

**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 the production during 2005-06 was 54,211 tonnes with a turnover of Rs. 630 Crores. It is one of the most diversified Aluminium Sheet Factories in the world capable of manufacturing a wide variety of 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.

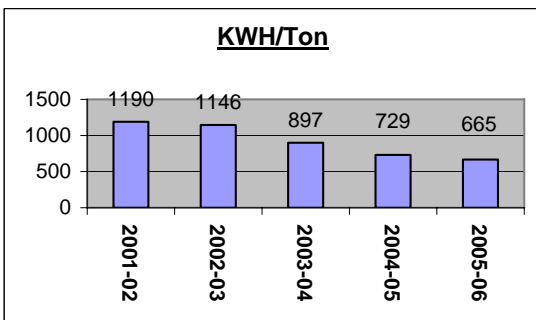
The Plant key processes are :-

- a) Remelting and Casting
- b) Hot Rolling
- c) Cold Rolling & Finishing

ii). Energy Consumption :

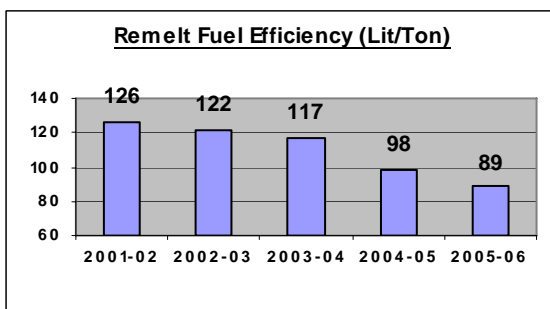
1. The Plant consumes Energy in three forms v.i.z Electricity, Furnace Oil and Coal Gas. During the year 2005-06 the Total Plant Energy Cost comprised about 21.5% of Plant Manufacturing Cost. This was 31% in 2002-03 and 29% in 2003-04. This is inspite of steep increase in the Unit Rate of Purchased Electricity and Fuel Price. The Plant has implemented a large number of Energy Efficiency Projects including Fuel Switching, Process Modifications and Process Improvement through small group activity. Major Projects already having being executed during the past few years, the present thrust is on Process Optimisation, Sustenance and Involvement of more people. Thus during the year 2005-06, the Plant has also initiated Kaizen Scheme as a measure to encourage and enhance Energy Improvement initiatives.

**Specific Energy Consumption :
PLANT OVERALL ENERGY CONSUMPTION**



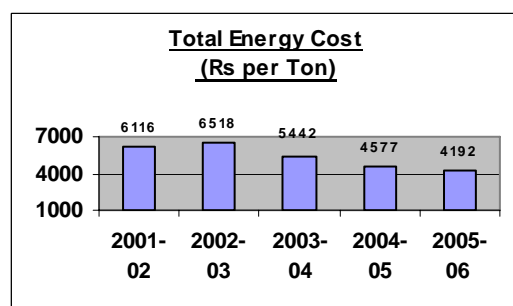
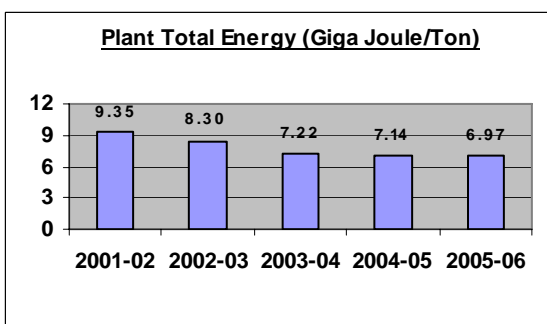
Electricity Consumption has come down rapidly due to

- i) Implementation of large number of EC Projects.
- ii) Operational Efficiency improvement.
- iii) Implementation of Fuel Switching Project.



Improvement in Remelt Fuel Efficiency due to:

- 1) Increase in Productivity.
- 2) Modification and tuning of Combustion System.



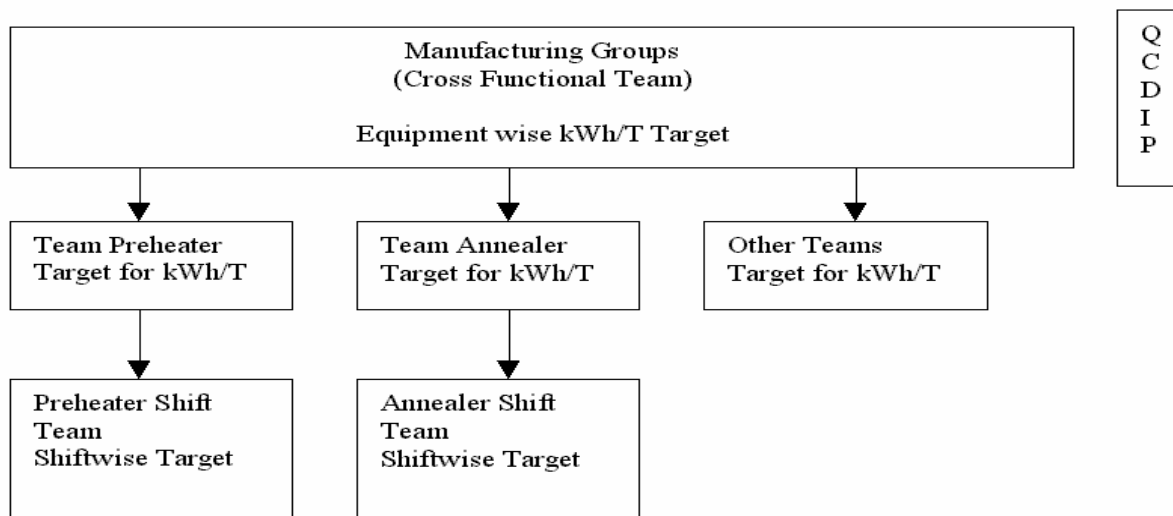
iii). **Energy Conservation Commitment, Policy and Organisational Set-up**

Energy Conservation Commitment is driven through Corporate Environment & Energy Policy. The Unit has adopted and implemented this policy in its day to day activity. The unit has two Energy Auditor certified by BEE and the Energy Cell carries out routine function of Monitoring, Reporting and Facilitating Energy Projects.

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 2005-06:

Focus in the current year was more on stabilising and maximising benefits out of some of the big Energy Saving Projects carried during the past one year. The other focus was on advanced instrumentation. This has not only helped the unit in improving the Specific Energy Consumption but also to reduce its the Energy Cost. The following table depicts the same.

	2002-03	2003-04	2004-05	2005-06
Electricity Used (KWT/Ton)	1146	897	729	665
Fuel Efficiency (Lit/Ton)	122	117	98	89
Total Energy Used (GigaJoule/Ton)	8.30	7.22	7.14	6.97
Total Energy Cost (Rs/Ton)	6517	5442	4577	4192
Energy Cost as % of Manufacturing Cost	31	29	21.5	21.8

Major Actions Taken :

- i) Conversion of 550 KW Electrically heated Annealing Furnace to Coal Gas Heating.
- ii) Installation of On-line Gas Calorimeter.
- iii) Installation of three Nos. Electronic Gas Flow Meters.
- iv) Installation of 12 Nos. of New Generation VFD replacing the old ones at 2 Nos. of Preheating Furnace
- v) Installation of High Efficiency Borewell Pump of right capacity replacing the old and over capacity Pump.
- vi) Replacement of Hydraulic Pump-Motor set at Bliss Cold Rolling Mill by efficient one.
- vii) Replacement of Mercury Arc Rectifier with Digital DC Drive at Hot Mill Screwdown Motor. (This Project had failed in earlier attempt)
- viii) Motor Capacity Optimisation at number of places
- ix) Enhancing Rain Water Harvesting leading to reduction in use of Ground Water Pump and the Water Treatment Plant.

(v) Energy Conservation Plan and Targets :

	2002-03	2003-04	2004-05	2005-06	2006-07
Electrical Energy KWH/Ton	1146	897	729	666	600
Giga Joules/Ton	8.15	7.35	7.14	6.97	6.40
Cost (Rs/Ton)	6517	5442	4577	4192	4000
GHG Index	1.36	1.10	0.97	0.89	0.85

Major Projects to be undertaken during 2006-07 & beyond:

Sl. No.	Energy Conservation Measures (Planned - 2006 - 2007)	Anticipated Savings		Investment (Rs.lakhs) Investment	Project Completion
		Energy Value Lakhs KWH	Thermal KL of Oil Eq		
1	Installation of On/Off Valves in the Combustion Air Line to stop air flow in Burner during Off condition.		50	5.0	2006-07
2	Installation of Recuperator at New Remelt Furnace.		60	10.0	2006-07
3	Increasing the size of the compressed air piping to reduce the line pressure drop.	0.6		2.5	2006-07
4	Re - Insulation of Preheating Furnace No 3		60	15.0	2006-07
5	Installation of Intelligent motor controller as a pilot project for fluctuating load application	0.6		6.0	2006-07
6	Installation of Intelligent Motor Controller at 5 paces after the pilot project	3.0		30.0	2007 - 08
7	Heating of Combustion Air at Preheating Furnace by Waste Heat.		30	10.0	2006-07
8	New Coal gas operated 30 T Annealing Furnace	21.60		400.00	2006-07
9	Obtain Water from the River and avoid Borewell pump and Water Treatment plant	0.84		150.00	2007-08
Total Nos. Of Projects :- 9		26.64	200	628.5	

DETAILS OF PROJECT EXECUTED DURING 2005-06
Hindalco Industries Limited, Belur Works

• **Conversion of 25 T Coil Annealing Furnace from Electrical to Coal Gas fired Radiant Tube heating**

After success of converting Preheating Furnace from Electrical to Coal Gas Heating, the Plant took up the Project of converting one of its Annealing Furnace to Gas Heating using Radiant Tube Burners. The Furnace was with a Connected Load of 550 KW and catered to Temper Annealing Loads and also Homogenizing Loads.



Energy Efficiency before Modification	: 140 KWH/Ton
Energy Efficiency after Modification	: 6.89 Therms/Ton
	+ 25 KWH/Ton (for Circulating and Combustion Fan)
Savings Achieved	: Rs 207 per Ton
	= Rs 12.42 Lakhs Per Annum
Investment made	: 55 Lakhs
Simple Payback	: 4.5 Years

• **Replacement of Mercury Arc Rectifier by Digital D.C. Drive at Hot Mill Speed Screw Down**

For control of Roll Gap at Hot Mill, High Speed DC Drive System with 2x 40 HP DC Motors are in use. DC Power is obtained from a Polyphase Mercury Arc Rectifier. The No-Load Loss of this system was about 7.3 KW. A Project was taken up during 2003-04 for replacing the Mercury Arc Rectifier with Solid State Rectifier, however the same failed as there were Repetitive Rectifier failure. The replacement Project was again taken up but this time with Digital DC drive. The Project has helped in Eliminating Energy Wastage and also improve the system reliability.



Savings Achieved	:	7.3 kW (Rectifier Unit) + 3 KW (Diverter Circuit)
Annual Savings	:	0.75 Lakh Units
		Rs 3.0 Lakhs/Annum
Investment Made	:	Rs 15 Lakhs
Simple Payback	:	5 Years

- **Installation of Drives for Pre-Heater # 2 & 3 Re-Circulation Fan Motors**

The Preheating Furnace has 6 Nos. of Circulating Fan of 15 HP capacity. It is observed that it is possible to save Energy by varying Speed of the Fans based on temperature of the Furnace. VFD were thus installed at Two Nos. of Preheating Furnaces with Automatic Speed Control based on Furnace Temperature.



Energy Consumption (before)	:	7.6 Lakh Units Per Year
Energy Consumption (after)	:	6.2 Lakh Units Per Year
Savings	:	1.4 Lakhs Units
		= Rs 6.0 Lakhs
Investment	:	Rs 13 Lakhs
Simple Payback	:	2.2 Years

- **Reducing number of Pump in operation at Cold Mill Hydraulic System**

One of the Hydraulic System in SMS Cold Rolling Mill employs 3 Nos. Hydraulic Pump with 30 KW Motor each in parallel. Through change in Pressure Setting and Modification in Delivery System it was possible to operate the system with only 2 Nos. Pumps.

Savings Achieved	:	0.52 Lakh Units Per Annum
		= Rs 2.0 Lakhs
Investment	:	Nil

- **Replacement of Cold Mill Main Drive Ventilation Motor**

Blower Motor for SMS Mill Cold Mill Ventilation was operating in under loaded condition. The 75 KW Motor was replaced by a 30 KW Motor.

Annual Saving	:	0.19 Lakh Units
		= Rs 0.76 Lakhs
Investment	:	Nil

- **Further Reduction in Cold Mill Fume Exhaust Motor Speed during idle operation**

VFD was already installed in the 75 kW Fume Exhaust Blower Motor. The Speed of the Motor during idle operation of the Motor was earlier set at 900 RPM (30 HZ). The same is now changed to 300 RPM (10 HZ)

Annual Saving	:	0.60 Lakh Units
		= Rs 2.4 Lakhs
Investment	:	Nil

- **Changing the connection of Cooling Tower Fan Motor from Delta to Star**

3 Nos. 18.5 KW Motor for SMS/Bliss Cooling Tower Fan found operating at 4 KW only with P.F: 0.505. After changing the connection from Delta to Star, KW reduced to 3 KW and P.F improve to 0.834.

Annual Saving	:	0.20 Lakh Units
		= Rs 0.8 Lakhs
Investment	:	Nil

- **Modification in the Operating Logic**

A Modification in the Operating Logic of Electro-Mechanical Clutch of 2 x 1200 KW SMS Coiler Motor has done so that Coiler Slave Power will be OFF after the disengagement of Clutch, which saves wastage of constant field current after disengaging of the Clutch.

Annual Saving : 0.15 Lakh Units
= Rs 0.60 Lakh

Investment : Nil

- **Installation of On-Line Gas Calorimeter and Electronic Gas Flow Meters**

On-line Gas Calorimeter is installed for continuous monitoring of Coal Gas CV value. The Preheating and Annealing cycles are adjusted accordingly for optimum efficiency. Gas flow meters have been installed to measure and monitor furnace wise gas consumption.



Investment : 7.0 Lakhs

- **Installation of Energy Efficient Hydraulic Pump at Bliss Cold Rolling Mill**

During Energy Audit it was observed the Hydraulic System was operating at a Low System Efficiency because of inefficient Pumps. The Pumps were replaced.

Annual Savings : 0.47 Lakh
Rs 1.91 Lakhs
Investment : Rs 2.6 Lakhs
Simple Payback : 1.5 years
Investment : Rs 2.6 Lakh

- **Optimizing Electricity use during Peak and Non-Peak hours and maximizing benefit of TOD Tariff through effective planning.**

The Plant Operations w.r.t the above have been divided as follows:

- 1) Hot Rolling Circuit
- 2) SMS Cold Rolling Circuit
- 3) Bliss Cold Rolling Circuit
- 4) Auxiliary System

While the Plant and almost all equipment operates for 24 hours in a day. The Consumption rate for Rolling Mills varies based on product (Type of Alloy/Chemical Composition) and particular Rolling Stage (different roll force required to reduce gauge of Sheet at different stages). Again in Electrical Furnaces the Consumption is maximum in the initial stage while the same comes down with time and as temperature gets raised. These factors have been incorporated in the Equipment scheduling process to maximize consumption in the Non Peak hours and minimize the same during peak hours. The system has been reinforced by incorporating Equipment wise consumption rate monitoring using the already existing Power Monitoring System. This has also led to reduction in Energy Rate through making best use of the TOD Tariff.