Hindalco Industries Limited
Belur Works, West Bengal

i). Unit Profile :

The Belur Unit of Hindalco Industries Limited is located in the State of West Bengal and is just 5 kM from the city Kolkata. The plant was established in the year 1938 and is the oldest aluminium sheet rolling plant in the country. It has gradually grown over the years and currently has a capacity of 45,000 tonnes per annum. The plant had a turnover of Rs 519 crores during 2004-05. It is one of the most diversified aluminium sheet factories in the world capable of manufacturing 32 different alloys and supplying to the Defence, Packaging, Bottle Closure, Pressure Cooker, Automobile and Building industry throughout India. The unit is ISO 9001, ISO 14001 and OHSAS 18001 certified. The current employee strength is 800.

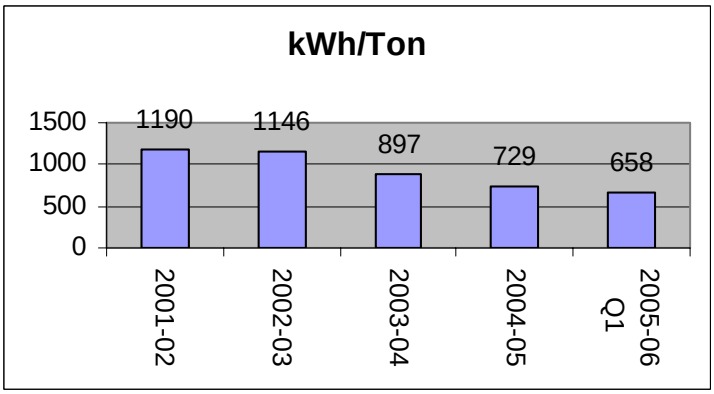
ii). Energy Consumption :

The plant consumes Energy/fuel in three forms v.i.z Electricity, Furnace oil and Coal Gas. During the year 2004-05 the Energy Cost comprised about 21.5% of Plant manufacturing cost. This was 31% in 2002-03. The Electricity cost has come down from 26.4% in 2002-03 to 17.7 % in 2004-05. The thrust therefore has been in reduction of Electricity consumption. The plant has been reducing its specific energy consumption year after year. This has been possible of the following:

1. Passion for Excellence
2. Committed Senior Management Team
3. Committed Work Force
4. Structured approach towards reduction in losses and improvement in productivity

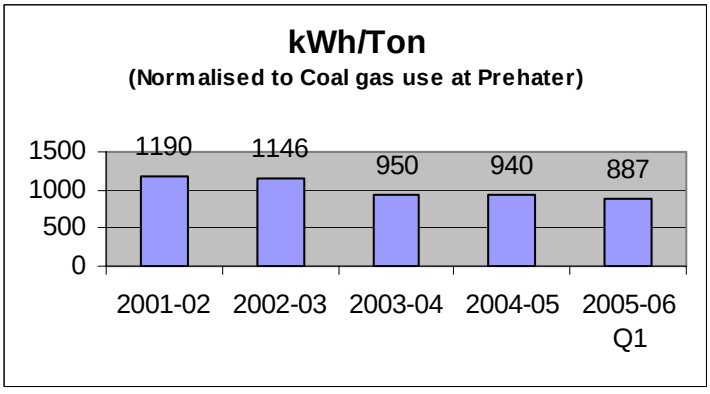
Specific Energy Consumption

PLANT OVERALL ENERGY CONSUMPTION

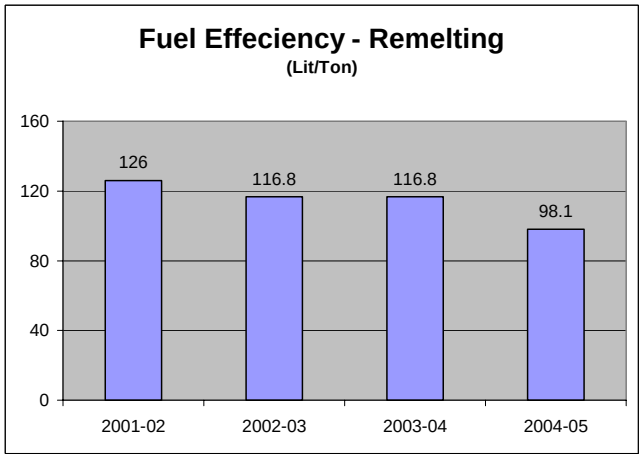


Electricity consumption has come down rapidly due to

i) implementation of large number of EC projects
ii) Operational efficiency improvement
iii) Implementation of Fuel switching project

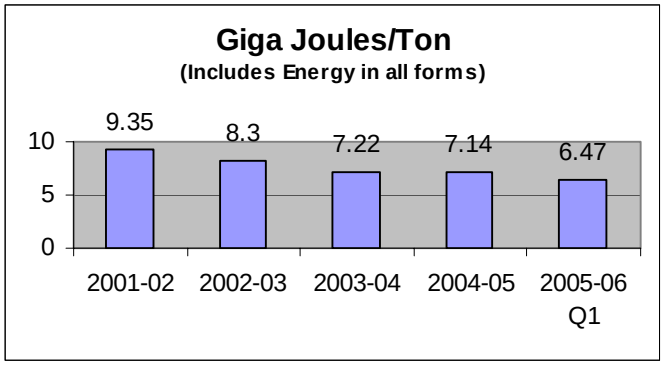


After the Energy Substitution project (Conversion of Preheating Furnace from Electrical to Coal gas heating it was felt necessary to convert the coal gas consumption in kWh equivalent for the purpose of specific energy consumption comparison



Improvement in Remelt Fuel efficiency due to:

1) Increase in productivity
2) Modification and tuning of Combustion system



Again it was felt necessary to compare the Total energy consumed in Giga Joules per Ton. This is also because Fuel efficiency and Power Efficiency were so long treated separately. Hence monitoring in terms of a composite Index of Jiga Joules per ton was started.

Improvement in Area wise Specific Energy Consumption

Activity wise specific consumption		Base Period (Apr - Jun 03)		Result Period (Apr - Jun 05)		Improvement (per Ton)	
		Giga Joules	Rs	Giga Joules	Rs	Giga Joules	Rs
Remelting	On Remelt Tons	5.99	1610	3.75	1251	2.25	359
Hot Rolling	On Gross Hot Rolling Tons	1.12	1366	1.97	984	-0.85 **	382
Annealing	On Gross Annealed Tons	0.56	683	0.51	626	0.05	57
Homo	On Gross Homogenised Tons	1.08	1319	0.99	1204	0.09	114
Cold Rolling & Fin	On Gross Cold Rolled Tons	0.70	860	0.53	647	0.17	213
Utility	On Gross Plant Tons	0.30	370	0.24	290	0.07	81

Note : (a) Increase in energy consumption due to energy substitution from Electricity to Coal Gas
(b) All cost calculated based on present prevailing energy prices

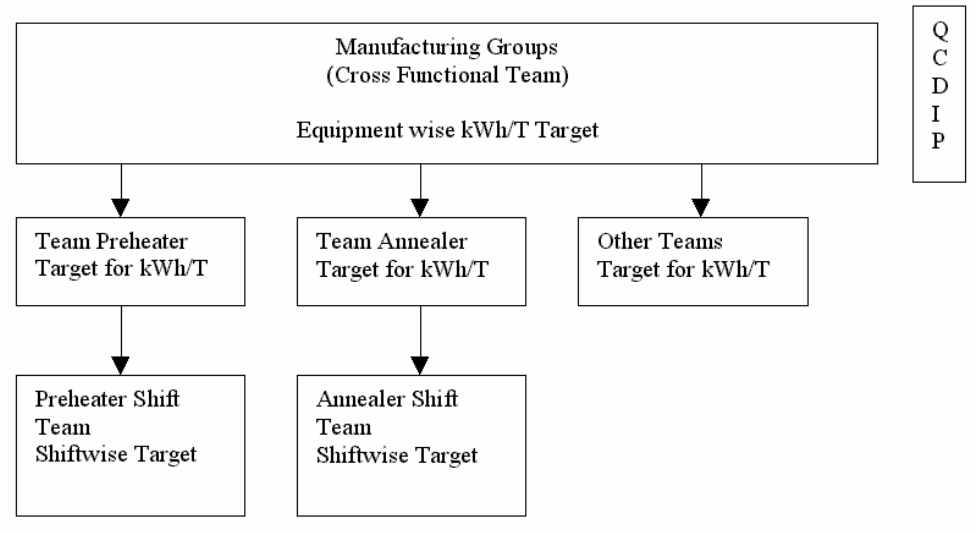
iii). Energy Conservation Commitment, Policy and Organisational Set-up

Energy Conservation Commitment is driven through Corporate Energy Policy. The same is enclosed. The unit has adopted this policy in its day to day activity and has integrated the same. The unit has a designated Energy Manager for facilitating all activities related to Energy Conservation.

Facilitating Structure and Team Based Organisation

The plant has been segregated into four Manufacturing areas and support functions. Each of the Manufacturing Groups are Cross functional empowered teams with defined area of operation, clear objectives and targets.

Each of the Areas in turn has number of operating teams under them. There are a total of 36 such cross-functional operating teams. Each of the team has its QCDP (Quality, Cost, Delivery & productivity) targets derived from the unit objectives. Each team maintains details of Abnormalities identified/removed, details of meeting held, Why-Why analysis, Innovations and weekly/monthly QCDP data.
Thus the Preheater & Annealer teams maintain kWh/T data as part of their cost data. Again they monitor Tons/Load, idle time etc under productivity.



iv). Energy Conservation Achievements
Details of major action taken during 2004-05:

More focus was on improving productivity/capacity utilisation and reducing losses. Some big energy saving projects were undertaken during year which has not only helped the unit in improving the specific energy consumption but also to reduce the energy cost.

Cost in Rs per Ton of Plant output

	2002-03	**2003-04**	**2004-05**
Electricity (Rs/Ton)	5507	4552	3780
Fuel (Rs/Ton)	1011	890	797
Total Energy Cost (Rs/Ton)	6517	5442	4576
Energy cost as % of Manufacturing Cost	31	29	21.5

DETAILS OF PROJECT EXECUTED DURING 2004-05
Hindalco Industries Limited, Belur Works

Elimination of MG set of Bliss Cold Rolling Mill

The Bliss Cold Rolling Mill had MG sets for its DC Main Drive and Coiler Motor. Although the drive motors of the MG set were synchronous motors and were used for Power factor correction, the same were inefficient. In a rolling mill typically there are time gaps between rolling of coils and during this time the MG set used to operate under no-load condition leading to loss of energy. Also there were separate cooling blowers required for cooling of the drive motor and the DC generator. Lot of power was also required for the field excitation. Thus the project for replacement of the MG set with Thyristor DC drive was taken up.

MG SET FOR 1000 HP MOTOR ELIMINATED

MG SET FOR 400 HP MOTOR ELIMINATED

MOTOR COOLING BLOWERS ELIMINATED

Savings per Annum = 5.40 Lakh units = Rs. 23.0 Lakh per annum
Investment = Rs. 110 Lakhs
Simple Payback = Rs. 4.8 Years

Other Benefits :
i) Extra Floor space generated
ii) Reduction in Maintenance time & cost
iii) Increase in reliability & productivity

Conversion of Second Ingot Preheating Furnace from Electricity to Coal Gas Heating.

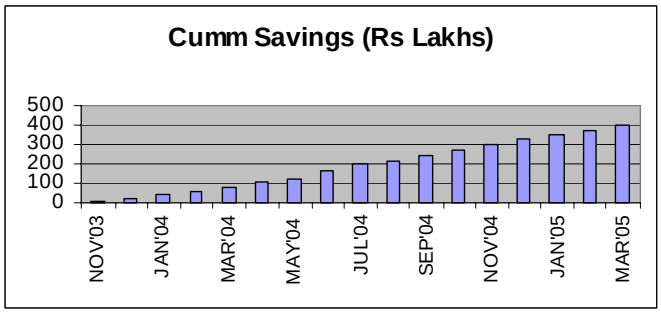
Background :

Ingot Preheating operation (prior to Hot Rolling) is energy intensive and traditionally this is done in electrically heated furnaces. The Belur unit has three such furnaces of 1600 kW each. Preheating alone used to consume about 30% of the total electricity consumption. While expensive estimates were made in the past for conversion of these furnaces with radient tube burners, the first furnace was converted in 2003-04 using direct fired coal gas burners. After success of the first conversion and after establishing the preheating practices under the new condition, the second furnace was converted in 2004-05. This has resulted in reduction in electricity consumption and huge cost savings. This has also reduced the Green House Gas emission per ton of preheating.

Comparison of Efficiencies

Condition	**Efficiency**	**Cost**
Electrical Heating Specific electricity consumption with electrical heaters	260 kWh/Ton	Rs. 1144 /Ton
Coal Gas Heating Specific electricity consumption with coal Gas heating Electricity consumption for circulating & combustion fans	16 Therms/Ton 20 kWh/Ton	 Total = Rs. 474/Ton
Savings		Rs. 664/Ton

Project Details:
Investment : 25 Lakhs
Savings in Electricity Consumption = 47.25 Lakh units
Savings per Annum = Rs. 155 Lakhs (after deducting costn of gas used)
Simple Payback = 2 Months



Replacement of Old Motors with Energy Efficient Motors

The preheating furnaces have each 6 nos of recirculation fans. These are 15 HP each, old and have undergone rewinding a number of times. All motors of two furnaces were replaced with new efficient motors.

Total numbers of pumps replaced = 12
Investment = Rs. 4 Lakhs
Savings Achieved = 0.8 Lakh units/Annum = Rs. 3.4 Lakhs
Simple Payback = 15 Months

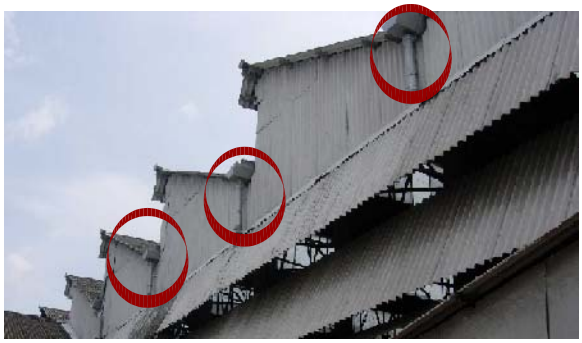
Optimisation of Remelt Combustion System

SL NO.	Detailed Energy Audit Recommendation	Action taken	Saving as Estimated by Auditor	Savings post implementation of actions
1	Improve Remelt Melter combustion efficiency from the present 60% to 75%.(Maintain 5% excess oxygen as against measured 8.3%)	Fine tuning of combustion system done to limit O2% in the range 4-4.5%. Portable analyser procured and weekly monitoring being done.	222.4 KL/Annum = Rs 26.7 Lac (Based on reduction in excess O2 from 8.3 to 5%)	104 KL/Annum = **12.48 Lac** (Based on reduction in excess O2 from 6 to 4.5%)
2	Improve Remelt Holder combustion efficiency from the present 45% to 75%.(Maintain 5% excess oxygen)	Fine tuning of combustion system done to limit O2% in the range 4-4.5%.	33.6 KL/Annum = Rs 4.03 Lac (Based on reduction in excess O2 from 11.3 to 5%)	27 KL/annum = Rs 3.4 Lac
3	Supply hot combustion air to Holder at 350 deg C	Hot air from recuperator outlet partially diverted to holding furnace. Temperature of combustion air at holder : 250 deg.c	49.63 KL/Annum = Rs 5.96 Lac (Based on increase in comb. Air temp. from ambient to 350 deg.c)	30 KL/Annum = Rs 3.6 Lac (Based on increase in comb. Air temp. from ambient to 250 deg.c)
4		Modification in the combustion logic of melting furnace to turn down the burners by 50% in the two melting burners during transfer of metal from melter to holder. (essentially an idle time of 25 minutes / transfer when there is no input into the furnace)		**172 KL/Annum = 20.6 Lac** (Based on improvement in fuel eff. By 4.5 litre/t)

Rain water Harvesting

The plant usually depends upon ground water to meet all its water requirement. The input water is treated in a water treatment plant far making it suitable for industrial use. This process starting from pumping of ground water, its treatment and then distribution consumes lot of energy. The plant utilised the captive pond to hold the rain water that is collected from the overhead roof. Thus during rainy season it has able to eliminate lifting of ground water and its treatment by using the rain water directly in the process.

Captive Pond



Collecting the rain water from factory shed

Average Savings : 75 KL/Day
Energy saved : 80,000 units per annum = Rs. 3.6 Lakhs
Investment : Rs. 2 Lakhs
Simple payback : 7 Months