

Innovative Measures in Power Saving : A Case Study of a Medium Sized Paper Mill

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ABSTRACT

This paper attempts to explain some of the key points realized in energy savings, over a period of four years in pulp and paper industry with implementation experience on a wide range of continuous process equipments of the mill.

INTRODUCTION

Brown Paper Technologies Ltd is a professionally managed paper manufacturing plant with two paper machines producing on an average a total of 20000 MT per annum of multi grade papers. The mill is situated at Shirwal, a village 50 Km from Pune on the banks of 'Neera' river. PM 1 is a MF machine producing various grades of paper from 45 gsm Newsprint to 200 gsm Extensible and High Strength Kraft. PM 2 is a MG machine manufacturing 21 gsm poster to 100 gsm Kraft. Both machines mainly use recycled fibers of various types in addition to virgin pulp in various percentages as per the properties required in finished product.

RESULTS AND DISCUSSION

Energy Matters

Other than paper machine and equipments, pulping, screening, dispersing, refining, chest agitation and pull transfer are the major power consuming processes. The non-machine end loads are not only high in magnitude but also account for shock loads due to frequent 'start - stops'. Thus it is not so surprising that often paper mills end up paying penalties for crossing the approved maximum demands to the 'Electricity Boards'. To control such anomalies a 1MW cogeneration plant was installed. Thereby the required peak demand is kept below the Maximum Demand.

Since, power was identified as a major consumer of revenue next only to raw material, energy saving through proper Planning, Doing/executing, Checking/evaluating and Acting to improve (PDCA) upon and bettering the results of earlier actions, the mill's Energy Conservation Measures (ECM) was started. Bench marking and setting grade wise targets in

specific power consumption at all levels, right from pulping & utilities to slitting and rewinding was necessary. The first step in this direction was simple. From the mill history, the attained, till date, minimum specific consumption for various grades with some percentage cut was set as the target SPC for that grade. This led to identification and isolation of equipments with abnormal energy consumption. Further, the targets were again revised downwards for all grades through routine energy conservation activities like trimming of impellers, interlocking of pump and agitators to avoid idle run, etc.

These results encouraged the mill to go for innovative measures in energy conservation. Some of these are listed below (Table 1-3).

1. The disperser was found to consume more energy. By installing a multi level, PLC controlled screening system, the mill could bypass the disperser and its auxiliary equipments completely for some grades. This in itself reduced the SPC by 70 kW/MT.
2. Replacing old inefficient vacuum pumps with a properly sized higher efficiency vacuum pump resulted in higher vacuum, lower web breaks and increased production and an energy savings of the order of 75 kW/Hour.
3. Proper sizing of pumps also contributed to reduction in SPC. For instance, PM 2 Machine Chest Pump of 15kW/1440 RPM was replaced by 5.5 kW/1440 RPM resulting in a saving of 144 kW/Day.
4. Another area of concern was piping/stock line. Earlier, the lines were sized for 30 TPD production. The machines were upgraded to enhance production by more than twofold, but the lines were not changed. This resulted in higher energy consumption in stock transfer. Proper sizing of

Table 1 Power Consumption PM 1 (Grade wise)

Grade	Year	1999-2000	2000-2001	2001-2002	2002-2003
Newsprint	PMC	600	580	515	440
	Stock	167	180	167	170
	Utility	83	83	90	100
	Total	805	843	772	720
Abrasive kraft	PMC	502	521	435	270
	Utility	92	102	112	100
	Total	930	1022*	914	707
Extensible sack kraft (Cl. 8)	PMC	475	470	378	350
	Stock	340	320	320	310
	Utility	72	85	95	100
	Total	887	875	793	760

SPC High for M/c Disturbance due to low quality fibre substitution

Table 2 Power Consumption PM 2 (Grade wise)

Grade	Year	1999-2000	2000-2001	2001-2002
MG Newsprint	PMC	---	426	363
	Stock	---	324	314
	Utility	---	94	87
	Total	---	844	764
MG Plain Kraft (MGPK)	PMC	456	408	376
	Stock	386	383	349
	Utility	70	93	98
	Total	912	884	823
MG Ribbed Kraft (MGRK)	PMC	455	426	405
	Stock	380	376	352
	Utility	80	98	70
	Total	915	900	827
Inter leaving Kraft (ILK)	PMC	---	680	588
	Utility	--	120	95
	Total	--	1413	1299

some pump delivery lines reduced the pumping time and saving power during stock transfer by almost 16%.

5. Water conservation was another means of conserving both power and water. By proper recycling and substituting fresh water with back water wherever possible, the quantity of water to be pumped from river to the holding tank was reduced. Similarly, the volume of effluent to be pumped out was also brought down, thus reducing power requirement. Also by pumping the water from river to holding tank during low tariff duration contributed to the savings in power costs. Some of the measures taken for better water recycling are:-

a) Collection of white water after head box dilution to the elevation tank for direct reuse in the

process.

- b) Use of clarified water for vacuum pump sealing instead of fresh water.
- c) Reworking and realignment of paper machine shower nozzles to reduce water consumption.
- d) Recollecting of cooling water from DG sets and other processes into fresh water tank.
- e) Wash down water substituted by ETP clarified water.
- f) Usage of clarified water for knock down showers.
- g) Use of TG cooling water for machine high pressure showers.
- h) All quality changes except white grades use clarified back water.

Table 3 Finish Production Rate (Grade wise)

Machine	Grades	2000-01	2001-02
PM1	Newsprint	1.48	1.61
	Abrasive kraft	1.48	1.48
	Extensible sack kraft (Cl. 8)	1.92	2.04
	Inter leaving kraft (ILK)	0.71	0.77
	MG Plain Kraft (MGPK)	1.12	1.25
PM2	MG Ribbed kraft (MGRK)	1.07	1.12
	MG Newsprint		

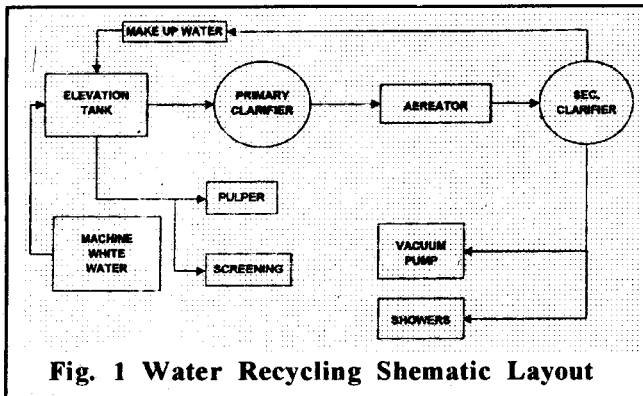


Fig. 1 Water Recycling Schematic Layout

With above steps and further improvements, the mill is expecting 15 M³/Tonne water consumption in the near future in spite of 10 to 12 quality changes (Fig. 1).

- Another important step in this direction was the installation of new three stage centricleaner system and double dilution system for PM 1 stream. These enabled the mill to produce 50 TPD finished production on PM1 against 38 TPD before these changes, hence reducing SPC.
- Power factor control is also another area where the saving potential was identified. By installing automatic power factor controller there was considerable improvement in power factor. Earlier the PF was less than 0.95 and now the PF is about 0.99. This increased utilization of power not only reduced the electricity bills but also enabled the mill to receive additional concession from the electricity board of about Rs. 55000 to 100000.
- Use of high consistency pulper in place of conventional low consistency pulper also reduced power consumption in pulping.
- Reorganizing the steam distribution and separation of individual groups both in predryer and post

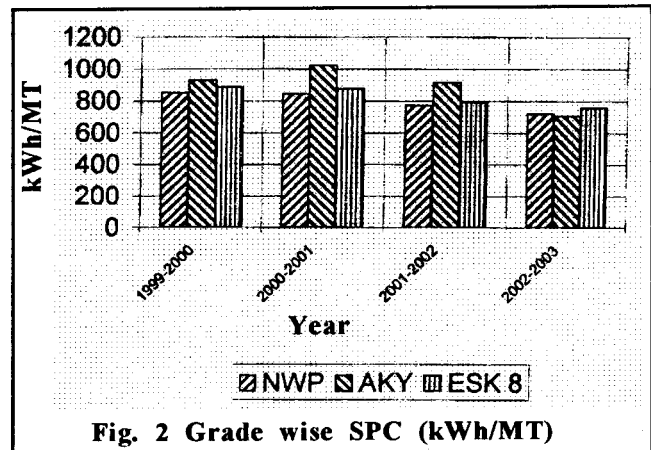


Fig. 2 Grade wise SPC (kWh/MT)

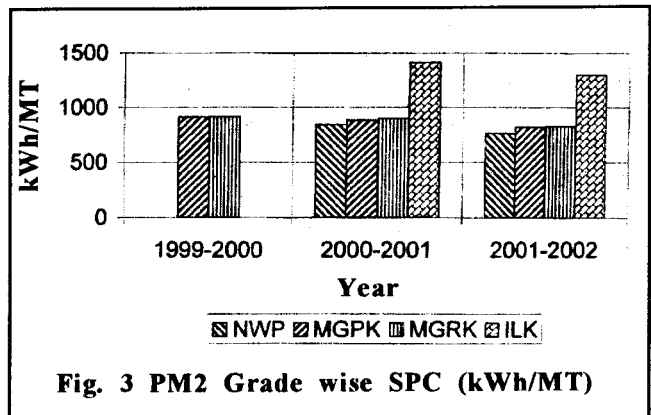


Fig. 3 PM2 Grade wise SPC (kWh/MT)

dryer sections gave the mill a better control over drying, lesser steam consumption and better condensate recovery.

- On PM 2 (MG) machine, second touch roll addition has augmented production by 15%.

CONCLUSION

'Energy Conservation' is not an one time activity, rather it is a continuous process. By way of revising targets, use of new tools and methods and involving employees at grass root level with motivation and awareness, the mill is all set for achieving word class energy utilization. Remember "you can not achieve what you cannot imagine" so, attempt for the best not for a compromise.

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