

Active energy conservation techniques for Paper Makers

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ABSTRACT

Paper making is an energy intensive industry ranking next to steel and petrochemical. In today's intensely competitive market the Energy Conservation is a vital component of cost control for paper industries. The escalating cost of energy and fast depletion of resources has made the energy conservation important. This made the paper makers to develop action steps to improve energy efficiency of their machines. Here we have focussed on such areas those are obvious and controllable.

Introduction

A reliable energy reporting system should be established for shortest time span possible, i.e. daily, weekly or monthly. This requires installing meters, recorders and other important sensors with routine calibration checks. Paper machine should be equipped with a computer programme that monitors energy and can help paper makers to control energy consumption. Normal or extra communication channels should be used to keep employees aware of company's energy programs and progress along with real time display of energy cost and consumption to retain every body's attention.

Electrical Energy

Refining consumes maximum electrical energy. The key variable for optimum refining applications are proper tackle designs, low running loads, separate refining of long & short fibres and replacing old conical refiners with new disk refiners which consume low energy. Old chest agitators which require large motor to be replaced with new modern agitators which have large diameters & operate at lower rpm and require less Hp drive with ON-OFF operations. Variable speed drives at fan pump also offers opportunity to save electrical energy. Flat box vacuum must be graduated

upwards from wet to dry end for optimum results. Survey of vacuum pumps and installation of more efficient pump can reduce power consumption. Energy auditing of paper machines can reveal the area where more power is used and paper makers can take suitable action to minimise it. The thyristor drives in paper machine can further conserve power.

Water

A key factor in tightening white water system is reuse of clarified white water at maximum points. Save-all and filters must be provided for reuse of back water. The fresh water consumption can be reduced by putting low volume-high pressure showers at machine, by reducing excessive seal water flow to pumps and by good housekeeping.

Heat Energy

Steam and condensate are the heat energy source in a paper machine. Basic requirements for a good steam and condensate system are properly sized and located syphons, ability to develop pressure drop, proper insulation of the piping, proper pressure and flow gauges should be located at convenient positions for better monitoring.

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Heat transfer in a dryer cylinder can be improved with elimination of noncondensable gases, keeping condensate films at minimum, eliminating inner scale and keeping outside dryer surface clean. Flash steam should be effectively used in the pre dryers. Periodic steam trap & steam line leakage checking reduces steam consumption. Steam control valves should be positioned on the operating floor. Blow through steam control can reduce steam consumption. Pocket ventilation system increases heat transfer capacity. Radiation heat losses from paper machine can be reduced with installation of dryer end caps and closed hood. High exhaust air moisture content increases the efficiency of heat transfer.

A good press section performance is very essential for efficient machine operation and minimum energy consumption. An increase of 1% in press dryness will permit a 3-4% reduction in steam consumption. This is shown in TABLE - 1, 4th presses are being installed on newsprint and fine paper machines to increase web dewatering and to reduce sheet two sidedness. Sheet rewetting can decrease sheet consistency, and rewetting after the last press is critical since the added water must be evaporated in dryer section. So care should be taken to avoid rewetting.

Proper application of steam showers in last presses can provide more efficient use of steam. The final dryness of sheet in fourdriner table configuration can have a significant effect on overall paper m/c performance and energy conservation. Proper application of hydrofoil, vac augmented foil units and suction boxes can provide energy savings. The moisture in the final sheet at pope reel should be as high as possible as this will reduce steam consumption in dryers. Moisture measuring device should be provided before pope reel to have a control on final sheet dryness. Cost benefit of moisture meters is shown in CASE Study.

Case Study

Paper machine no 3 at Ballarpur paper mills, unit Ballarpur produces writing and printing paper. Moisture measuring device has been provided before

pope reel. The economics of the device are as under.

Quality of paper	: Cream wove
GSM of the paper	: 58.6
Machine speed	: 310 M/MIN
Draw per hr	: 3.9 MT
Rise in moisture content	: 0.5% (after installation of device)
a) Saving in steam	= 0.06 MT/HR = Rs 40,583/year
b) Saving in fiber	= 0.0195 MT/HR = Rs 7,35,134/year

Coal cost Rs 465/MV & fiber cost Rs 5500/MT

Total Saving (Rs)	= Rs 7,75,717/year
Cost of the device	= Rs 5 lakhs.
Pay back	= 8 month.

TABLE NO. 1

Saving from increasing sheet dryness at presses.

Increase in dryness (%)	: saving of steam (Kgs/MT of paper)
1	: 80
2	: 159
3	: 233
4	: 305
5	: 375

Conclusion

There are significant opportunities for reducing energy on paper machines. Routine energy consumption and performance monitoring is necessary for an effective conservation programme.

Literature Cited

- 1) L.A. Sherlaw, Energy management & conservation in paper making.
- 2) R.A. Reese, Pulp & Paper Canada 89:10 (1988).