Strategies to Reduce Energy Cost and Energy Consumption at SPB Ltd.

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ABSTRACT

The Indian paper industry is 100 years old and like many other Indian Industries had grown under protected economy until trade reform was initiated in the year 1990-91. After the reforms were introduced, the Industry has crossed many hurdles for survival. Lowering of customs duty on imports steadily over a period of time has encouraged the imports of paper at cheaper price. The most recent hike in excise duty for paper made from agro-waste and waste paper, made such Indian paper mills to look for alternate ways for reducing cost of production. The Industry has been trying to cope with such changes by up gradations of technology, down sizing of manpower, improving operational efficiency including energy efficiency, etc. This paper reviews the energy scenario of the Indian paper Industry and the approach adopted at SPB in reducing the energy consumption and cost.

INTRODUCTION

ENERGY SCENARIO IN INDIAN PAPER INDUSTRY

Indian pulp and paper Industry is one of the top ten consumers of energy. Energy requirement of the pulp and paper sector is 4 million tons of coal and about 2 million MWh purchased electricity. The large integrated mills meet some portion of power requirement through co-generation while small mills entirely depend on the purchased power. The energy consumption in GJ per ton of paper, for the Indian mills is compared with that have developed countries, in Fig. 1 (Source: Srevastava, 1998 and Center for Science and Environment, 1999). It can be seen that for countries where the energy in GJ/ton is the lowest, the pulp to paper ratio is also the lowest. For India, even though the pulp to paper ratio is 64%, the energy consumption is still much higher than other developed countries that are compared here. The range of energy consumption (GJ/ton) for various categories of mills shown in Fig. 2. The cost of energy has become one of the primary input at par with the raw materials.

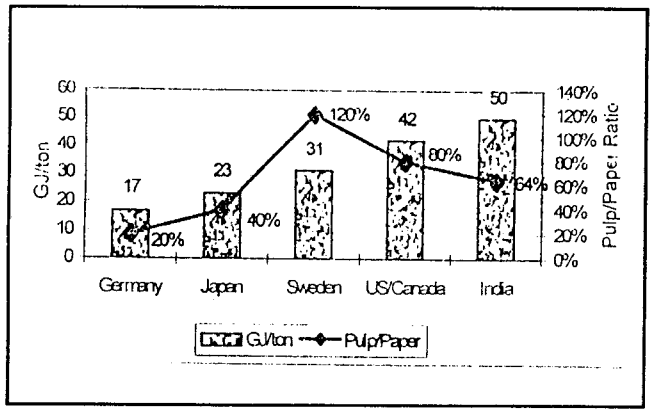


Fig. 1 Energy Consumption and Pulp/Paper Ratio

M/s Seshasayee Paper and Boards Ltd., Erode-638 007, Tamilnadu, (India)

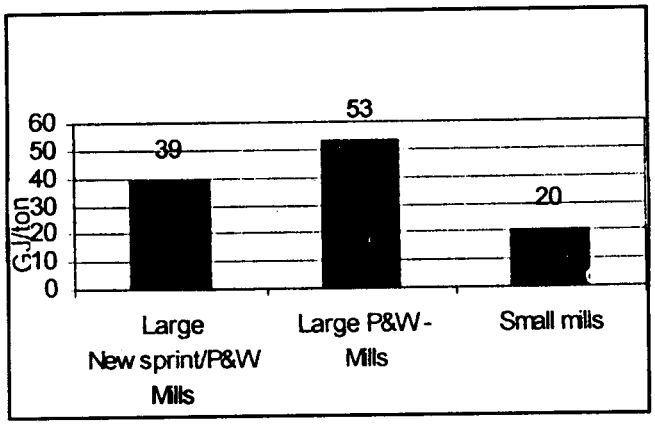


Fig. 2 Comparison of Energy GJ/ton-Indian Mills

Fig. 3 (a) Indian Paper Industry - Capacity utilisation %

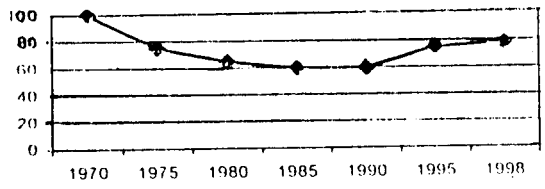
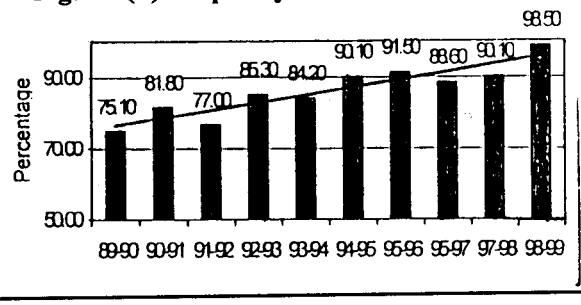


Fig. 3 (b) Capacity Utilisation - SPB



The cost of energy for typical large printing and writing grade mills is approximately 25% of the cost of production. Both from the point of view of environmental improvement as well as profitability improvement, reducing the energy consumption is of paramount importance to the Indian Paper Industry.

THE THRUST AREA OF ENERGY MANAGEMENT

The thrust areas of energy management in SPB is as follows:

- increase capacity utilization
- reduce purchased fuel consumption
- reduce electricity consumption
- self generation of electricity.

CAPACITY UTILIZATION

The capacity utilization for the Indian Pulp and Paper Industry has (Fig. 3 (a) shown continuous down ward trend due to increased imports, after 1970. But SPB has carried out number of up-gradation jobs to increase capacity utilization (see Fig. 3 (b). This was possible due to up-gradations of production units in the mill. Some of the up gradations carried out in paper machines are as follows:

(a) MF-1 Machine

- Low vacuum foils to improve drainage
- Lump breaker roll to improve off couch dryness
- Vibrating screen for recovering fibers from the rejects of the selectifier screen.
- Turbine drive system replaced with DC drive system.
- Unbalance and scales drying cylinders were changed.
- Old rewinder replaced with new rewinder.

(b) MG Machine

- Low vacuum foils to improve drainage
- Lump breaker roll to improve off couch dryness
- Double felt circuit for first press.
- Vibrating screen for recovering fibers from the rejects of the selectifier screen.
- Turbine drive system replaced with DC drive system.
- Conversion of reverse press into a inverse press.
- Grinding of the worn out surfaces of drying cylinders
- High velocity and high efficiency hood for MG cylinder

Fig. 4 Steam generation/day-Chemical recovery boilers in tons/day

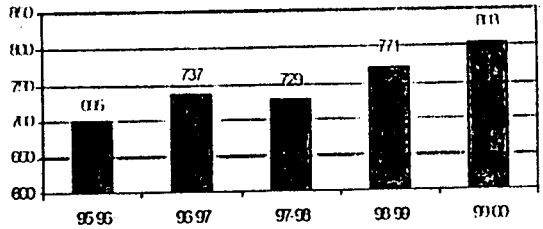
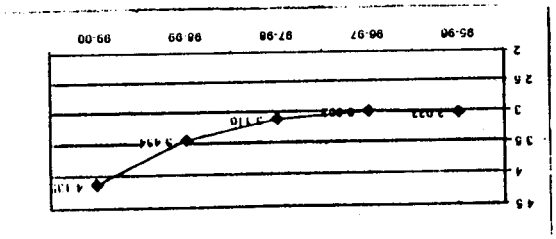


Fig. 5 Steam per ton of fuel



(c) Yankee Machine

- Changing the table rolls in the wire part with vacuum foils
- Grinding of the worn out surfaces of MG cylinder
- High velocity and high efficiency hood for MG cylinder
- Vibrating screen for recovering fibers from the rejects of the selectifier screen.
- Edge trim removal system was installed.
- Drive system control was changed from the thyrister to DC drive.
- Old rewinder replaced with new rewinder.

(d) MF-2 Machine

- New low vacuum foils were added
- Primary centricleaner inlet manifold was changed.
- Lump breaker rolls was installed.
- Vibrating screen was installed to screen the rejects from selectifer screen as well as broke form hydrapulper.
- Separate top felt circuit for first press and second press
- Fluff blower was commissioned to remove the fluff in the dryer.
- Paper jam removing blades were installed.
- Drive system changed form turbine to DC Drive.

REDUCE QUANTITY OF PURCHASED FUEL CONSUMPTION

Reduction of purchased fuel consumption is achieved by the following sub activities:

- Increasing the steam generation from recovery boilers: SPB has been steadily increasing the steam generation in the recovery boilers. The amount of steam generated in these boilers is shown in Fig.-4.
- Improving thermal efficiency of boilers: For improving the efficiency of boilers controlling of excess air and reducing the un-burnt in ash are the important measures adopted. Also always it is ensured that the boiler is operated at rated capacity. SPB has varied the proportion of fuels, such as coal, lignite, etc and has arrived at an optimum fuel mix for which evaporation ratio is the maximum. Fig. 5 shows the evaporation ratio achieved in SPB.
- Reducing the steam consumption in the process: Number of measures has been carried out at SPB to reduce the steam consumption. These include the following also:
  - Replacement of MS tubes with SS tubes in black liquor evaporator.
  - Replacement of steam traps and arresting of steam leaks.
  - De-super-heaters for steam supplied to paper machines.
  - Temperature control system for causticising tanks.

Fig. 6 Grid power - million kWh

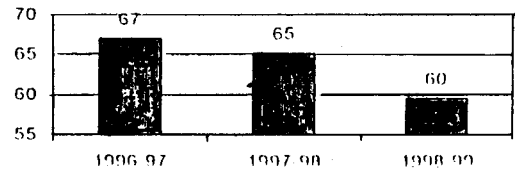


Fig. 7 Electricity price

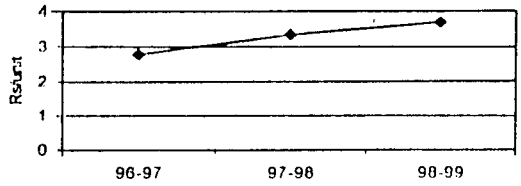
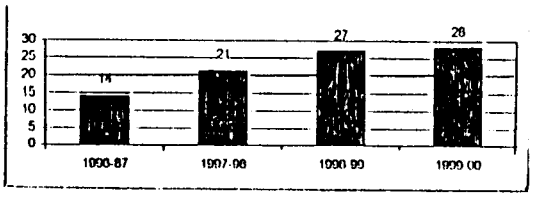


Fig. 8 Self Cogenerated Power in Million kWh/year



REDUCE QUANTITY OF PURCHASED ELECTRICITY

The quantity of purchased electricity was reduced by increasing the co-generated power and condensing power as well as reducing the demand itself by adopting conservation measures. Fig.-6 shows declining tre in the drawl of electricity from grid.

Various electricity conservation measures hav been implemented and some of them are listed belo

- Installation of medium consistency pumps in pulp mill and stock preparation.
- Stoppage of centricleaner system for wood pulp.
- Installation of energy efficient stock pumps.
- Installation new type of conical refiners.
- Installation of a new back pressure turbogenerator 3 MW capacity.
- Energy efficient fans for forced draft fans in recovery boiler (GV).
- Energy efficient fans for ID fan in recovery boiler (B&W)
- Energy efficient vacuum pumps in press felt cleaning (MG).
- AC variable speed drives for some of the washers in pulp mill.
- Star mode connection for agitators.

In addition to the above measures the mill has carried out number of water conservation measures. Schemes like reuse of paper machine effluent for the vacuum pumps in two paper machines have been successfully completed.

INCREASE SELF GENERATION

The unit rate of purchased electricity for the last few years is given in Fig. 7. During the four-year period from 1996-97 to 1998-99, there has been an increase of about 34% in the price of electricity. In order to compensate for the increase the mill has adopted the strategy of generating higher in house power by way of co-generation as well as condensation. The amount of self generated power for last few years is given in Fig. 8.

THE TREND OF SPECIFIC STEAM AND POWER CONSUMPTION

The above approach to energy management has resulted in reducing the specific steam and power consumption on a long-term basis. The specific steam consumption and power consumption per ton of paper for period of 10 years is shown below in Fig. 9 and 10.

Fig. 9 Specific Process Steam (tons per ton of finished paper)

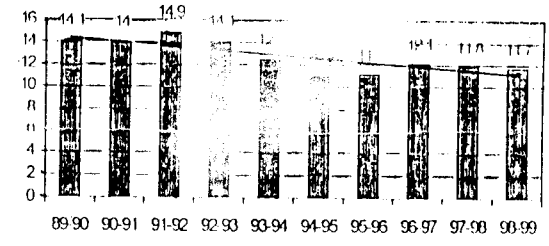
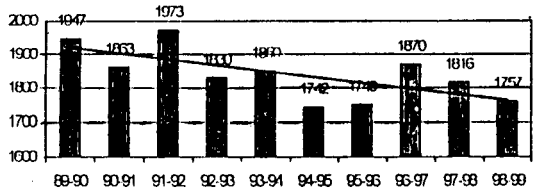


Fig. 10 Specific Power Consumption (kWh/ton of finished paper)



CURRENT EFFORTS TO REDUCE ENERGY CONSUMPTION

The mill is implementing the expansion project to double its production capacity from 60,000 tons per year to 1,20,000 tons per annum. This program involves the following.

- New Paper Machine with Design capacity of 200 tons per day with energy efficient design comprising of conflow refiners, hybrid former, trinip press, on-line coater, infra-red dryer, closed hood system with exhaust heat recovery, DCS and Supercalender for the production of on machine coated papers for the printing industry.
- Conversion of travelling grate spreader stoker boiler to fluidized bed combustion system and increasing the generation capacity from 30 tons/ hr to 50 tons/hr.
- Conversion of double extraction cum condensing turbine to single extraction cum condensing turbine.
- Modifications in pulp mill to marginally increase the production capacity of screening plant and bleach plants.
- Modifications in the waste paper processing plant to process higher rate of waste paper and imported pulp.

The new paper machine, modification of waste paper plant and FBC boiler conversion has been completed and just commissioned. These efforts are expected to bring down the specific steam and specific power consumption as shown below when the new paper machine is running at full capacity:

	Before Expansion	After Expansion
Specific Process steam t/t	11.7	7.2
Specific Power kWh/t	1757	1250

FUTURE EFFORTS

The existing mill supports, in full, the new paper machine by supplying the required power, water and process steam. The pulp mill also supports the new paper machine by supplying required proportion of wood and bagasse pulp to the extend of its full capacity. The existing waste paper plant was strategically retrofitted to process required quantity of waste paper for the new paper machine. Thus capacity utilization in water treatment plant, effluent treatment plant, boiler house, turbogenerators, 110 KV substation, pulp mill, soda recovery plant and waste paper plant were increased after the commissioning of the new paper machine.

FUTURE EFFORTS

Number of schemes are under engineering and evaluation stage. Some of the schemes under study that will be taken up for implementation during the next two years are:

- 15 MW captive power plant.
- Modifications to old evaporator plant to improve steam economy.
- Replacement of venturi scrubber and cyclone separator with cascade and ESP in the B&W Recovery boiler.
- Energy efficient pumps for stock preparation and soda recovery plant.
- Energy efficient vertical turbine type pump for bleach plant water supply.
- Energy efficient ID fan for GV recovery boilers.

ENVIRONMENTAL MANAGEMENT

SPB is proud of its achievements on environment. The treated effluent is used in nearly 1500 acres of barren land for sugar cane cultivation. Environmental conservation and pollution control award has been received from the Indian Chamber of Commerce and Industry for 1993-94. Installed environmental control equipment such as lined anaerobic lagoon, secondary ETP and ESP for boilers. Further it has stepped up the production of bagasse pulp compared to forest based wood pulp, uses per-oxide for bleaching and reduce chlorine and increased the use of bio-fuels and reduced the fossil fuel consumption. SPB is in the process of getting the ISO 14001 certification by June 2000.

CONCLUSIONS

Energy consumption in Indian Paper Mills is

very much higher than that in developed countries. Strategically focusing on energy cost and its components is the only tool for survival in the present global competition. SPB follows PDCA cycle for energy management. SPB has taken number efforts to reduce the energy consumption including the maximization of capacity utilization and cogeneration, reducing the price as well as quantity of purchased energy inputs. The current efforts it has taken up will bring down further reduction specific energy consumption. SPB is highly committed to manufacture quality paper in a clean, green and safe environment.

REFERENCES

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2. Center for Science and Environment, Down to Earth Journal, New Delhi, 1999.