

Energy Conservation - A Case Study of Century Pulp & Paper

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Requirement of Energy is met by consumption of fossil fuels which are non-renewable. Nature took millions of years in preparing them but humanity has almost exhausted it in last 200 years. There is an ever-growing demand for energy resulting in faster depletion of resources. The conversion of fuel not only exhausts the resources but also results into emission of GHG which have an extremely adverse effect thereby throwing new challenges for the survival of mankind. This situation has resulted into adopting the concept of 'Energy Conservation' and 'Energy Efficiency' by implementing Cleaner technologies and minimizing wastage of Energy, Various laws are being enacted to promote Energy conservation and to adopt cleaner conversion of fuel to Energy. It is imperative that the individuals understand the gravity of situation and adopt these measures voluntarily. For efficient use of Energy efficient equipment is needed but replacement of all equipment is not practical. However, there are methods for improving efficiency by utilizing the design spare capacity. In order to reduce wastages of Energy and conserving environment Government of India has enacted EC Act 2001. This Act identifies energy intensive consumers as designated consumers and lays emphasis on reducing Energy requirement in a manufacturing process by adopting technical solutions continuously. The methodology includes appointing an Energy Manager, conduct audits by accredited auditors and setting up Norms. Another dimension added to this is to maintain cost competitiveness of the industries due to globalization. In a paper plant 15-20 % cost is contributed by Energy and several opportunities exist in various sections of the Plant to reduce costs. The effort of this paper is to share our experience.

INTRODUCTION

Energy resources are getting scarce and increasingly exorbitant with time. Share of Energy costs in total production costs is rather significant. Reduction in energy costs can improve the bottom line of any company significantly.

Century Pulp And Paper has adopted a systematic Energy Management Plan with focus on reducing losses, regular tracking of consumption, energy auditing and benchmarking to continually improve on this front.

Century Pulp and Paper, a unit of Century Textiles and Industries Ltd. is Flagship Company of B.K. BIRLA GROUP of industries. The company is an ISO- 9001: 2000 and ISO- 14001

certificated unit and has established it's brand very well in the domestic and overseas market; with excellent quality of it's products i.e. Writing Printing Papers and Dissolving/ Paper Grade Pulp. The company has the following installed capacities:

Rayon Grade/ : 31320 TPA

Paper Grade Pulp

Writing & Printing : 37250 TPA

Papers (wood)

Writing & Printing : 84600 TPA

Papers (Bagasse)

A State Of The Art Technology for Bagasse pulping, sound Environment practices and excellent Product Quality are the core competencies of the company.

Energy Consumption

The power requirement of the plant is met by a 7500 MVA grid connection from UPCL and 21 MW & 6.8 MW own

turbo generator sets. The plant consumes approx 6 lacs units per day, 90% of which is met by own generation . The daily thermal energy inputs are from 600 tons of coal through 7 CF Boilers . Black Liquor & Pith generated as liquid & solid wastes are also used for meeting steam and power requirements of the mill.

The annual energy bill of the company is 16.78 % of the manufacturing cost.

Because of continuous energy conservation efforts, plant optimization and adopting technological advances, there has been a continuous reduction in specific energy consumption.

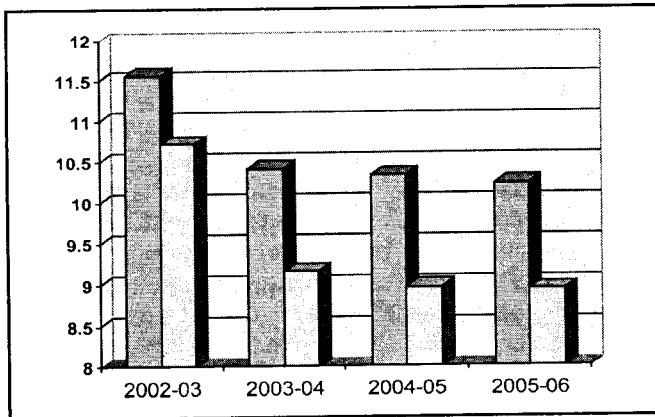
ENERGY CONSERVATION COMMITMENT POLICY AND SET UP

CPP has accorded high priority for energy conservation from the inception. Accordingly for energy conservation, a cell consisting of all energy producers & consumers is formed. The objective

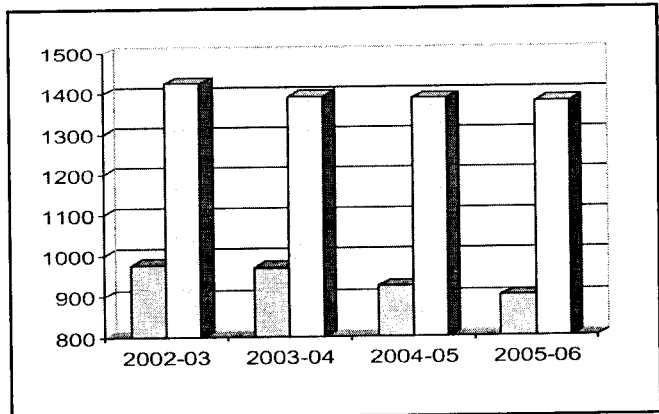
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ENERGY CONSUMPTION TRENDS :

| UNITS/TON | 2000-2001 | 2001-2002 | 2002-2003 | 2003-2004 | 2004-05 | 2005-06 |
|-----------|-----------|-----------|-----------|-----------|---------|---------|
| RGP | 1009 | 1012 | 976 | 969 | 924 | 900 |
| PAPER | 1507 | 1483 | 1424 | 1391 | 1386 | 1378 |
| STEAM/TON | 2000-2001 | 2001-2002 | 2002-2003 | 2003-2004 | 2004-05 | 2005-06 |
| RGP | 12.78 | 12.68 | 11.56 | 10.41 | 10.32 | 10.22 |
| PAPER | 11.59 | 11.24 | 10.72 | 9.16 | 8.96 | 8.93 |



STEAM CONSUMPTION TREND



POWER CONSUMPTION TREND

of the cell is to coordinate the steam and power requirement of the mill, study the causes of variance in consumption figure with targets on daily basis and take corrective measures. The cell also identifies energy conservation schemes and monitors their progress.

The energy conservation is a part of our Company Policy. Some of the major energy saving projects implemented by us are :

- Capacity utilization continuously increased
- Fine tuning of pumps and motors
- Installation of VFD'S
- Optimization of voltages & frequency of own generation.
- Optimization of operating procedures for Agitator, pumps, Depithers
- Energy efficient lighting practices
- Prevent idle running of equipments

CPP also believes that apart from

energy conservation lot of savings can be generated by effective utilization of plant capacities. The thrust is on continuous plant operation without any unscheduled stoppages. In order to involve and motivate all employees of the company we have Kaizen Scheme (small improvements) which lays emphasis on minimizing of all types of waste.

We have also executed a Productivity linked scheme wherein monthly specific steam & power consumption are compared with a base value and consumptions beyond a stipulated value enhance the pay package. A reduction of 1T/T of steam on 9.37 T/T results into an increase of Rs 650.00 similarly a reduction of 1 units results into Rs 2. An employee today earns Rs 500 - 700 per month on account of this scheme.

The company gets Energy Audits conducted by Professional bodies on regular basis. During the recent years, following audits were conducted:

- Energy Audit by CII – 39 schemes

identified.

- Audit by Ingersol Rand on compressed Air System – 8 schemes
- Audit by ECHO Pumps on Paper M/c Vacuum System – 4 schemes
- Audit by DSCL on Power Plant - 4 schemes.

There are two components to the overall Energy Management System

- Conservation: The avoidance of wasteful energy use and reduction in demand for energy related services.
- Efficiency: The reduction in consumption of energy by introducing more efficient equipments & systems.

It is often seen that in our enthusiasm to adopt energy efficient; new systems; the core ideas of conservation are overloaded. After installing various schemes towards this goal at our unit,

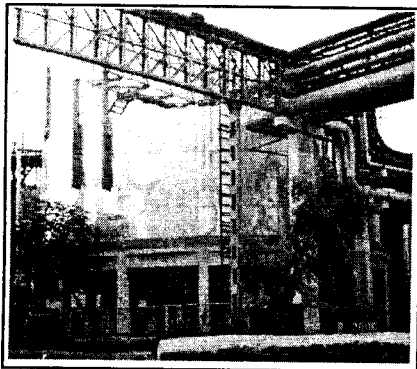
the simple conservation steps like insulation and avoidance of leakages too contributed significantly in the overall improvement as seen in the list of measures.

The above mentioned methodology adopted has resulted into 119 measures in last 3 years requiring an investment of Rs 4138.25 lacs and has yielded a saving of Rs 2982.66 lacs.

Some of the innovative measures are -

WEAK BLACK LIQUOR CLARIFIER

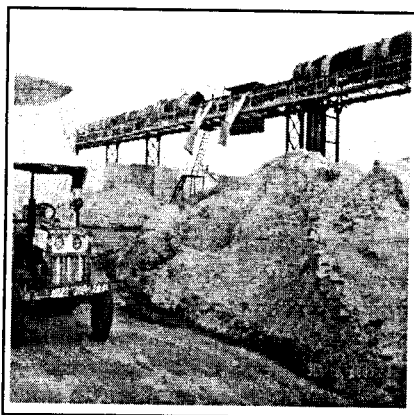
We have three Pulp mills for Rayon Grade Pulp, Wood Paper. Bagasse Paper which process Hard Wood, Bamboo and Bagasse. The cooking methods are different and accordingly the WBL generated also has different characteristics. The mixed WBL consists of lot of solids in the form of fractional fibers, earthy and siliceous material. These suspended solids on evaporation cause scale formation on the heating surface thereby reducing the capacity of evaporation and affecting the steam economy. It also requires frequent stoppages of Evaporators.



To overcome this problem we installed storage cum clarifier of 2000 m³ capacity where suspended solids along with fractional fibers and earthy materials settle down by gravity and are withdrawn from the bottom of clarifier and clear Black Liquor with 300 ppm suspended solids is available resulting in better heat transfer and reduced steam consumption. The scheme required an investment of Rs 120 lacs and resulted in an Annual Savings of Rs 9.29 lacs.

DIVERTER FOR PITH CONVEYOR

For producing Bagasse Paper we consume 1200 Tons of Whole Bagasse daily. This whole Bagasse consists of approx 65% Fiber which is used for manufacture of paper. The balance 35% is Pith which is removed during the dry and wet depithing and is used as a substitute of Coal. The pith separated during dry depithing is carried to Pith yard by a conveyor. From the discharge of the conveyor the pith is shifted and stacked by Pay Loaders. It was later transported to Coal Fired Boilers by Tractor Trolleys. These trolleys were filled by pay loaders and during loading yard stones got mixed with pith.



To overcome this problem direct feeding of pith to Boilers was thought of. Accordingly three Diverters were provided on the main conveyor such that the trolleys could be directly filled without the pith coming in contact with the ground. Pith devoid of stones caused removal of screens in the Boiler resulting in increased utilization of waste Biomass and reduced coal consumption. This direct feeding of pith also reduced handling of pith in yard

VACUUM PUMPS IN WPP

In Paper plant, Vacuum pumps are used for dewatering from pulp or paper sheet.

They consume large amount of power. These pumps were evaluated and found to be operating at low efficiency. 10 pumps were substituted by high efficiency pumps

| | Before consumption | after consumption | savings |
|-----------|--------------------|-------------------|---------|
| Pulp mill | 180 kw | 136 kw | 44kw |
| Paper m/c | 1274kw | 1040 kw | 234 kw |

This required an investment of Rs 63 lacs and resulted into a savings of Rs 51.18 lacs

resulting in savings in Pay loaders operations.

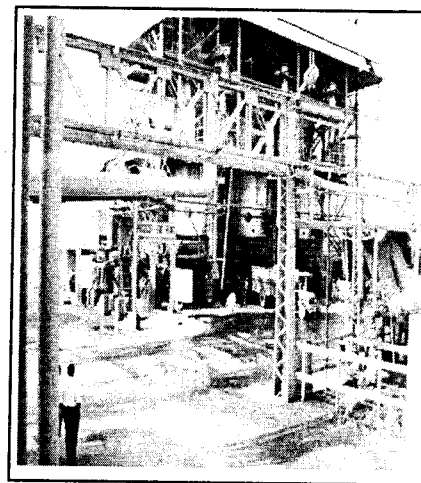
The investment was 0.5 lacs resulting into a saving of Rs 52.5 lacs through diesel & Pay loader hiring charges and Rs 97 lacs through higher utilization of Biomass and savings of coal.

PRODUCER GAS PLANT

We have got two rotary Lime kilns to recalcine Lime sludge which is a waste material generated during Chemical Recovery process. The lime produced is used in process. In this process the energy is supplied for drying, pre heating & calcining through the firing of R.F.O. In both the Lime Kilns about 36 tons of oil is consumed per day.

Considering the spiraling cost of oil we decided to install a Producer Gas Plant as a fuel substitution measure. Producer Gas is generated by gasification of coal in extended shaft gas producer.

This required an investment of Rs. 338.0 Lacs. The project was executed in April 2003 and resulted into a saving of Rs 196.0 lacs.



IMPROVED HEAT TRANSFER IN PAPER M/C DRYING CYLINDERS

For obtaining uniform moisture profile across the deckle and reduction in steam requirement for drying, the surface of dryer cylinders were ground and polished for paper m/c. This resulted in reduced steam consumption with improved Moisture profile. The project required an investment of Rs 107 lacs and an annual savings of Rs 30.4 lacs

VARIABLE FREQUENCY DRIVES

Several fans and pumps in plant have variable flow requirements. This is achieved by valve throttling/ damper operations. By this method the reduction in power consumption decreases but at the same time the efficiency of the equipment decreases drastically. RPM reduction by VFD is closest to ideal capacity control. 43 Equipments (for applications of pulp Stock, chemical dozing, back water supply, FD & PA fans) were identified and provided with VFD's. this required an investment of Rs 53.0 lacs and resulted into a saving of Rs 35.3 lacs.

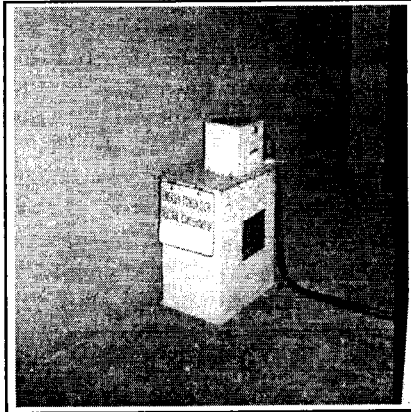


NEUTRAL COMPENSATOR

Lighting loads are single phase loads and are difficult to balance. An unevenly loaded Phase circuit results in different phase to neutral voltage and heavy return current in Neutral. It is difficult to balance it and energy is lost through uneven voltage and Neutral current.

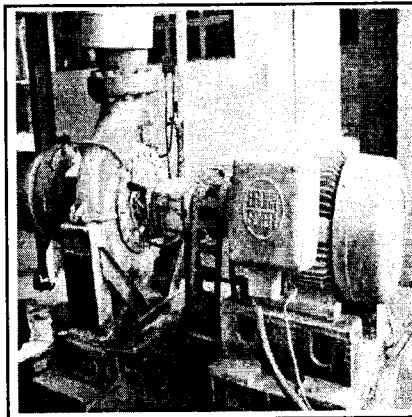
To make such loads evenly distributed, a Neutral Compensator is installed. A neutral compensator is a specially wound transformer and establishes Neutral point symmetrical with respect

to phase voltage, resulting in balance voltages in all three phases and reduced Neutral current. Four Neutral Compensators were installed with an investment of Rs 0.78 lacs and resulted into an annual saving of Rs 1.5 lacs



LIQUOR CIRCULATION PUMP

The liquor circulation pump in WPP Digester No 4 was installed since 1984. On evaluation it was found to be operating at low efficiency. The pump was replaced by Sulzer make high efficiency pump resulting into an annual savings of Rs 1.92 lacs with an investment of Rs 17 lacs.

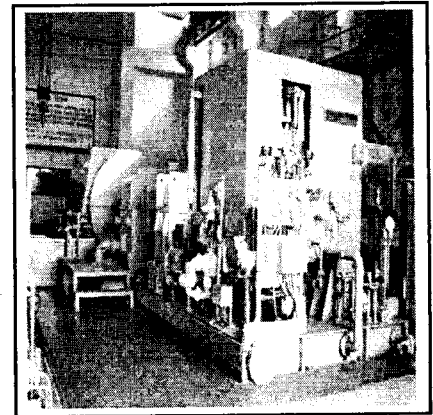


OPTIMIZATION OF CAPTIVE GENERATION

For a generation of 18.5 MW from Double Extraction Condenser Turbine significant quantity of steam was passed through the condenser and the Process steam requirement was met by PRDS. This caused partial utilization of steam energy and reduced efficiency.

In order to recover both Thermal and

Power energy from steam, optimum utilization of Extraction was done and the condenser was utilized for Process variations only. The Reduced generation was made up from UPCL grid, at a tariff of Rs. 1090/ kwh. This



resulted into

- Full extraction of steam at 10.5 Kg/cm² from Turbine which helped in arresting steam through PRDS.
- Higher Power generation from Process Steam
- Avoided venting of steam at 3.5 Kg / cm² due to process fluctuations.
- Stop one coal fired boiler of 23 TPH capacity
- Steam to Dearator was reduced
- one boiler Feed pump of 150 Kw was stopped

savings

Coal - @2700 MT/ month resulting in annual gains of Rs 583 Lacs.

Power - 350 KW Load i.e. 2.8 MKwh/ annum resulting in annual gains of Rs 56 lacs

ENHANCED POWER GENERATION BY IMPROVED WATER TREATMENT

21 MW TG had scale formation resulting into a washing cycle every 3-4 months. Turbine scale indicated presence of Sodium and Phosphate which was due to addition of CAUSTIC SODA to increase pH of boiler water. To minimize scale formation caustic soda was substituted by Indion 1605

as a PH Booster. After the treatment the washing cycle could be extended to 11-12 months. Gain of power generation equivalent to 700 kw was achieved i.e. equal to Rs 106 lacs / annum.

OTHER MEASURES

- Replacement Of 40 W Tubes.
- Use Of Energy Efficient Ballasts
- Use Of Low Loss Capacitors
- Optimization Of LT Operating Voltages
- Use Of Low Watt HRC Fuses
- Use Of LED Indicating Lights
- Optimum Utilization Of Plant

ACHIEVEMENTS

Appreciating our efforts –

- IPMA awarded us **ENERGY CONSERVATION AWARD** for the year 2002 – 03 & 2003 - 04.
- CII identified us as "**Energy Efficient Unit**" for the year 2003-2004
- Awarded **National Energy Conservation Award** for 2003 – 04 by **G.O.I.**

ENERGY CONSERVATION PLANS & TARGETS:

The following measures are planned to be undertaken in future:

- 1) Replace 14 nos reciprocating compressors by 2 nos Centrifugal Compressors to achieve better energy efficiency. The scheme requires an investment of Rs 142.0 lacs , and would result in an annual savings of Rs 39.74 lacs.
- 2) Retrofitting of Rotary Lime Kiln to improve the production and reduce Heat losses requiring an investment of Rs 200 lacs and would result in savings of Rs 98.50 lacs
- 3) Retrofitting of Mud filter for improved Dryness of Lime mud for reduced consumption of FO in Lime Kiln. The scheme requires an investment of Rs 200 lacs and would result in savings of Rs 58.06 lacs
- 4) Retrofitting of Blow Heat Recovery system in WPP Pulp Mill for enhanced heat recovery requiring an investment of Rs 58.96 lacs and would result in savings of Rs 38.92 lacs.
- 5) Condensate recovery from WPP Digester 132 M³/per day – 24.0 Lacs
- 6) Condensate recovery from Bagasse Digester 57 M³/per day – 10.35 Lacs
- 7) Condensate recovery from RGP Digester 125 M³/per day - 22.8 Lacs
- 8) Reduction of steam consumption in Soot blowing for ABL & BHEL (90 & 44 T/day)- 132 Lacs & 66 Lacs

9) Improve LP Steam pressure available at P.M/III through optimization of PRDS & TG back power.

10) Insulation jobs 45.68 Lacs (24 schemes)

CONCLUSION

Energy conservation should form an integral part of the overall management system to ensure sustainable development. In view of the rising energy costs, the paradigm has shifted towards locating innovative schemes to conserve energy. It is imperative that the employees at all levels must be made aware of the theoretical energy requirements and actuals being consumed so that the gaps can be identified and plugged. Generally, in a plant people see the losses but rarely own them. A culture must be inculcated to identify losses and eliminating them themselves. We all owe this obligation to the future generations. BEE's endeavor to fix norms for designated consumers would certainly give an impetus to industry's efforts towards judicious use of energy and its conservation.

ACKNOWLEDGEMENT

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