also Energy Cost as % of Manufacturing Cost has come down. This resulted in saving of Rs 4.8 crores in energy during 2005-06. Last three years' specific energy consumption figures are as shown below:

PRODUCT	DESCRIPTION	UNIT	2003-04	2004-05	2005-06
Automobile chassis	Electrical energy	KWH / Eq. Vehicle	374	318	287
	Thermal energy	MkCal / Eq. Vehicle	0.258	0.204	0.169
Forge Tonnage	Electrical energy	KWH / MT	576	536	498
	Thermal energy	MkCal / MT	2.84	2.67	2.48
Casting Tonnage	Electrical energy	KWH / MT	1790	1688	1681
	Thermal energy	MkCal / MT	0.302	0.295	0.343
Manufacturing Cost		Rs. Lakhs.	304141	453377	496491
Total Energy Cost		Rs. Lakhs.	8373	8985	9205
Energy cost as % of Manufacturing Cost		%	2.75%	1.98%	1.85%

A graphical representation of the specific consumption is also attached on page .

Energy Conservation Commitment, Policy and Set up

Energy Conservation and energy efficiency in all our operations is a Top Management priority for the unit and an Energy Policy is in place. An Engineering Audit group headed by certified Energy Manager co-ordinate the energy conservation activities in the plant.

Awareness & involvement of people at all levels has been a major plank for implementation of energy conservation measures. **Energy auditing** is a function of the Engineering Audit group. Every year **Targets** are set for the various divisions & **Energy Conservation Action Plans** are worked out. The Specific Energy Consumption & status of action plans is reviewed weekly with divisional coordinators using a *common matrix*

which is shared across all divisions and areas to facilitate *cross-pollination of ideas*. Ideas implemented by groups are encouraged by publication in in-house magazine 'Flashes'. The Team set-up and a sample leaves from in-house magazine are also attached.

Specific consumption of each area is monitored by Engineering Audit on daily basis & is shared with each Divisional Head / divisional Coordinator as well as the Top management. The group also maintains an 'EnergyWeb' on the intranet for use by all employees for reports and analyses.

ENERGY POLICY

We, at Tata Motors are committed to optimum use of all forms of energy by:

- Using energy efficient alternatives, methods, work practices and eco-friendly technologies.
- Minimizing and eliminating wastages in all segments of our operations.
- Creating awareness on energy conservation amongst employees at all levels and using effective Energy Management system for reducing energy consumption and its cost.
- Using renewable energy sources where feasible.

Sep 20, 2004



A P Arya
Sr Vice President
Jsr & Lkw Works

TATA MOTORS



Energy Conservation Projects

Celdek Pad in Air Replacement Plant in Paint shop

Celdek Pad in place of high pressure water spray jet system has been installed in ARP Nos 5,6 &7 also thereby reducing the size of pump from 11 kW to 1.5 kW and saving electrical energy.

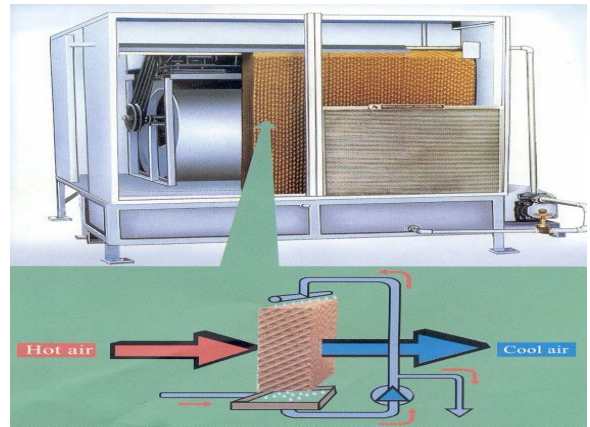
Earlier consumption: $2 \times 11 \times 0.88 \times 16 = 282$ kWh per day

After change, consumption: 39 kWh / Day

Annual Energy saving : 2.24 Lakh kWh

Annual saving : Rs8.08 lakhs

Investment: Rs 12 Lakhs; Payback: 18 months



Installation of 210 HP VFD for second Cold water pump in Engine Shop

Besides other places, VFD was also installed on the standby second Cold Water Pump in Cooling Tower for Engine Machine shop in 2005. This application with 210HP VFD resulted in energy savings as below:

Annual savings elect. Energy: 101000 kWh

Net Saving in energy cost : Rs 3.65 Lakhs

Investment: Rs 4.5 Lakh

Payback period: 15 months



High Speed Cold Core Making Machine

High Speed Cold Core Making machine has eliminated the use of 7 Nos of Shell Core machines which used 28 kW heating elements each.

Annual Energy saving : 9.78 Lakh kWh during first year without automation.

Annual saving : Rs 35.20 lakh

Investment: Rs 700 Lakhs;



Air Pressure Booster for Higher Compressed Air pressure requirement

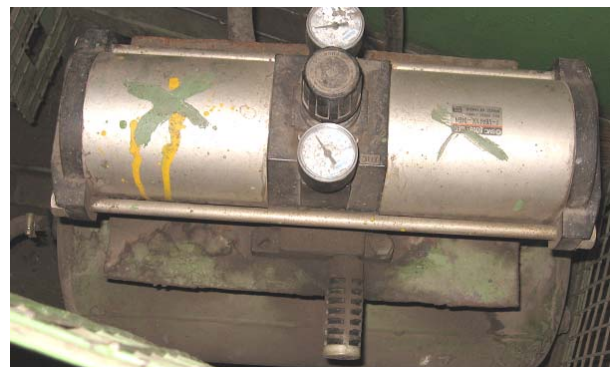
Makino Machine in Engine shop required 90 psi pressure as against 75 psi pressure setting for the entire shop. The requirement of pressure was met by installing a Booster thus preventing increase of supply pressure. A similar application was made in Air-line testing for vehicles in Assy line.

Energy saving: 1.68 Lakh kWh / yr

Saving : Rs 6.05 Lakhs / Yr;

Investment: Rs 2.0 Lakh

Payback : Within 4 month



Installation of Translucent polycarbonate roof sheets in Novus and Forge areas

In order to harness natural day light in the new Novus Assy & Forge Maint areas translucent poly-carbonate roof sheets were installed in 2005.

It has been established that one translucent roof sheet replaces the use of a 250W HPSV lamp during day light hours.

Energy Saving: 26000 kWh/yr, Rs 0.93 Lakh/yr;
Investment: Rs 1.32 Lakh ;
Payback: 17 Months



Installation of Wind Ventilators for improving ventilation

Installation of 100 Nos of Wind Ventilators on roof of Engine Machine shop has prevented requirement of electrically operated exhausters.

Energy saving: 60,000 kWh per year
Saving : Rs 2.16 Lakhs / year
Investment : Rs 7.0
Payback Period: 40 Months



Besides the above, other projects implemented during 2005-06 are:

- * Reduction of baking temp and time by use of QD paint in electrical Ovens.
- * Change-over to lower wattage energy efficient lamps for lighting in the plant & improved luminaries and circuit & control.
- * Low cost automation using timers, interlocking , solenoid valve etc for saving energy.
- * Use of VFD's at 3 more locations for flow control of pumps and blowers and saving energy.
- * Systematic Kaizen exercises small improvements in equipment, improved work practices and improved hearth loading and scheduling resulting in reduced shift running of production lines & certain equipment.
- * Use of energy efficient motors, low-loss transformers replacing old ones.
- * Replaced metallic blade Fans by energy efficient FRP blades for Man-cooler.
- * Reduced thermal losses in Furnaces and Ovens by improved insulation / combustion efficiency.
- * Optimal utilization of Medium Frequency induction melting furnace vis-à-vis line frequency.
- * Technical improvements in process in various areas for reducing energy consumption.

Energy Conservation Plans & Targets

Jamshedpur unit of Tata Motors is committed to further improve its energy performance by exploring new avenues for energy saving on a continuous basis. It is understood that adopting further

improvements in energy efficiency will call for changes in processes involving more investment Some of the major proposals as a part of future plan for achieving targets in energy conservation are:

- (1) Set up for robotic painting with high speed conveyor to reduce cycle time and thus energy consumption besides improving quality.

- (2) Installing and commissioning one more Medium Frequency Induction furnace in Foundry so that old normal frequency furnaces are completely phased out for saving in energy.
- (3) Installing one more high capacity Cold Core Making machine and enhancing and reduce dependence on power intensive shell core machines.
- (4) An exercise has been carried out to evaluate alternate sources of heat and accordingly use of Propane in place of LDO is planned for cost saving.
- (5) Installing VFD's other identified areas to save power.
- (6) Continuing with phased installation of Translucent roof sheets for day lighting in identified areas.
- (7) Installing Celdek pad in place of water spray in smaller Air Replacement plants also in CPS.
- (8) Installing energy efficient billet induction heating and automation of same, replacing old inefficient oil fired R/H furnace.
- (9) Installing smaller size Energy efficient screw compressors for ensuring better capacity matching during different times of the day.
- (10) Converting 2000 lb electrical heat treatment furnaces into thermal heating.

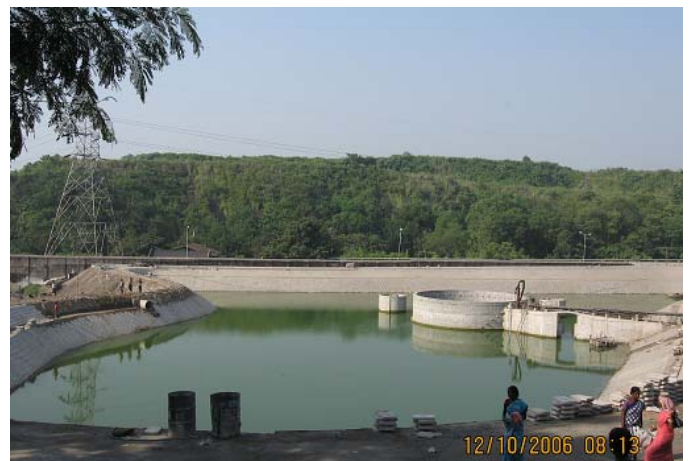
Environment & Safety

Tata Motors was recognized as Company of the Year 2004; and CVBU received JRD-QV award and CII-Exim Bank Award in 2005 as a 'Role Model' for excellence in management. Tata Motors places a high importance on preserving Environment, employee health and safety and is set to attain OHSAS 18000 certification. Company also makes Corporate Sustainability Report under GRI guidelines. Tata Motors was adjudged 6th Best Employer-2004 by Hewitt Associates as also received 'India's Best Employer' 2003 award from Employee Provident Fund Organization under 'Best complying oldest establishment' category.

In line with the Environment Policy of the Company the Jamshedpur unit has a full-fledged department to monitor and coordinate the safety and environment aspects. The Plant and the Town services is certified to ISO 14001 Environment Management System.

A Rainwater Harvesting project at cost of Rs 3.2 crores nearing completion in 2006 will save 197 million gallons of water annually.

A major Centralized Effluent Treatment Plant has been set up. Treating and recycling of water has helped reduce specific water



consumption from 11.86 to 10.52 m³/ Eq. Vehicle produced during 2005-06.

Besides, an industrial incinerator has been set up in 2005-06 for disposal of solid wastes. Centralized Paint Shop has been converted from AED to CED in June, 2003 reducing the effluents substantially.

I. Install / Use energy efficient equipment in place of old inefficient equipment.

Old horizontal air-curtains at entrances and exits to the paint shop using blowers with 11 kW motors were found to be very noisy besides being in-efficient. Top mounted vertical air- curtains with 3 kW energy efficient blowers have been found to do the job better. Replacement of 4 Nos of the air-curtains resulted in a energy saving of 1.34 Lakh kWh in a year amounting Rs 4.82 Lakhs per year. An investment of Rs 1.20 lakhs was paid back in 3 months.

2 Nos old 1000 KVA clophen filled transformers were replaced in 2005-06 with low-loss dry type transformers. Since clophen is hazardous for health and environment, replacing this transformer has fulfilled the environmental obligations besides the sizable Energy cost saving of Rs 2.64 lakh/year.

Similarly, replacing old inefficient (re-wound) motors by new Energy efficient motors has been found to reduce energy upto 15-16 % due to improved efficiency. This was experienced with replacement of balance 2 Nos 30 kW old re-would motors in Hydropack where the energy saved could pay back the cost of new motors in 10 months.

II. Technical improvements in Process and equipment to save energy

Reducing baking time as well as temperature from 140⁰C to 110⁰C by use of QD paint in Frame baking ovens reduced energy consumption by 3.0 Lakh kWh annually amounting Rs 10.80 Lakhs.

Using Cold-box technology instead of shell-core process eliminates use of electrical heating. Installation of a High Speed Core Making machine has resulted replacement of 7 Shell core machines during 2005-06. This reduced the load by 196 kW and saved 9.78 lakh kWh/yr amounting Rs 35.2 Lakhs annually.

Installation of Celdek pad in the suction side of ARP -5, 6 & 7 in CPS has eliminated the requirements of high pressure water spray jet system. With Celdek pad only low-pressure water flow is required. Thus 11 kW pump motor is replaced with 1.5 kW pump unit. This has resulted in energy saving of Rs 8.06 lakhs annually giving payback in 15 months.

Change over to 6562-5 low air pressure burner from existing 5514 closed-type high air pressure burner is found to reduce consumption of furnace oil by 3.5 litres per hour of running resulting in saving of 32 KL of FO amounting Rs 4.75 Lakhs annually.

Besides, using FRP aero-foil blades in place of metallic ones, using low wattage air-circulators in place of man-coolers, reducing wire-feed motor wattage from 180W to 80W in welding guns, etc are other technical improvements resulting in 1.95 Lakh kWh annually amounting Rs 7.02 Lakhs with investment of Rs 1.6 Lakhs.

III. Improved equipment efficiency through modifications and better work practices

Certain work practices when improved help reduce energy consumption per unit of output. Increasing length of 1516 Hardening furnace for increased shift output, reducing heating cycle time per job of ED Paint baking oven from 6 min to 5 min, optimizing utilization of Medium Frequency and Line frequency induction melting furnaces in line with production requirement, continuous running of 4th Spring line and stopping after meeting schedule for the week to reduce start-up energy losses etc are some of the measures implemented resulting reduced energy consumption per unit output. These measures resulted in saving of 4.12 lakh kWh and 474 kL of fuel oil annually amounting Rs 112.73 Lakhs.

IV. Reducing idle running of motors / drives through Low Cost Automation

In automobile industry which has large number of stand-alone equipment it was possible to reduce energy consumption in individual equipment by low cost automation and often, simple improvements with the involvement of the workmen & line supervisors in the shop. These include installation of Timers to save energy during non-working period for coolant motors, hydraulic motors and auxiliary units of machine tools; Automatic pneumatic-cylinder operation of dust collector No 6 after finishing cyl block castng.

These measures resulted in annual savings of Rs 12.37 lakh by investing Rs 0.15 lakh with a pay-back period of less than a month only.

V. Use of VFD's for Flow Control of pumps and blowers

Using Variable frequency drives to change flow for a pump or blower instead of using conventional throttling of valve or damper has been made at 64 locations at the plant. It is now well known amongst supervisors on the shop floor level as a means to save energy. During 2005-06, 4 (four) more VFD's were installed. Besides reduced energy consumption, the equipment have been running very smoothly due to reduction in speed. An investment of Rs 7.5 lakhs was paid back in 15 months for these applications by energy saved.

VI. Harnessing natural Daylight and Wind energy

Use of natural daylight in manufacturing areas where feasible has become a norm in the plant as it has been assessed that one such sheet replaces the use of a 250 W HPSV lamp during daylight hours. 44 Nos more of translucent roof sheets were installed in Novus and Forge shops.

Also, installation of 100 Nos of Wind Ventilators in Engine machine shop for improving ventilation has prevented requirement for electrically operated exhausters. These measures have saved 88,000 kWh of energy annually with an investment of Rs 8.32 lakhs being paid back in 30 months.

VII. Reduced Energy in Compressed Air

The approach in compressed air energy has been --- reducing generation cost by Optimal running of 5500 cfm Centac Compressors; Minimal running of old inefficient reciprocating compressors by introduction of energy efficient screw compressors; Matching of load by introducing smaller size of screw compressors; optimizing the demand and supply by installed Controllers for various pressure requirements of different areas; pressure booster for small exceptionally high pressure requirements; Modifying pipe lines in distribution network for reducing the losses .

Installation of one more energy efficient 1000 cfm compressor in Forge(O/C), a pressure booster for air-line checking for vehicles, elimination of compressed air requirement in LM drying operation and modification of distribution lines in Truck-I and CPS were carried out during the year.

Besides above, a 'Compressed Air Zero-leakage Competition' amongst all production shops during May'06 helped bring down leakage to near zero level in some of the areas. Regular comprehensive leakage audit is carried out regularly in all the shop and subsequent prompt corrective action is taken to prevent the compressed air losses.

All above approaches & measures resulted in saving of 15.5 Lakh kWh in compressed air energy during the year 2005-06 which amounted to Rs 55.8 lakhs, with investment of Rs 13.2 lakhs.

VIII. Reduce thermal losses in Furnaces

A good amount of energy was saved by preventing heat losses due to poor insulation, openings, damaged refractory, discharge door through overhauling & modifications, renewing of insulation, replacing burner blocks of furnaces.

Saving in energy of Rs 5.11 lakhs/year was achieved during 2005-06 through reduction in thermal losses & increase in overall efficiency of furnaces.

IX. Change over to energy efficient & lower wattage lamp

Energy efficient lamps like CFL, Poly lux tubes & LED lamps are fitted in remaining areas of shops & offices, machine control panels by replacing conventional tube and incandescent indicator lamps. These helped in lower energy consumption with improved illumination & better aesthetics.

These measures have resulted in further annual saving of Rs 4.86 lakh during 2005-06.

X. Improved lighting circuit and control.

Further Installing 5 Nos time switches on O/H light circuits of Forge Shop so as to switch these OFF in the morning without fail saved Rs 0.78 lakhs annually with an investment of Rs 8000/- only.