

# Energy conservation by Optimising Operations and Implementing Energy Saving Ideas

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Energy is most vital resource for human life in this modern world. Energy is obtained primarily from the natural resources mainly Coal, Crude oil, Natural gas and water etc. From these resources, other energy like electricity, thermal etc. are produced for domestic as well as Industrial use. These natural resources are limited and getting depleted day by day and in the absence of these natural resources, life on the earth is difficult to imagine. Today, it is our moral responsibility to conserve these resources religiously and retain them for a longer period to lead a normal life in future.

Energy efficiency became critical for reducing global warming and climatic change conditions. Climate change is considered to be among the most serious threats to the sustainability of the world's environment, human health and the global economy. Reducing green house gas emissions, which can be achieved by reducing fuel consumptions, can minimize impact of climatic change.

As per recent findings, energy requirement in our country has grown substantially with peak shortage of 11% to 19% and average of 7% to 12%. Energy cost in our mills is about 17% of the total manufacturing cost of paper. There is a further scope in this area for improvement and Indian paper industry has to put in lot of efforts to improve energy consumption norms in comparison with the developed countries. Having known this, increased efficiency is the only way to meet the shortfall. In-fact, this calls for removing in-efficiency and bottlenecks by each one of us in optimizing energy utilization and up-gradation of technology wherever economically viable. Even small ideas contribute a lot. We at Ballarpur are continuously implementing such ideas.

## INTRODUCTION

Pulp and Paper Industry is highly capital-intensive, energy intensive and is driven by fluctuating market conditions. Though lot of efforts have gone and initiatives are underway to improve the environmental performance of the industry but the public perception and opinion of regulatory authorities is not very encouraging. Being a high capital-intensive industry and volatile market conditions, it is not always economically viable to changeover to a new energy efficient technology with single line of higher capacity equipments. The major drawback of Indian Paper mills is multiple paper machines and equipment, which have been added time

to time for increasing capacities for survival. This kind of set up is also contributing for inefficiencies in energy consumption. Apart from this, other reasons are product mix, non-availability of suitable raw material, high fixed cost etc.

In view of conserving fossil fuels, there is an urgent need to conserve energy through better control of various operations and by maximizing the utilization of existing plants / equipments. It is the best step towards reducing specific energy consumption of existing Mills.

Bilt, Ballarpur, is an Integrated Pulp and paper mill located on the pithead of WCL coalmines. Yet, we are very conscious of Energy cost and specific consumption figures. We firmly believe that lower energy consumption gives us competitive edge when variable cost

is increasing due to increasing prices of raw material and other inputs.

Bilt Ballarpur has installed capacity of 114,500 MT of Paper and meets its 96 - 97% of power demand of 26 MW through own cogeneration plant only 3 to 4% power is purchased from the MSEB grid. The Energy conservation and management activities in Bilt BPU started long back in 1980's. In last few years, the capacity utilization has increased without any major investment. Fig.1 gives the production trend of last 8 years. The energy cost as % of total production cost is given in Fig.2.

## SPECIFIC ENERGY CONSUMPTION TREND AT BPU

The specific energy consumption i.e. steam and power is shown in Fig.3 (a) and (b). It may be observed that there

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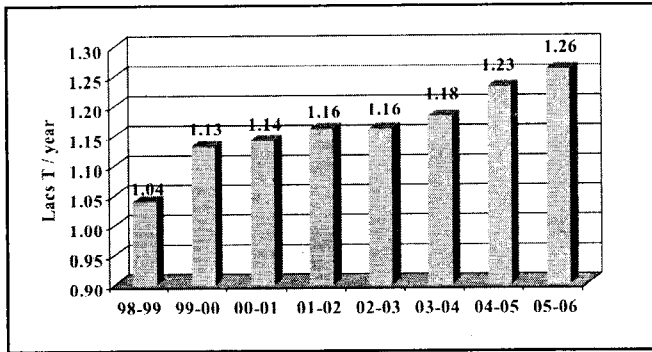


Fig. 1 Paper Production (Lac Tonnes/year)

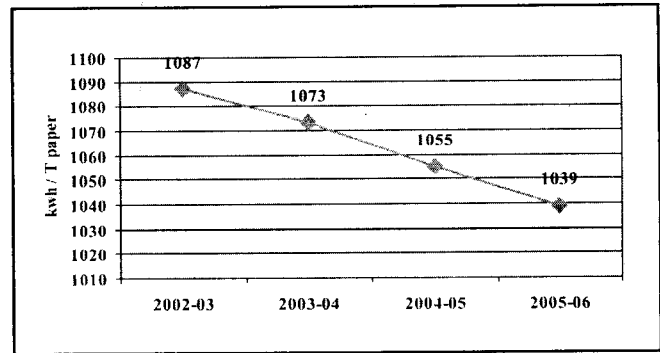
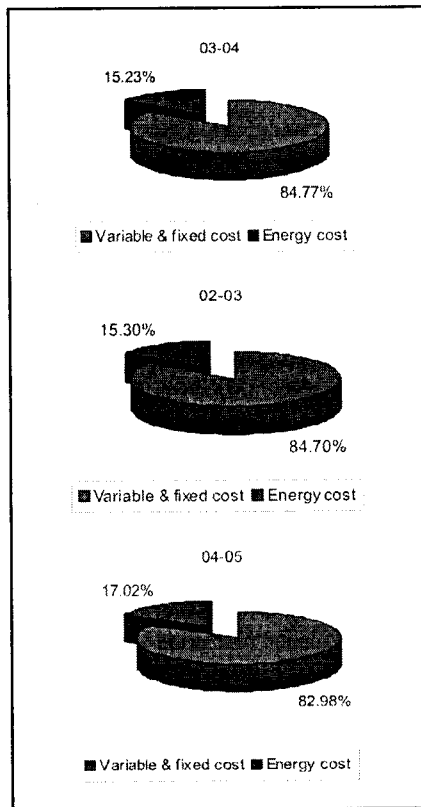


Fig 3 (a) Electrical Energy Consumption Trend



2004-05 increase is due to impact of coal price

Fig. 2 : Energy Cost as % of total manufacturing cost

is a decreasing trend in the consumption of these two vital resources. It has been possible due to various measures taken by the mill with sustained efforts. Fig 3 (c) shows the water consumption trend. We have taken various measures such as maximizing recycling of backwater, Installation of disc filter, optimizing fresh water consumption usage in various sections etc.

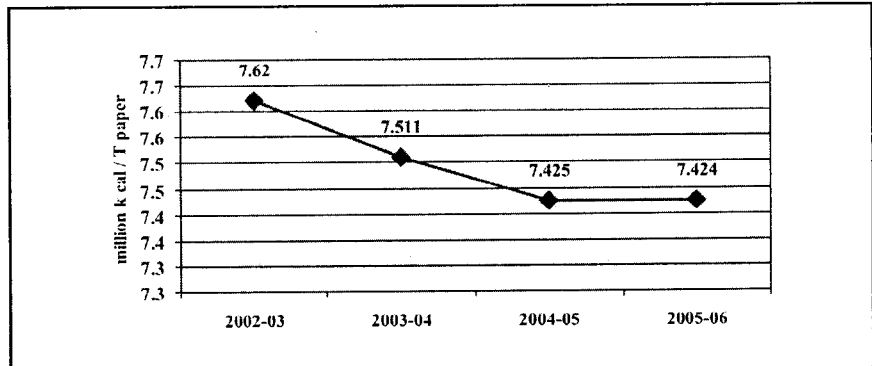


Fig. 3 (b) Thermal Energy Consumption Trend

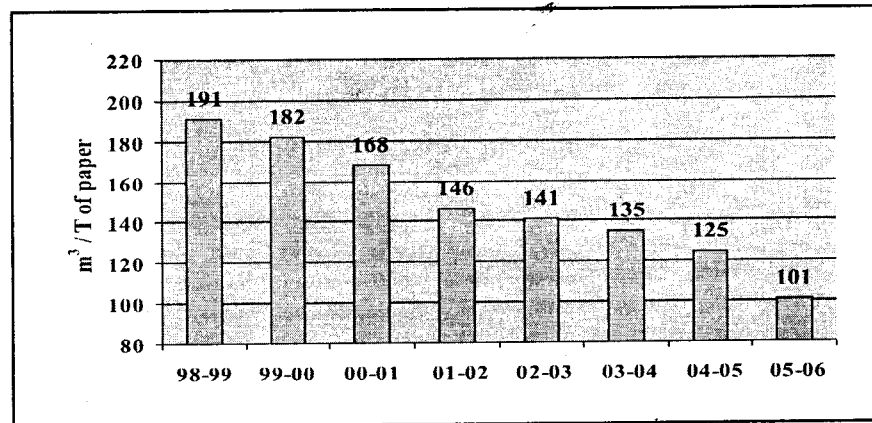


Fig.3 (c) Water Consumption Trend

### 3.0. ENERGY CELL

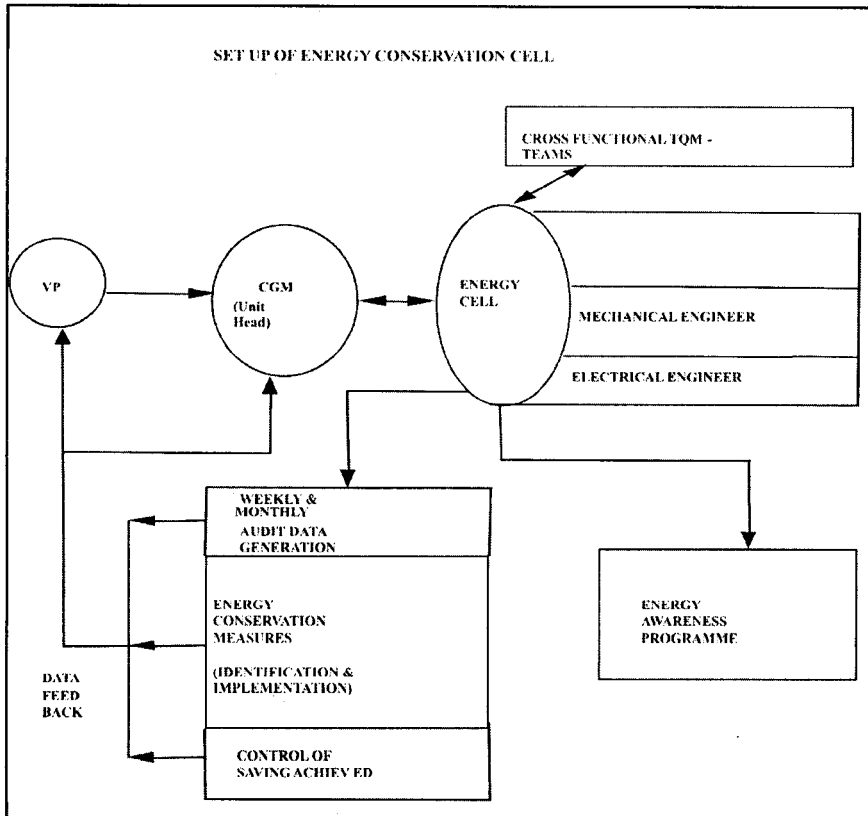
For last so many years, the company has independent Energy Conservation Cell, headed by an Energy Manager to facilitate energy conservation and management activities across the mills. The Company has three tiers 'Energy Set-up' reporting system and Cross Functional Teams headed by respective Sectional Heads inclusive of Process, mechanical & electrical maintenance shown below.

The role and responsibilities of energy conservation cell are:

- Daily monitoring of Energy generation, Consumption and Energy inputs- Coal and purchase power.
- Daily monitoring of condensate recovery.
- Regular monitoring and corrective actions of compressed air system.

- Regular monitoring of variances and action plan for corrective actions.
- Identification, selection of ENCON ideas and its implementation in coordination with deptts.
- Conducting Internal and external Energy Audits.

cross functional teams involving workmen. The monitoring of these projects is done on regular basis and their achievements are displayed at notice boards and work place for their recognition and motivation.



#### 4.0. ENERGY CONSERVATION THROUGH TOTAL QUALITY MANAGEMENT (TQM) AT BALLARPUR.

Ballarpur has explored lot of energy conservation by adopting TQM approach since July 2003. Under TQM methodology, Unit has organized Sr. management workshop and took targets for achieving 8 to 10 tangible and intangible goals all the management staff and most of the workmen were trained under TQM methodology. Energy is one of the goals for the unit. In this workshop, entire cross-functional senior team takes the time bound target for reducing mill wide energy consumptions. These targets get converted into small projects with

#### 5.0. ACTIVITIES CARRIED OUT RECENTLY FOR ENERGY CONSERVATION

##### Project No. 1

##### Direct Pumping of Pulp from UnBleach HD Tower to Primary fractionator and shutting down one Pump

There was separate pump running for supplying the Pulp to primary fractionator. The delivery line of UnBleach HD tower pump has been modified to supply the pulp to Primary fractionator, which resulted in shutting down one Pump of 75 kw.

Power saved = 289800 kwh /yr  
 Investment = Rs. 0.20 Lacs  
 Monetary Gain = Rs. 6.29 lacs /yr

##### Project No. 2

Enhancing the capacity of single Vacuum Pump in place of two pumps for couch on Paper Machine No.2

Power saved = 352800 kwh /yr  
 Investment = Rs. 0.30 Lacs  
 Monetary Gain = Rs. 7.66 lacs / yr

##### Project No. 3

##### Shutting down one Propeller of PM-3 Under Pulper.

Power saved = 332640 kwh /yr  
 Investment = Nil  
 Monetary Gain = Rs. 7.22 lacs / yr

##### Project No. 4

##### Installation of Variable Frequency Drive in 2 Nos. Shrink Bundling Machine

Power saved = 54600 kwh /yr  
 Investment = Rs.0.60 lacs  
 Monetary Gain = Rs. 1.18 lacs / yr

##### Project No. 5

##### Modification of grit re-firing system in coal boiler No.7 and 8

Power saved = 29700 kwh  
 Investment = Rs.0.25 lacs  
 Monetary Gain = Rs. 0.64 lacs / yr

##### Project No. 6

Modification of ash handling belt No. 3,4, and 5 by providing single belt conveyor as by pass arrangement.

Earlier three belts were running for ash handling in coal boiler No. 7 & 8. One single belt conveyor is provided by modifying the system which has resulted in shutting down two conveyors..

Power saved = 59400 kwh /yr  
 Investment = Rs.1.50 lacs  
 Monetary Gain = Rs. 1.29 lacs / yr

##### Project No. 7

Shutting down one De-super heater pump by direct feeding thr'o Boiler feed pump.

Power saved = 29700 kwh /yr  
 Investment = Rs.0.25 lacs  
 Monetary Gain = Rs. 0.64 lacs / yr

#### Project No. 8

Repositioning of PM-5 vacuum pump silencer.

PM-5 one vacuum pump was on a height of 5 ft due to which vacuum pump was pumping water against head and resulting in more power consumption. By keeping the silencer at ground floor, load of pump reduced by 8 amps.

Power saved = 40320 kwh /yr  
 Investment = Rs. 0.10 lacs  
 Monetary Gain = Rs. 0.87 lacs / yr

#### Project No. 9

**Installation of 2000 KVAR capacitors for maintaining the power factor**

Investment = Rs. 10 lacs  
 Monetary Gain = Rs. 10 lacs

#### Project No. 10

**Grinding of PM-3 Dryer cylinders**

Paper Machine No.3 Dryer cylinders had developed grooves due to which uniform drying was not taking place, 24nos. Dryer cylinders were grinded by M/S Pikoteknik Finland for improving Heat transfer & paper quality which also resulted in reducing the specific steam consumption.

Investment Rs. = 150 Lacs  
 Steam saving = 1.209 T/hr  
 Equivalent Coal saved= 2268 MT Coal  
 Monetary Gain = Rs. 30.73 Lacs /yr

#### Project No. 11

**Increasing moisture by 1.3% after grinding dryer of PM-3 resulted in fibre saving.**

Investment: With in same investment of project No.10  
 Monetary Gain = Rs. 28.77 lacs

#### Project No. 12

**Installation of on line QCS on PM-4 for better control of moisture & basis**

#### weight.

Fiber saving achieved by increasing moisture from 2.54 to 4.4% (1.86%)

Investment: Rs. = 30.40 Lacs  
 Monetary Gain = Rs. 9.63 lacs

#### Project No. 13

**Installation of feed water heater in Coal Boiler no. -4 & 6**

Investment Rs. = 5.00 Lacs  
 Saving in Coal = 3260 MT on Yearly basis  
 Monetary Gain. = Rs. 44.17 Lacs/ year

#### Project No. 14

**Replacement of old inefficient CI2 Compressor in CSC plant**

Investment Rs. = 3.0 Lacs  
 Saving in Power = 87579 Kwh p.a.  
 Monetary Gain = Rs. 1.05 Lac p.a.

#### Project No. 15

**Replacement of inefficient rotor of warm water pump in Pulp mill**

Two pumps of 300 M<sup>3</sup>/hr with 100 HP x 1450-rpm motor were running to meet the water requirement in blow

heat recovery. running load was 100 & 70 amps respectively. The rotor was replaced in Jan-04, which is meeting the water requirement with single pump and running load is 123 Amps

Investment Rs. = 0.75 Lacs for one rotor.  
 Saving in Power = 252000 Kwh p.a.  
 Monetary Gain = Rs. 3.02 Lacs p.a.

#### Project No. 16

**Utilization of flash steam of PM-6 by providing in-house Condenser**

Flash steam of PM-6 was going to atmosphere. We have installed one old condenser near PM-6, by using its flash steam, hot water is generated & sent to pulp mill for use.

Investment = Rs. 0.50 lacs

Saving in Coal = 672 MT p.a.

Monetary Gain = Rs. 9.10 Lac p.a.

#### Project No. 17 (Under Implementation)

**Up-gradation of existing BHR and addition of New Blow heat Recovery**

Existing blow heat recovery is 65%. It is being upgraded and a new BHR is being added to achieve 95% blow heat recovery. This is being done by installing wide gap free flow plate type heat exchanger and automation.

Total flash vapors / blow – 9.7 T

Present BHR = 65%

Future BHR = 95%

Total savings = 108 TPD flash steam

Saving in = Rs. 78 lacs per annum

Investment = Rs. 300 lacs

#### 6.0. MAJOR ACTIONS PLANNED FOR NEXT TWO YEARS:

Replacement of spreader stoker type coal boiler with CFBC boiler to improve boiler efficiency and use cheaper quality coal.

Higher pressure cycle of Boiler and turbines (existing 37 kg/cm<sup>2</sup> g and 425° C) FFFF type evaporators Installation of producer gas plant in new 180 TPD limekiln, which will be installed this year. Thermo compressor on Paper Machines 1, 4 & 6.

Installation of new high capacity paper machine to stop operations of small multiple Paper machines to improve quality, productivity and reduce usages of chemicals additives and other inputs.

#### CONCLUSION

Energy consumption in Indian pulp and paper mill is on higher side as compared to international standards. Energy cost is increasing day by day. The prices of coal furnace oil and purchased power are also affecting global competitiveness and bottom line of pulp and paper industry. Hence, Energy conservation and management is an urgent need of the time in this global competition. No idea is small or big if it

Besides above projects, some of the other ENCON ideas implemented are as under:

S.No	ENCON Measure	Energy Saved	Investment Rs. lacs
1	Replacing partially RB-1 air preheater MP steam with LP steam to enhance Power generation.	Power 2 lac kwh	1.25
2	Replacement of RB-1 FD fan with efficient fan for power saving	Power -3.92 lac kwh	5.0
3	Modification of Boiler feed water pump system to save power.	Power -6.72 lac kwh	1.0
4	Installation of Thermo pump on PM-6 to lift pre-dryer group condensate.	Condensate 4200 TPA	1.6
5	Installation of VFD on pulp mill decker.	Power -1.1 lac kwh	1.6
6	Utilisation of PP-3 2 <sup>nd</sup> extraction steam in its gland replacing HP steam.	Coal - 11.4 TPA	Nil
7	Installation of trim blower on Rewinder to divert trims in a common pulper and shut down one pulper.	Power-3.92 lac kwh	1.65
8	Replacement of PP-1 cooling tower aluminum fan with FRP fan	Power-0.69lac kwh	1.0
9	Grinding of PM-4 dryers and addition of one dryer resulted in steam saving.	Coal- 670 TPA	100.0
10	Use of Activiser 'G' with coal in coal boiler No. 4 & 6.	Coal saving- 7259 TPA	59.9
11	Shutting down both fans of CSCP cooling tower in winter season for about three months (20 days a month)	Power-0.25 lac kwh	Nil
12	Reduction in water pumping power by reducing water consumption in the mills.	Power-8.862 lac kwh	Nil
13	Reduction in radiation and other steam losses by proper insulation and prompt attention on leakages in the plant.	Coal- 5102 TPA	22.0
14	Reduction in water consumption		
15	Replacing Halogen lamp fittings with energy efficient sodium vapor lamps in 16 locations.	Power-0.74 lac kwh	1.6
16	Optimizing operations by running of 0.5SDM in place of 0SDM on PM-6.	Power-2.13 lac kwh	
17	Optimizing operations by running single DDR at PM-3 during higher GSM resulting in power saving.	Power-6.798 lac kwh	
18	Repositioning of vacuum pump silencers resulted in power savings.	Power-2.49 lac kwh	0.50

contributes saving in terms of energy or fibre because fibre preparation itself consumes lot of energy. Reducing wastages through optimizing operations also contributes a lot in saving of energy for which tremendous efforts on sustained basis are required to create awareness among all employees. Continuous improvement is necessary in terms of better control of operations, system improvements and up-gradation. Even after adding new paper converting equipments for quality improvement and customer satisfaction in 2002-03, the specific energy consumptions could be brought down by implementing ideas which came from all levels.

The current requirement of pulp and paper Industry is to generate/ identify/ communicate ideas on energy

conservation, suitably implement them and re-examine their effectiveness periodically. It may be worthwhile to get the periodic energy audit done by some reputed external agency. However the real gains come from within the cross functional teams involving workmen. It must be driven by a dedicated management team headed by a senior person who regularly reviews the progress made by various teams formed for this purpose. There are no ready made solutions and all mills are somewhat different. Therefore, in-house teams contribute a lot in this regard. There is a need to work out the feasibility of technology up-gradation and implement the same if economically viable as a long-term strategy. We strongly believe that all pulp and paper mills should openly share their ENCON

success stories as saving on this account will not only improve the profitability of individual mills but help in preserving vital natural resources.

Bilt is working out on many up-gradation ideas in cogeneration and pulping process for improving Environment and Energy efficiency by TQM methodology and Clean Development Mechanism (CDM) Projects in next two years.

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