

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 sixth largest commercial vehicle manufacturer. Enjoying nearly 60.4% overall market share in commercial vehicle sector the company had a turnover of Rs. 20483 crores during 2004-05. 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 60,000 vehicles, the plant produced 83035 vehicles during the year 2004-05 to meet the buoyant demand in commercial vehicle industry. Having acquired the Daewoo Commercial Vehicle plant at South Korea and Hispano Carrocera, a reputed bus manufacturing company in Spain, Tata Motors is set to expand its product range and presence in international market substantially. Also, integrating its interventions of Six-sigma, Kaizen, TPM, WCM, ICR and ISO/TS 16949, the unit is set to become a global player to reckon with.

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 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 7.60 crores in energy during 2004-05. Last three years' specific energy consumption figures are as shown below:

PRODUCT	DESCRIPTION	UNIT	2002-03	2003-04	2004-05
Automobile chassis	Electrical energy	KWH / Eq. Vehicle	493	374	318
	Thermal energy	MkCal / Eq. Vehicle	0.337	0.258	0.204
Forge Tonnage	Electrical energy	KWH / MT	626	576	536
	Thermal energy	MkCal / MT	3.21	2.84	2.67
Casting Tonnage	Electrical energy	KWH / MT	1926	1790	1688
	Thermal energy	MkCal / MT	0.323	0.302	0.295
Manufacturing Cost		Rs. Lakhs.	237179	304141	453377
Total Energy Cost		Rs. Lakhs.	8083	8373	8985
Energy cost as % of Manufacturing Cost		%	3.41%	2.75%	1.98%

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

Installation of Medium Frequency furnace for melting

A Medium Frequency furnace for melting iron has been installed. Improved design for charging, reduced de-slagging time and reduced melting time has reduced energy consumption.

Before Installation:

Energy Cons 646 kWh / MT of molten metal

After Installation:

Energy Cons 540 kWh / MT of molten metal

Savings Achieved : Rs 105 Lakhs per annum

Investment : Rs 330 Lakhs

Payback : 38 Months



Installation of Energy Efficient Wieshaupt Burners

Use of fuel efficient Weishaupt burners with modulating regulation has been made in three more ovens in Centralised paint shop. This has resulted in saving of 144 KL of LDO per year.

Energy cost saving : Rs 25.9 Lakhs per year

Investment : Rs 24.0 Lakhs

Payback Period: 11 months



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 3 & 4 also thereby reducing the size of pump from 11 kW to 1.5 kW and saving electrical energy.

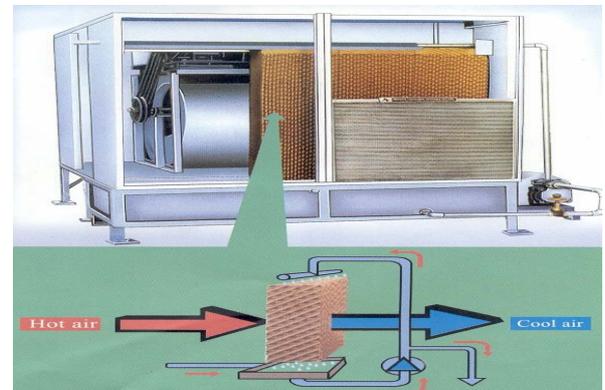
Earlier consumption: $2 \times 11 \times 0.88 \times 16 = 282$ kWh per day

After change, consumption: 39 kWh / Day

Annual Energy saving : 1.46 Lakh kWh

Annual saving : Rs 5.33 lakh

Investment: Rs 8 Lakhs; Payback: 18 months



Rad-Heat Gas Heating in place of Electrical in 3 Ovens

Remaining 3 Ovens for coating sand heating in Shell core shop in Foundry which earlier had 90 kW electrical heater each, have been replaced by Radiant Heat Gas heating system.

Earlier energy consumption: 1112 kWh/Day each

Now, LPG consumption: 88 kg/Day each

Annual savings elect. Energy: 8.61 Lakh kWh

Net Saving in energy cost : Rs 18.48 Lakhs

Investment: Rs 17.7 Lakh

Payback period: 11 months



ControlAir system for Compressed Air in Outer Complex

ControlAir systems for demand side pressure management of Compressed Air in 5 more areas in Outer Complex has resulted in reduced pressure requirement by 4-8 psi in different user shops due to less than 1 psi variability.

Energy consumption reduced by 1967 kWh/Day

Energy saving: 6.0 lakh kWh / Year

Annual saving: Rs 21.90 Lakhs

Investment : Rs 20 Lakhs

Payback period: 11 months



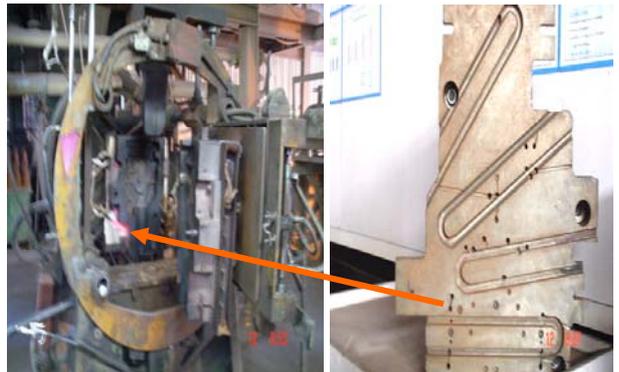
Modification of Core box and elimination of intermediate heater plate

In shell core machine core box was mounted on heater plate and heat was transferred from heater plate to core box. In 2004-05, the Core box for new 6BT was modified to eliminate the heater plate & thereby reducing the wattage of heating elements.

Earlier: $9 \text{ kW} + 2 \times 1.92 \text{ kW} = 12.8 \text{ kW}$

Now : $4 \times 1.92 \text{ kW} = 7.6 \text{ kW}$

Annual saving: Rs 12.78 lakhs for 6 machines

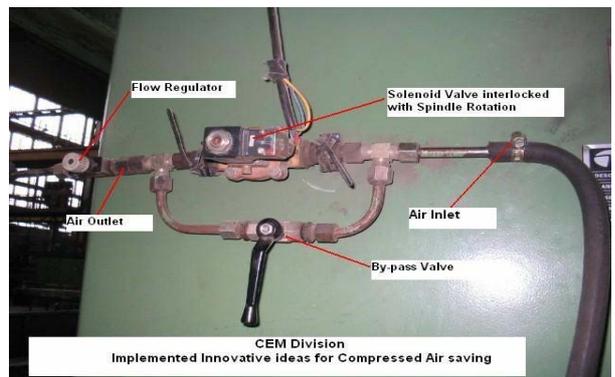


Use of Solenoid operated valves for controlling compressed air

Solenoid operated valves interlocked with machine spindle running were installed on 6 CNC machines at the initiative of men on shop floor so that compressed air is saved during non cutting cycle. 44 kWh/Day of energy in compressed air was saved for each machine.

Annual saving was 79000 kWh amounting Rs 2.78 lakh at an investment of Rs 0.15 lakh

Payback period : 1 month



Briefing on the Projects under taken during 2004-05

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

Changing technology for melting furnaces from normal frequency (50 Hz) to Medium Frequency (270 Hz) is known to improve energy efficiency. Reduced melting time combined with faster bogey charging system & slag removal system has been found to reduce energy consumption by 100 kWh/MT of molten metal. In the first phase, an MF Furnace of 120 MT/day capacity was installed during 2004-05 with an investment of Rs 330 Lakhs resulting in annual energy saving of 28.8 Lakh kWh amounting to Rs 105 Lakhs/year giving payback of 38 months.

2 Nos old 1000 KVA clophen filled transformers were replaced in 2004-05 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 2.66 lakh/year.

Replacement of 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 4 Nos 30 kW old re-would motors where the energy saved could pay back the cost of new motors in 17 months.

Similarly, installation of 3 nos. fuel-efficient Weishaupt burners on oven in CPS has saved 144KL of LDO during the year amounting Rs 25.92 Lakhs at an investment of Rs 24 Lakhs.

II. Low cost automation for energy saving

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 pumps, exhausters, power-packs of riveting machines, hydraulic motors and auxiliary units of machine tools; Pneumatic-cylinder operation of duct gates for rotoclones; Using Energy saver-cum soft starter / Cyclic load automatic Del-Star converter for presses.

These measures resulted in annual savings of Rs 16.43 lakh by investing Rs 2.69 lakh with a pay-back period of 2 months only.

III. Process changes / modifications to save energy

Developing and converting of bore-core making for Cylinder block from shell-core process to cold box process eliminated electrical heating load of 80 kW resulting in annual energy saving of 4.32 lakh kWh amounting Rs 15.77 lakh at development cost of Rs 2.1 lakh.

Similarly, modification of pattern plate and eliminating heater plates from 6 Nos shell core machines helped in reducing the rating of heating elements from 12.8 kW to 7.6 kW and resulting in annual energy saving of 3.5 lakh kWh.

Besides, installation of Celdek pad in the suction side of ARP -3 & 4 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 5.33 lakhs annually giving payback in 18 months.

IV. Improved work practices & increased equipment productivity

Certain work practices when improved help reduce energy consumption. Systematic Kaizen exercise eliminating need for a third shift running in Rivet line of Frame shop; reduced number of shifts in Forge shop; Improved hearth loading and proper scheduling resulting in improved thermal efficiency oh heat treatment operations; Increased heat input thereby reducing discharge time of pusher furnace; Modification of slot furnace in Spring shop to increase shift output thereby reducing fuel consumption per unit.

All these simple measures resulted in energy saving of 13.67 lakh kWh and 524 KL of fuel oil during 2004-05 amounting to annual saving of Rs 112.78 lakh with an investment of Rs 2.75 lakh in all.

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 61 locations at the plant. It is now well known amongst supervisors on the shop floor level as a means to save energy. During 2004-05, 3 (three) 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 4.0 lakhs was paid back in 4 months for these applications by energy saved.

VI. Installing and using dedicated smaller facility instead of running larger centralized facility

Earlier a centralized chilling plant was being run for entire Paint Shop at 22 deg C and meet the lowest temperature required in distant Paint Kitchen. By installing a smaller capacity dedicated chilling plant for Paint Kitchen to maintain the required 25 deg C enabled the centralized chilling plant to be run at 29 deg C required for CED paint setup thereby reducing the load and energy consumption.

Similarly, a small 2.2 kW cooling pump for a critical Boring M/c could avoid running central cooling tower in C shift.

These measures could save 1.37 lakh kWh in energy during 2004-05.

VII. Reduced Energy in Compressed Air

The approach in compressed air energy has been --- reducing generation cost by Optimal running of 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 installing Controllers for various pressure requirements of different areas ; Modifying pipe lines in distribution network for reducing the losses .

5 nos. additional ControlAir System have been installed in different areas of Outer Complex during the year 2004-05 & now compressed air is supplied in all the shops of Jamshedpur unit through ControlAir System at different pressure as per the individual shop's requirements.

Besides above, 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 19.0 Lakh kWh in compressed air energy during the year 2004-05 which amounted to Rs 69.5 lakh, with investment of Rs 45 lakhs.

VIII. Reduce thermal losses in Furnaces/ Ovens

A sizable amount of energy saved by preventing heat losses due to poor insulation, openings, damaged refractory, bigger volume of furnace through overhauling & modifications, renewing of insulation, fitting of recuperator & volume reduction of furnaces.

Saving in energy of Rs 76.38 lakhs/year was achieved during 2004-05 through reduction in thermal losses & increase in overall efficiency.

IX Use of thermal heating in place of Electrical heating

A 90 kW Electrical heating in one oven for sand coating in Shell Core Shop was replaced by a Radiant Heat tube LPG heating element during 2003-04. Remaining 3 nos 90 kW each similar electrical ovens have been replaced during 2004-05. This gas-based heating system is found to be very efficient. The exhaust gas from the system exits only at 170-180 deg C. The workmen are also very happy with the system. This has resulted in saving in electrical energy by 8.61 lakh kWh and net energy cost saving of Rs 18.48 lakh/annum with investment of Rs 17.7 lakh and hence pay back period is less than a year.

X. 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 1.00 lakh during 2004-05.

XI. Improved lighting circuit and control.

Installing further time switches on 5 Nos O/H light circuits of Engine Shop so as to switch these OFF in the morning without fail. These measures saved Rs 1.8 lakhs annually with an investment of Rs 6000/- only.

Further, changing over to electronic ballasts for tube lights working for more than 16 hrs a day makes economic sense which with the energy saving, recovers the cost of electronic ballast within 12 months.

XII. Harnessing Natural Day light

We have further installed translucent roof sheets selectively in location to harness natural day light in place of high bay lighting during the day time. It has been observed that 1 translucent sheets gives much more light than one conventional high-bay fitting (250 W) during day time between 8.30 am to 5.30 p.m, which makes environment more lively besides saving electrical energy. 60 Nos. of these sheets have been further installed during 2004-05 taking the total to 493 Nos.

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. Some of the major proposals as a part of future plan for achieving targets in energy conservation are:

- (1) 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.
- (2) Installing high capacity machine and enhancing Cold Box core making capacity and reduce dependence on power intensive shell core machines.
- (3) Installing VFD's in Engine Cooling Tower , Stage I degreasing and other identified areas to save power.
- (4) Continuing with phased installation of Translucent roof sheets for day lighting in identified areas.
- (5) Installing Celdek pad in place of water spray in remaining Air Replacement plants in CPS.
- (6) Installing energy efficient billet induction heating, replacing old inefficient R/H furnace.
- (7) Continuing with phased Conversion of existing metallic blade to FRP blade for man-coolers .
- (8) Installing smaller size Energy efficient screw compressors for ensuring better capacity matching during different times of the day.
- (9) Converting 2000 lb electrical heat treatment furnaces into thermal heating.
- (10) Trying alternative fuels for reducing energy cost and improving environment.