

ENERGY CONSERVATION EFFORTS AT SPB

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ABSTRACT:-- Energy Conservation is the need of the hour for a developing country with a growing population, like ours. The very first step in any Energy Conservation scheme is to maximise the capacity utilisation of available equipment with optimum energy consumption. Keeping this in mind SESHASAYEE PAPER AND BOARDS LTD (SPB) has implemented several Energy Conservation measures. SPB has conducted few Energy Audits by engaging external agencies apart from regular in-house studies. Most of the recommendations have been implemented. The following paper outlines the Energy Conservation efforts taken up by SPB during the last three years and its future plans in this direction.

INTRODUCTION

Paper industry, in general, is highly "energy intensive". The cost of energy consisting of steam and power constitutes about 25-30% of the cost of production. The industry consumes about 1500 KWh of power and about 10t of process steam for every tonne of saleable production.

Our company, SESHASAYEE PAPER AND BOARDS LIMITED (SPB) was established in the year 1960 with an installed capacity of 20,000 tonnes per annum. The mill has over the years gradually expanded to the present installed capacity level of 60,000 tonnes per annum. In view of various expansion and modernisation schemes carried out in different stages, the mill has a multiplicity of equipment with four machines to produce a wide range of papers viz. printing and writing papers, posters, multi layer duplex boards, packaging papers, coated papers and so on. The mill has three chippers, four digesters, three washing sections, four power boilers, two turbo generators, two recovery boilers and so on. The mill generates about 2000 tonnes of steam and 6MW of power besides drawing an equal amount of power from grid.

ENERGY CONSERVATION- OUR APPROACH

Being an old mill with a multiplicity of equipment, the primary task before embarking on energy

conservation scheme is to clearly assess the present status on energy consumption. For a mill like SPB, energy is consumed in two different forms viz. steam and electrical energy.

The first step undertaken was to locate various points of steam consumption in the mill, install suitable measuring systems and assess the actual steam consumption. Similar exercise was done for electrical power consumption also.

Based on the above data and the theoretical requirement, a guide line was prepared specifying norms for consumption of steam and power in each section. Such norms were fixed after detailed discussions with concerned section heads to enable the management to involve and make section head responsible for meeting targets.

ENERGY AUDITS

Outside agencies are also involved for ENERGY AUDITING. An UNDP-GOVERNMENT OF INDIA energy audit was conducted in the year April 1991. Similarly another energy audit was conducted in the year September 1994 by engaging CONFEDERATION OF INDIAN INDUSTRIES

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(CII)-MADRAS. The mill has just completed Steam Generation and Consumption Audit by Forbes Marshall, Pune. The mill has introduced the concept of TOTAL QUALITY MANAGEMENT (TQM), where staff and workers at various levels are involved to take up the projects on energy conservation. Apart from the above the mill is now in the process of acquiring ISO 9001.

OPTIMUM USE OF ENERGY

SPB strongly believes that, in any Energy Conservation measure the two priorities would be

- (i) Maximise Capacity utilisation with the available equipments.
- (ii) Introduction of New Energy Efficient Technology.

The mill has increased its capacity utilisation from 103% in the year 1990-91 to 158% in the year 1995-96 (Fig-1).

The mill has implemented various Energy Conservation measures to achieve maximum capacity utilisation for better specific consumption of Energy such as Steam and Power.

In the intake well 3,125 hp and one 75 hp pumps were in use, with less throughput and consuming more power. After installation of 125 hp high efficiency pumps, now only 3 are in operation with more throughput and less power consumption.

In the boiler house, four boilers were in operation with partial load because of various problems in each boiler. Now, after implementing corrective

actions and Energy Conservation measures, only two boilers are under operation with maximum load and one boiler in under partial load.

The mill could reach today's Energy Consumption level by monitoring Energy Consumption figures for individual sections on daily basis and analyse variations. Major deviations from set norms are studied and any Energy Conservation measure to be taken up is decided. Energy Conservation Measures, depending on the investment required, are discussed with the management and taken up for implementation.

COST OF ENERGY

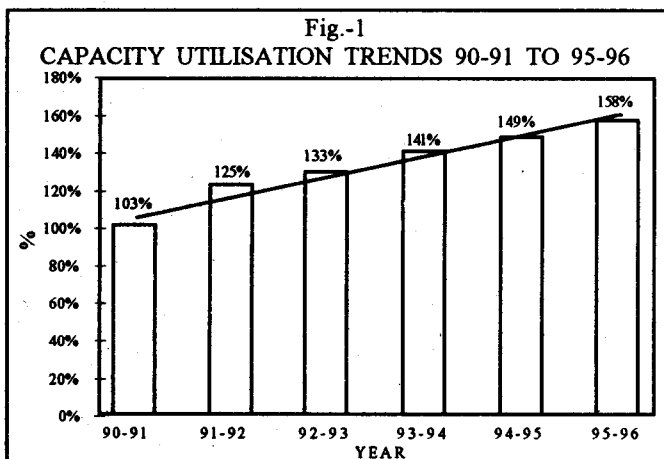
The mill has also had a close look at the cost of energy. The economics of Captive power generation as compared to bought out power has been analysed. This has helped to fix the ratio of Captive and Grid power by optimising total power cost besides avoiding flow through the Pressure reducing valve.

Similarly in the case of steam a detailed analysis was done on the cost of steam. Since the mill has four power boilers and two recovery boilers with varied capacities, the generation cost per tonne of steam for each boiler was computed. The availability of various fuels and the possibilities of various fuel mix in the boilers were also analysed. Based on the above, the optimum fuel mix and the steam to be generated from different boilers were firmed up to achieve optimum steam cost. This has helped the mill to reduce the Coal consumption by about 93% within three years.

MONITORING ENERGY CONSUMPTION

Our approach for monitoring of energy is

- Data collection on sectional energy consumption
- Computation of cost of energy
- Highlight and project the impact of cost of energy initially at department heads level
- Highlight the variation of cost of energy consumption over the fixed norms
- Discuss and arrive at course of action to be taken to contain the cost of energy within the norm-every day at top management level
- Continuous monitoring of consumption and cost of energy.



MAJOR ENERGY CONSERVATION MEASURES UNDERTAKEN AT SPB

A list of energy conservation measures implemented at SPB is enclosed. A brief description of some of the major energy conservation measures which were implemented in the recent past is mentioned below.

NEW EVAPORATION PLANT

SPB had three streets of evaporator (LTV) each with four bodies and mismatched finisher effects. These street were equipped with steam ejectors and barometric condensers. Steam consumption was approx 600 t/day with the steam economy of 1.94.

A New evaporation plant of six bodies (LTV) with dedicated finisher effect has been installed in the year August 1993. This street is equipped with water ring vacuum pump and surface condenser. Steam consumption is 250 t/day with the steam economy of 5.2.

INVESTMENT:	Rs 400.00 lakhs
ENERGY SAVINGS:	350 t/day- 50 Psi steam
SAVINGS:	Rs 110.00 lakhs/year

INSTALLATION OF HIGH EFFICIENCY PUMPS AT INTAKE WELL AND EFFULENT TREATMENT PLANT

3,75 HP old inefficient Vertical turbine pumps were replaced with 125 HP high efficiency pumps in the intake well. Similarly 3,125 HP vertical turbine pumps of CI casing pumps are replaced with SS casing of high efficiency same 125 hp resulting in higher throughput in the ETP.

INVESTMENT:	Rs 14.25 lakhs
ENERGY SAVINGS:	4224 Kwh/day
SAVINGS:	Rs 30.90 lakhs/year

INSTALLATION OF BIO FUEL FIRING SYSTEM FOR BOILER #6 & 7

For the power boilers no 6 & 7 bio fuel firing system was introduced in the year 1992. With belt

conveyors, pith feeders and air blowers etc. to substitute coal upto some extent.

INVESTMENT:	Rs 25.00 lakhs
ENERGY SAVINGS:	about 2190 tonnes of coal & lignite/year
SAVINGS:	Rs 18.00 lakhs/year

INSTALLATION OF ELECTRICAL DC DRIVE INPLACE OF STEAM TURBINE

DRIVE FOR PMC # 4 LINE SHAFT

Paper machine no # 4 line shaft drive was replaced by electrical DC Drive motor in SEP 1994. The Steam turbine was consuming 11 tons of 150 psi steam per hour and deliverling a power equivalent of 248 KW whereas the same quantity of steam when passed through 5 MW turbine, 585 Kw of power is produced

INVESTMENT:	Rs 45.00 lakhs
ENERGY SAVINGS:	1728 KWH/DAY
SAVINGS:	Rs 11.40 lakhs/year

INSTALLATION OF PROCESS CONTROL SYSTEM FOR PMC # 4

Micro processor based on-line process control system was introduced for PMC # 4 paper machine with associated field instruments.

INVESTMENT:	Rs 169.00 lakhs
ENERGY SAVINGS:	a) 1350 tonnes of steam/year b) reduction in fibre consumption by 3.2%
SAVINGS:	Rs 69.62 lakhs/year

ENERGY CONSERVATION-FUTURE PLAN

Installation of new 3 MW backpressure TG

SPB has three nos of Turbo generators of following specifications

- 5 MW-Double extraction cum condensing
- 4 MW-Fully condensing
- 2.5 MW-Single extraction cum condensing

Out of above three, 4 MW TG is very old and presently out of service.

SPB is installing a new 3 MW back pressure (Low pressure) Turbo generator to reduce the Grid power load and to avoid flow through Medium to Low Pressure PRS valve.

INVESTMENT : Rs 72 lakhs

ENERGY SAVINGS : a) Reduction in Grid power by 1.62 MW/day

b) Flow through PRS nil

SAVINGS : Rs 1.41.79 lakhs/year

Installation of Process Control for PMC # 2

Micro-processor based on-line process control is being installed for PMC #2 paper machine with associated field instruments.

INVESTMENT : Rs 74.00 lakhs

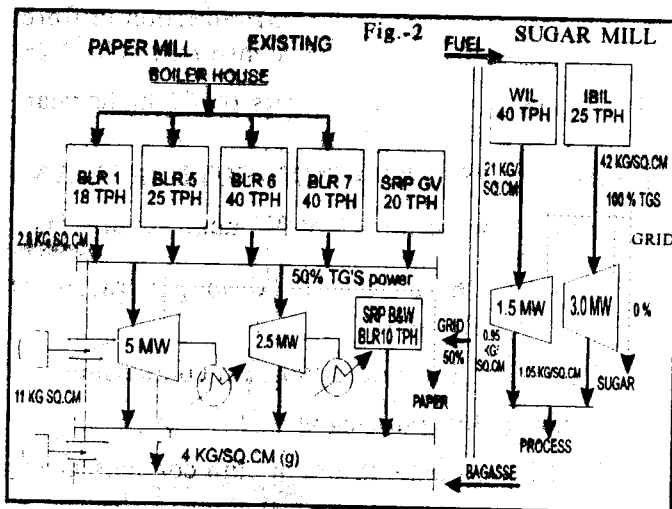
ENERGY SAVINGS : Savings in fibre about 1.8 tpd

SAVINGS : Rs 59.40 lakhs/year

EXPERIENCE ON CO-GENERATION

I. Present System

Presently SPB is producing 2000 tonnes of steam per day from their four power boilers and two recovery boilers and generates 6 MW of power



and drawing an equal amount of power from the grid. Steam is produced at 30 kg/cm² pressure and used at 28 kg/cm² at turbo generators.

Similarly PONNI SUGARS, located adjacent to SPB, produces 1000 tonnes of steam and 1.67 MW per day from their two boilers (one at 21 kg/cm², and the another one at 42 kg/cm²) and two nos of turbo generators (1.5 MW & 3 MW).

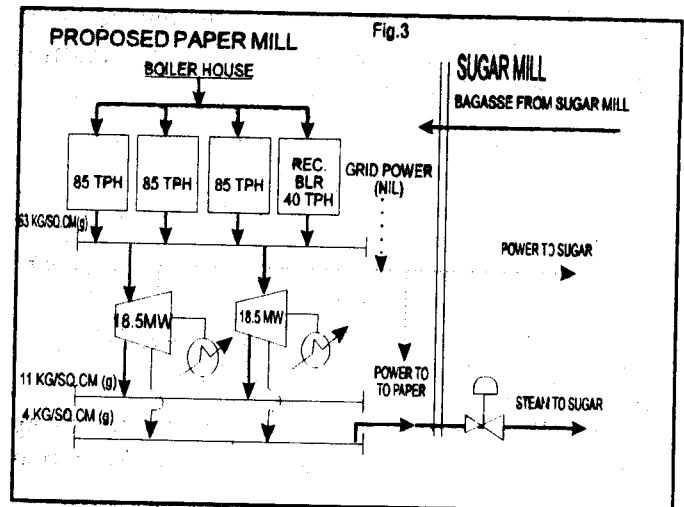
At present SPB supplies fuel for PONNI boilers and gets bagasse in return (Fig-2).

II. New Power Plant

It is proposed to install 3 power boilers and 1 recovery boiler along with 2, 18.5 MW turbo generators (TGs) to cater the steam and power requirement of both SPB and PONNI SUGARS. In this proposal SPB will supply both steam and power to PONNI and get bagasse in return. Steam will be produced at 65 kg/cm² and used at turbo generators at 62 kg/cm². Both boilers and turbo generators are designed for the future expansion of additional paper production of 150 t/day and 500 tonnes of additional crushing per day (Fig-3).

ADVANTAGES OF NEW POWER PLANT

1. Since the new TGs will be working at higher pressure level than the existing TGs, the specific steam consumption will be of improved level.
2. New TGs will be of higher efficiency than the existing ones.



ENERGY CONSERVATION MEASURES IMPLEMENTED AT SPB FOR LAST THREE YEARS

Year of commissioning	Project description	Actual achievement of energy savings per year basis			Investment incurred on the project Rs lacs	
		Power	Fuels	Others		Total savings
		lac kwh	Coal & Lignite t			Rs lacs
1993-94	INSTALLATION OF 6 EFFECT LTV EVAPORATOR		14450		110.00	400.0
	INSTALLATION OF BLOW HEAT RECOVERY SYSTEM IN STATIONARY DIGESTER		1840		14.00	10.00
	ARRESTING OF AIR INFILTRATION IN BOILER #6 AND B&W RECOVERY BOILERS		470		3.60	1.50
	REPLACING AIR PREHEATER AND PARTS OF CYCLONE EVAPORATOR IN B&W RECOVERY BOILERS		395		3.00	2.50
1993-94	Sub Total		17155		130.60	414.00
1994-95	SHIFTING OF ONE HDO BROWN STOCK WASHER TO STOP TWO PUMPS OF TOTAL 100 HP	5.73			12.50	16.74
	INSTALLATION OF 3 NEW HIGH EFFICIENCY PUMPS AT INTAKE WELL	6.40			14.00	5.25
	INSTALLATION OF 3 NEW HIGH EFFICIENCY PUMPS AT ETP	7.68			16.90	9.00
	INSTALLATION OF BELT CONVEYORS TO REPLACE BLOWERS ON THE CHIPPER HOUSE	12.89			25.44	75.00
	INSTALLATION OF ELECTRICAL DC DRIVE FOR (PMC #4) PAPER MACHINE	5.76			11.40	45.00
	INSTALLATION OF PROCESS CONTROL FOR (PMC #4) PAPER MACHINE		498		69.62	169.00
	ADDITION OF SPARE BODY IN NEW EVAPORATION PLANT		3540		24.00	40.00
	REDUCE RPM OF 15 CHEST AGITATOR BY 15%	0.79			1.94	0.05
	REDUCE RPM OF HD CHEST AGITATOR BY 15%	0.28			0.62	0.05
	SWITCH OFF ONE OF TWO AGITATORS AT 343	1.22			2.67	--
	REDUCE RPM OF BOILER NO.7 FD FAN BY 10%	0.55			1.20	0.10
	OPERATE 5MW AND 2.5 MW TURBINES ALTERNATORS AT 49 FREQUENCY	16.16			36.00	--
	SWITCH OFF IDENTIFIED TRANSFORMERS	4.80			12.30	--
	SHIFTING OF 4th WASHER IN PULP MILL	5.73			12.50	16.74
1994-95	Sub total	67.99	4038		241.09	376.93

Year of commissioning	Project description	Actual achievement of energy savings per year basis			Investment incurred on the project	
		Power	Fuels	Others		Total saving
		lac kwh	Coal & Lignite t		Rs lacs	Rs lacs
1995-96	RELOCATION OF Vth CHIPPER IN CHIPPER HOUSE INSTALLATION OF SECOND OSCILLATING SCREEN AND FABRICATION AND ERECTION OF ADDITIONAL RECHIPPER IN OLD CHIPPER HOUSE	1.92			5.37	14.00
	SRP B&W BOILER ARRESTING OF AIR INFILTRATION			23.1 (Increase in BL solids firing 12 t/day)	13.86	2.00
	INTERCONNECTION OF 5 MW & 2.5 MW TURBO- GENERATORS WATER CONNECTIONS	3.4			8.51	1.25
	INSTALLATION OF ADDITIONAL CHEST IN STOCK PREPARATION FOR CENTRALISING THE PRIMARY WOOD REFINING	3.96			9.90	12.60
	INSTALLATION OF KROFTA SAVEALL FOR MG MACHINE			savings in fibre 400t per year	16.00	10.50
	INSTALLATION OF DC DRIVE FOR NO# 1 PAPER MACHINE			increase in machine produc- tion 4t/day	13.33	39.00
	INTER CONNECTION OF SPARE VACUUM PUMPS IN YANKEE MACHINE			avoid down time 1.80 during of failure of Vacuum pumps		0.50
	INSTALLATION OF SECONDARY AND TERTIARY CENTRICLEANERS OF VOITH TYPE			savings in fibre 0.20 tpd	4.0	5.0
1995-95	Sub total	9.28			72.77	84.85
	Grand total for 3 years	77.27	21193		444.46	875.76

3. No import of power from the TNEB grid. If possible, there may be some export to grid.
4. All the power block will be at one roof with latest control system at lesser steam generation cost than the present level.
5. No of boilers in operation will be less. i.e. presently at SPB 4 power boilers and 2 recovery boilers and at PONNI 2 boilers (total 8 nos) are in operation. This will be reduced to total 4 nos.
6. New power boilers will be of fluidised bed combustion.

CONCLUSION

With various energy conservation schemes already implemented and by continuous monitoring of energy consumption and cost, the mill has been able to achieve a distinct improvement in energy conservation. Good house keeping is yet another simple tool that is being implemented.

"INVOLVE PERSONNEL AT ALL LEVELS"
"CREATE AWARENESS ON CONSERVATION OF ENERGY"

These are extremely important to achieve results.