

A thermal energy kaizen was conducted to reduce the energy cost for the mill. The primary focus was steam and natural gas usage on the paper machines, natural gas usage in the lime kiln, and water load on the vapor compression evaporator (VCE) in utilities. Energy costs make up nearly 10 percent of the cost of products produced at our mill. Reducing our usage can help offset the rising costs of electricity, natural gas, coal, and fuel oil.

For this event historical information was analyzed by machine and grade of paper to figure out “normal” steam and natural gas flows and set upper limits that would be considered “abnormal.” This information was then added to the paper machine reel reports and color coded green for normal and yellow for abnormal. Troubleshooting guides were created and linked to the same reel report to help guide operators to the likely reasons for energy use to be abnormal. Quickly responding to abnormally high steam and natural gas usage on the machines will save more than \$100,000 per year.



Examples of the energy costs encountered at the mill are as follows:

- Every 1,000 pounds per hour of steam saved is worth \$35,000 per year.
- Every 1,000 cubic feet per hour of natural gas saved is worth \$75,000 per year.
- The cost to evaporate one gallon per minute of water from the spill collection system is \$6,400 per year.
- The cost to evaporate one gallon per minute of water from coating in the third dryer section is \$19,200 per year.
- The cost to evaporate one gallon per minute of water from coating in the paper machine ovens is \$75,000 per year.

The lime kiln natural gas usage was also analyzed that week. The lime kiln has demonstrated an 18-percent reduction in natural gas usage over the past two years, saving nearly \$250,000 per year. “Normal” usage and “abnormal” usage was also established for the lime kiln, and visual alarms were created to alert the kiln tender to both abnormally high and abnormally low natural gas usage to ensure production of good quality lime and not waste energy. Potential savings here are less than \$2,000 per year due to the improvements achieved since 2005.

The digester basement was also inspected to identify opportunities to reduce water flows to spill collection and thereby reduce the steam required to operate the VCE. Repairing a couple of small water leaks added up to several gallons per minute and another \$30,000+ in annual energy savings. Numerous (32) safety conditions were identified, 21 were corrected, and plans were made to correct the remaining 11 items.

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