Innovation & Technology is the Key for Profitable Growth

Ankur Gupta

ABSTRACT

This paper describes how the new Steambox technology is helping mills around the world in their efforts to make the best quality products at the lowest possible cost. The lower cost of ownership and improved performance results, compared to the older technology steambox, gives a return on investment of only 39 months.

Over last few years, India has been one of the fastest growing regions in pulp and paper sector. In order to sustain this momentum going forward and to better position the industry within the fast paced global market place, industry participants need to ensure that any increase in topline growth is accompanied by a commensurate increase in both productivity and profitability. This entails pursuing a twopronged strategy of maintaining / improving product quality while at the same time ensuring that the total cost of production is low. Both these objectives can be achieved by using latest and most innovative technologies such as the new Steambox technology within Indian pulp and paper machines. New steambox technology offers both profiling and higher heat transfer efficiency, at the same time, with the lowest steam consumption as compared to conventional steamboxes.

INTRODUCTION

Over last few years, Indian Pulp and Paper Industry has outpaced the growth in other regions of the world. Even though Paper Industry is a cyclical industry and the last peak occurred way back in 1995, there are a few things that can be done to protract this growth and to keep the profits rolling. The key being sustained profitability. There are two main ways that the Indian pulp and paper industry can remain profitable, first is by making quality worldclass products and second is by keeping the costs down to the bare minimum, thus maximizing the profits. Both of these objectives can be achieved by using latest and most innovative technologies within Indian pulp and paper machines. New Steambox technology is one such answer.

NEW STEAMBOX TECHNOLOGY

Papermaking by nature is an energy intensive operation with steam and electricity being the two major forms of energy consumed on a paper machine. Drying uses about 55% of the total energy required in making paper. Anything that can be done to reduce the amount of drying can significantly lower the overall cost of production. One possible solution is to remove more water in the forming and press section by using a steambox. When a steambox is placed on the former or in the press section, it increases the percentage of solids and sheet temperature going into the dryer section, reducing the energy required in the dryer section tremendously.

Metso Automation (USA) Inc, 2900 Courtyards Drive Norcross, GA 30071

According to TAPPI [3] Technical Information Sheet 040422, a 1% increase in press solids can potentially increase production by 3.5%, which if not used for production increase can be realized as energy savings in the dryer section. A steambox achieves this by increasing the sheet temperature and hence reducing the viscosity of water, leading to more dewatering in the press section. New Steambox delivers much higher heat into the sheet, as a direct result of carefully chosen design parameters. The major changes in design include new steam injection technology, integrated sealing zones and electromechanical actuators with actual position feedback.

This new generation steambox is already helping mills around the world improve the quality of products while lowering costs. The new steambox technology offers both profiling and production increase at the same time with lower steam consumption compared to the conventional steamboxes. In field implementations savings from using this new generation steambox have ranged from US$ 500K to US$ 2,000K simply from lower cost of production in terms of energy and fiber consumption.

The new diffuser plate design shown in Figure 1, eliminates the need for preheating zones. Instead, the entire MD width of the box, with optimized diffuser plate design and integrated sealing zones, is used for raising the temperature and creating CD gradients for excellent profiling [2]. As a result, the optimum MD dwell time is

Figure 1: New Optimized Diffuser Plate Design

achieved by judicious choice of the design parameters while the entire steambox is used to increase the temperature. Electromechanical actuators provide a 100% linear movement of actuators without Hysteresis, actual position feedback and online troubleshooting capabilities without having to take the steambox off the machine.

As a combined effect of all the above mentioned features, the steam used in the steambox is at a much lower pressure and a lower degree of superheat as compared to conventional boxes [1]. In addition to the impressive performance in energy efficiency, the new features also allow excellent simultaneous profiling capability, a feature that is not possible with conventional design. This is because it optimizes the zone response [2] by a number of design features including the elimination of the preheat zone already mentioned. The steam cloud that had become almost synonymous with

Figure 2a: New Steambox with no Steam Spillage

Figure 2b: Conventional Steambox with synonymous Steam Cloud

	New Design Steambox	Industry Average
Steam Consumption	$261,274	$493,715
Maintenance Cost	$575	$5,500
Total Operating Cost	$261,849/Yr	$499,215/Yr

Table 1: Comparison of Cost of Ownership

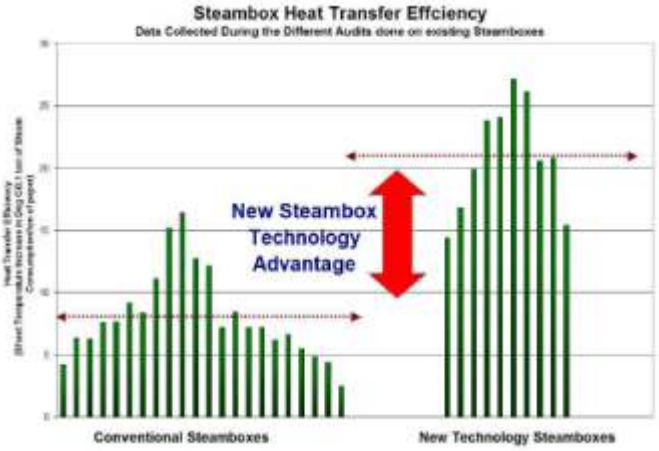

Fig. 3 Heat transfer efficiencies of 31 conventional and new steamboxes used in the study

steamboxes is not there anymore as there is no spillage at all. The integrated sealing zone technology is actually amazingly effective.

The photograph in Figure 2a shows the new design employing the integrated sealing zones in operation on a pulp dryer application. The steambox area is totally void of any steam spillage.

In comparison, the huge cloud of steam shown in Figure 2b was always present around the conventional steambox on the same machine before it was replaced with the new design.

The steam consumption in the new steambox is 50% to 60% lower compared to conventional steambox technology. The heat transfer efficiency is almost double.

WHAT THIS MEANS TO PAPER MILLS?

Due to these technological advances in steambox technology, the new steambox provides more heat to the sheet at lower steam consumption. It also helps improve CD moisture profile without compromising heat transfer. As a result paper machine operations get more drying capacity with reduced steambox operating cost, and better paper quality. Two case studies are described below to show benefits of new steambox technology.

CASE STUDY 1

This case study is for a Liner Board & Medium mill in Southern United States, showing the benefits of new technology steambox in terms of Heat Transfer Efficiency and Steam Savings.

Location : Mill in Southern United States
Grade : Liner Board & Medium
Production : 72 Tons/Hr
Moisture : 7.5%
Steam Cost : $12/Tons

Steambox Installation Location: Fourdrinier on top of the Tri-Vac before Couch Roll

- Steam Consumption in the conventional steambox: 16 Tons/Hr. Press Dryness Achieved with the conventional Steambox of 0.75%
- Steam Consumption with new generation Steambox of 7.5 Tons/Hr. Press Dryness Increase with New Generations Steambox of 1.25%
- Steam Savings Due to Additional Press Dryness: 1.8 Tons/Hr
- Steam Savings Due to Reduced Steam Consumption in new Steambox: 8.5 Tons/Hr
- Total Steam Savings: 10.3 Tons/Hr
- **Total Steam Savings: $998,321/Yr**

At the same time the CD Moisture 2 sigma reduction from before of 70%

CASE STUDY 2

This case study is from a fine paper machine in Northern Central Canada, comparing the cost of ownership between this new steambox and conventional steambox.

Production 768 Tons/Day
Grade Newsprint

Weight	45 GSM
Moisture	9%

Thus the total cost of ownership for the new steambox is $237,366/Yr, which is roughly half the industry average. Industry average numbers are based on several steamboxes that we have audited over the past few years. Some of the benchmarking results are shown in the next section.

STEAMBOX BENCHMARKING

For the last two years, we have conducted many steambox audits using two important performance indices for benchmarking purposes. This section takes a look at one of them: the heat transfer efficiency of a steambox.

Definition: Steambox heat transfer efficiency is defined as the sheet temperature increase provided by a steambox consuming a unit amount of steam for a ton of paper or board made. In our benchmarking of steamboxes, we have used 0.1 tons of steam / ton of paper (or board or pulp) as the normalization unit. Hence, the heat transfer efficiency, EA can be expressed as below.

$$EA = TI\,k / CS$$

where:

- T_I Total sheet temperature increase
- C_S Steam consumption in tons/ton of paper
- k Constant for unit conversions

As can be seen in the figure 3 (which highlights first 14 months of our auditing activity), new technology steamboxes are orders of magnitude better than conventional in terms of Heat Transfer Efficiency.

CONCLUSIONS

The paper describes the technological advances in the design of a new generation steambox. The factors underlying the improvement in performance have been discussed and presented using examples from various applications as case studies and benchmarking surveys of steamboxes in industrial use. The results indicate a significantly better performance for the new steambox compared to the conventional design.

This new steambox can be used as a tool by Indian Paper Industry to reduce operating costs, increase production and improve quality of paper. Reduced operating costs and improved paper quality can play a big roll in improving profitability and hence sustaining the growth in Indian Pulp and Paper Industry.

REFERENCES

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