Co-Generation in JK Paper Mills

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ABSTRACT

In power intensive industry such as pulp and paper industry, the utility area i.e. power and recovery, water etc. is a major cost centre. At JK paper Mills, energy management has assumed great importance similar to Quality Management and Environmental Management. JKPM has been able to maintain and improve its economic competitive edge in the Indian paper industry due to efficient energy management. Appropriate measures at the right juncture has improved its Co-generation capacity with turbo sets as old as 15-40 years.

INTRODUCTION

Pulp and Paper industry is highly capital and power intensive. The cost of energy for manufacturing of pulp and paper accounts for nearly 20% of the total variable cost. After the economy of the country was thrown open, the industry has to face tough competition against global players with respect to quality as well as cost. To add to the problem, the cost of the power, fuel and raw materials are increasing day by day threatening the very existence of the industry under the globalization and liberalization scenario. Therefore, the industry must look for ways and means to reduce the consumption of energy, minimise the waste and if possible, explore cheaper source of energy by generating the same from waste. Industry has to think of sustainable development in the field of generation and consumption of energy, which is economically viable and ecologically sustainable.

JK Paper Mills, (JKPM) during its course of journey from 1962 to the New Millennium, have been able to visualize the industrial scenario and could appreciate the gravity of the problem and therefore have taken timely steps in this direction (Fig. 1).

Co-generation at JKPM

Co-generation with double extraction of high pressure steams is a well known concept so far as economy of the process is concerned. JK Paper started with an installed capacity of 18,000 TPA with a co-generation of 2.5 MW passout, extraction and condensing type turbine. Over the years, the mill was able to increase its production capacity from 18,000 TPA to 1,00,000 TPA by the year 2002 and obviously the energy front has also changed. Today's power requirement for the mill and colony is nearly 19-19.5 MW (Fig. 2 & 3) and the Mill has its own generation capacity to the tune of 16.5 MW through 3 turbo generators of 2.5 MW, 5.4 MW and 12 MW. The balance power is drawn from state grid.

Power generation is very crucial to make the entire operation of the plant cost effective. Requirement of high pressure steam for ultimate power generation, process steam demand, both medium and low pressure, have to be properly equated and operation of coal fired boilers along with recovery boilers are necessarily to be balanced so that mill remains competitive. JKPM has taken such measures, which are economically viable and ecologically sustainable. The mill has stressed emphasis on the above operational parameters, but at the same time has led equal emphasis on conservation of resources, as a result, the condensate return from various consuming sections has gone up from a 30% to nearly 55%. Currently the total power consumption per tonne of paper is about 1600 kWh and measures are under way to bring it down to 1500 kWh by 2003. Efforts taken by the mills from time to time has brought recognition in the field of Energy conservation from 1985-89;1991-96 and for Best Energy Conservation Method from 1992-95. It has been possible due to number of steps taken for improvement right from coal handling to modifications in Turbine. A brief description given below will indicate the thoughtful and judicious steps taken by JKPM.

Coal Handling

- Storage shades for abut 8000 to 10000 MT of coal has been made to provide dry coal during mansoon.
- The coal yard was given a big face lift by providing stone pitch ground to reduce handling losses.
- Dry coal generates lot of dusts. People working in

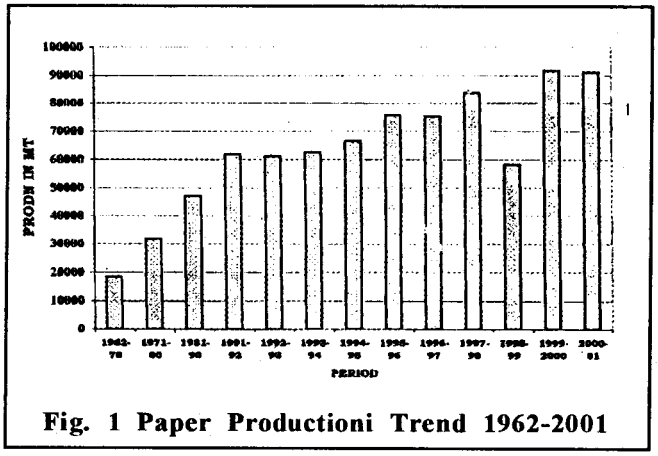

Fig. 1 Paper Productioni Trend 1962-2001

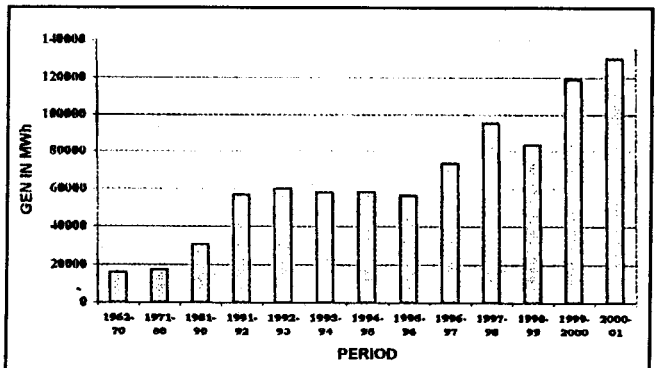

Fig. 2 Power Generation 1962-2001

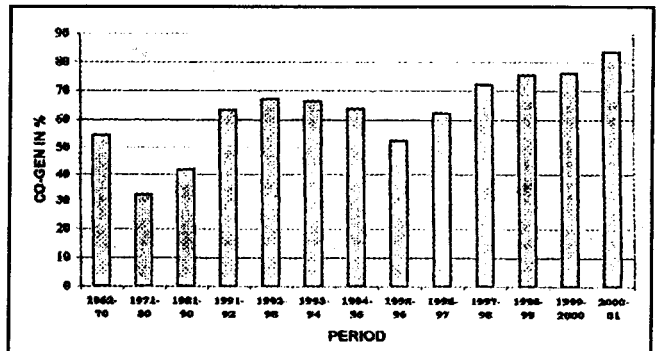

Fig. 3 Co-generation 1962-2001

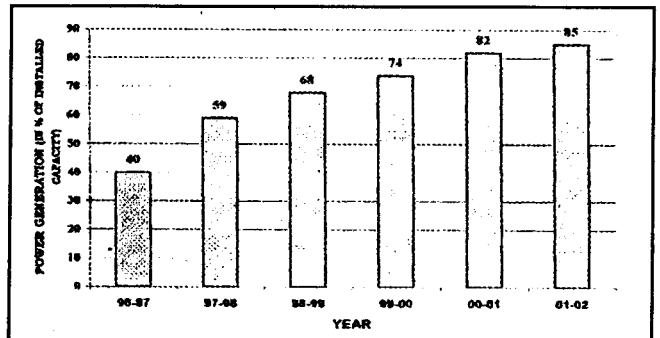

Fig. 4 Power Generation in JKPM (% of Installed Capacity)

the coal handling plant use to spray lot of water to overcome the dust nuisance and in the process, we used to loose some amount of useful heat. To overcome this and also improve the environmental condition, dry fog system has been introduced.

- Installation of Jaw Crushers has taken care of big boulders of coal.

Boilers

- The FBC Boilers had problem of bed coils failure due to erosion. A detailed technical deliberation with boiler manufacturers, bed coi[1] suppliers and government statutory bodies along with analysis of failure parts have led to the following solutions:-
  a) SS studs have been provided in the bed coil tube in place of MS studs to reduce erosion.
  b) In the eventual failure, only the eroded portion is changed instead of whole tube.
- On any available shut, wind box chamber seals are checked for leakage to avoid localised erosion.
- Coal fired nozzles and air nozzles have been made of SS.
- Refractory filled dummy tubes have been provided over economizer to avoid erosion of tube.
- Baffle arrangement has been provided in economizer duct to decrease the erosion taking place at bends.
- Variable frequency drives for FD fans has reduced power consumption besides giving advantages like: easy start up, minimizing chances of clinker formation, control of excess air, thereby reducing losses through dry flue gas, lesser emissions through stacks etc.
- The mill has also made provisions to use bamboo dust, wood dust, rejected charcoal fines, used cotton waste collected from various sections of Mill. This has given advantage on coal consumption besides keeping the environment clean. We are also proposing to burn waste core pipes, old HDPE bags, yard waste, screen rejects from pulp mill, waste lubricating oil and excess effluent sludge etc in the Boilers.

DM Plant

- Continuous monitoring of condensate return from user departments. Target of percentage return for each section has been fixed and strictly adhered to.
- Chemical treatment of cooling water has ben adopted to avoid undesirable scale formation or deposits in condensers.

Turbines

- 2.5 MW turbine (impulse) is nearly 40 years old. One row of blades was partially rectified and taken into operation with a derated load of 1.8 MW in 1998.

- One row of blades of the above turbines was rebuilt and turbo set was loaded upto 2.2 MW since 2000.
- The gearbox pinion was also replaced and a row of defective blades of the above turbine was rebuilt in the year 2000. Since then the turbo set is operating at its full capacity of 2.5 MW.
- 12 MW TG set was modified for its inlet chest and vacuum line during September-2000 and taken to its full operating capacity since then.

Maintenance of all the 3 TG sets i.e. 2.5MW, 5.4 MW and 12.0 MW was carried out indigenously and we have been able to achieve a load factor of above 90% (Fig. 4). To maintain the present level of performance and continual improvement of the same, we also plan our future activities, as follows:

i) Synchronization of turbo generators with grid to optimize the co-generation and to minimise the effect of load cutting during plant problem.
ii) Stone pitching and cement concrete of additional coal unloading and storage area.
iii) Providing variable frequency drive to FD fans of all boilers.
iv) Proper insulation of old HP, MP, LP and steam headers for obvious advantages.
v) Regular monitoring of steam and condensate leakage and wastage of compressed air and water.

CONCLUSION

At JKPM, production from 18,000 T in 1962-63 has steadily grown upto a level of nearly 1,00,000 T by 2001. Similarly power generation has been increased from less than 20,000 kWh to over 1,30,000 kWh per annum. Out of its total power requirement, JKPM was able to generate about 50-55% of its total power requirement during sixties, which have increased to around 85% by 2002. This has been made possible because of timely maintenance and improvement done. As a result, the power generation in JKPM has increased from 40% to 85% of its installed capacity with in a period of five years.

ACKNOWLEDGEMENT

The author thanks the Management of J.K. Paper Mills for granting permission to publish the experiences at the mills in the IPPTA journal.