MECHANICAL INSULATORS
LMCT
Labor Management Cooperative Trust
ENERGY CONSERVATION SPECIALISTS

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The following pages will outline a case study, which shows the benefits in energy and cost savings of properly installed mechanical insulation.

Insulation is a proven means for conserving energy, reducing greenhouse gas emissions, increasing process productivity, providing a safer and more productive work environment, controlling condensation (which can lead to mold growth), supporting sustainable design technology and a host of other benefits.

Mechanical insulation does all of this, while providing a return on investment (ROI) rate, which is seldom rivaled. Despite the proven ROI, insulation is often overlooked and its benefits undervalued. Insulation is truly the lost or forgotten technology. Can you think of a more important time than now to think about how insulation can help you?

An insulation system is a technology, which needs to be engineered and maintained throughout the entire process. Several studies have estimated roughly 10 to 30 percent of all installed insulation is now missing or damaged.

The practice of not replacing or maintaining an insulation system in a timely and correct manner reduces the full benefits of insulation, and in return, decreases the ROI. In many cases, significant other issues - such as excessive energy loss, corrosion under insulation (CUI), mold development, increased cost of operations and reduced process productivity or efficiency - develop.

You can learn more on www.MechanicalInsulatorsLMCT.com, where additional case studies can be viewed.

Please do not hesitate to contact me should you have any additional questions.
Thank you,

Peter Ielimi

Executive Director
Mechanical Insulators Labor Management Cooperative Trust

LONGEST-SERVING ACTIVE PAPER MILL IN THE WESTERN UNITED STATES

SIGNIFICANT NATURAL GAS SAVINGS ACHIEVED FOLLOWING SAVE ENERGY NOW ASSESSMENT

BENEFITS

- Saves approximately $379,000 annually
- Achieves annual natural gas savings of nearly 58,200 MMBtu
- Generates a simple payback of less than 6 months

KEY FINDINGS

- An independent, outside evaluation can validate energy savings measures.
- Although the West Linn paper mill had previously upgraded its boiler controls, the Save Energy Now assessment showed that these controls needed to be adjusted to improve energy efficiency.
- By connecting two separate steam headers, the West Linn mill significantly reduced its natural gas consumption.
- The assessment process taught plant employees how to analyze their steam processes and continue to identify energy savings opportunities in the future.

APPLICATIONS

Steam systems are widespread in the pulp and paper industry and can account for a major part of a paper mill's energy consumption. Improving the efficiency of a paper mill's steam system can significantly reduce energy costs while maintaining reliability.

SUMMARY

In March 2006, West Linn Paper Company received a Save Energy Now assessment from the U.S. Department of Energy (DOE) at the company's coated paper mill in West Linn, Oregon. While the mill was already taking measures to improve the efficiency of its steam system, DOE Energy Expert Bill Moir of Steam Engineering, Inc., conducted an assessment to help the plant identify ad-ditional opportunities with significant savings potential. Employees learned how to analyze the mill's energy consumption using DOE's suite of steam system software tools.

Steam is used to dry paper and power two papermaking machines at the West Linn Paper Company's mill in West Linn, Oregon, which produces nearly 700 tons daily of coated paper.

The assessment provided seven recommendations, including specific actions the plant could take immediately to implement the energy savings opportunities that had been considered previously but not yet completed, such as:

- Connecting two separate headers and installing a blow down heat recovery system.
- Adjusting the boiler combustion controls to lower the excess flue gas oxygen content.
- Performing a steam trap survey, repairing broken traps, and adding more insulation to the 200 psig header.

As a result of these efforts, the mill achieved annual natu-ral gas savings of approximately 58,200 MMBtu.

With annual cost savings of $379,000 and total implementation costs of $176,000, the mill's simple payback was under 6 months.

COMPANY AND PLANT BACKGROUND

Founded in 1889 in West Linn, Oregon, the West Linn Paper Company is the oldest active paper mill and the largest manufacturer of coated free-sheet paper in the western United States. The mill's 250 employees produce close to 700 tons daily of coated paper under the Sonoma®, Capistrano®, and Nature Web® brand names. The company's paper products are sold throughout North America and are used for high-end advertising materials, magazines, catalogs, and book publishing.

The mill's steam system is served by three boilers, including two dual fuel (natural gas and No. 6 fuel oil) units and one natural gas-fired boiler. Steam is very important for the mill's production as it is used to dry paper and to power two back pressure tur-bines that drive the line shafts on two papermaking machines. At the time of the assessment, the steam system generated approximately 166,000 lbs/hour at 200 psig.

Based on the potential savings identified using DOE's SteamSystem Assessment Tool (SSAT) software, the West Linn mill installed a new blow down heat recovery system to save approximately 18,000 MMBtu and $133,000 per year

While the mill does not have a formal energy man-agement policy, energy efficiency is a strong priority. In the late 1990s the mill's steam load averaged nearly 200,000 lbs/hour. At a DOE-sponsored work-shop several years earlier, mill personnel obtained 3E Plus®, DOE's insulation assessment tool that en-abled them to analyze their insulation levels. The mill began adding insulation to various parts of the steam distribution network and taking steps to improve efficiency, including performing regular steam trap surveys and maintenance. Plant personnel first began to realize the value of energy efficiency when they fixed the steam traps for the first time and the steam load was reduced by nearly 12,000 lbs. Since the mill began improving its steam system efficiency, energy use has declined from 7,500 to 5,200 lbs/ton of paper and production has increased by 40%.

Project Drivers

The employees at the West Linn paper mill are motivated by the need to improve their company's competitiveness. In an effort to contain rising energy costs, mill personnel investigated and implemented several energy savings projects over the past decade.

The Save Energy Now assessment helped consolidate various ideas and provided the economic and technical justification to implement ad-ditional energy efficiency projects. This enabled the mill to achieve significant energy savings in its steam system.

ASSESSMENT OVERVIEW

The Save Energy Now assessment conducted at the West Linn mill was sponsored by the DOE Industrial Technologies Program (ITP), which provides Energy Experts to help industrial facilities evaluate and improve system efficiency. As a Qualified Special-ist in the use of DOE's steam system assessment tool (SSAT) software, the Energy Expert formed an assessment team with mill employees and installed the SSAT on their computers. This enabled them to learn the software and review the data together to determine how they could make the mill's steam system more efficient. They also used SSAT to model the mill's steam system.

ASSESSMENT RECOMMENDATIONS

After modeling the mill's steam system and evaluating the data, the assessment team identified seven energy sav-ings opportunities and evaluated each one for technical and economic feasibility. They also compared the expected energy savings and associated payback periods in order to decide which were near-, medium-, or long-term op-portunities.

NEAR-TERM OPPORTUNITY

- Tune Boiler Controls—The mill had upgraded the boiler controls prior to the assessment. However, the team found that the average flue gas oxygen levels were above 4%. By adjusting the oxygen trim controls to lower the oxygen levels, the assessment showed that boiler efficiency would improve. Annual energy and cost savings were estimated at $118,000 and more than 15,500 MMBtu.

- Improve Insulation; Survey and Repair Steam Traps—Some areas of the 200 psig header were under insulated and the steam traps were due for the 6-month survey. Mill employees already familiar with DOE's 3E Plus software used the tool to estimate heat losses after the assessment, as well as energy savings from adding insulation and repairing malfunctioning steam traps.

MEDIUM-TERM OPPORTUNITIES

- Extend 40 psig Header to Machine #3—At the time of the assessment, the 40 psig steam header in the boiler room was unconnected to the 40 psig steam header that served paper machine #3. In addition, the boiler room 40 psig steam header vented approxi-mately 2,000 lbs of steam per hour. The assessment showed that if these headers were connected, the steam currently being vented could supply the paper machine. This would lower the mill's total steam load and yield natural gas savings of more than 23,000 MMBtu and cost savings of $175,000 annually.
- Blow Down Heat Recovery—Before the assess-ment, the mill expected to install a blow down heat recovery system with a flash tank and a plate-and-frame water-to-water heat exchanger. The team used the SSAT to analyze the effect this recovery system would have on the steam system's energy consump-tion and determined that it would save approximately 18,000 MMBtu and $133,000 per year in energy costs. This estimate was consistent with the mill's previous expectation.
- Remove Steam Heated Feed Water Heater—This water heater was installed to condense the 40 psig exhaust steam from the boiler room turbine drives. When the boiler room 40 psig header is extended to the 40 psig header on paper machine #3, this water heater should be removed. Instead, a feed water economizer will be needed on boiler #2 to allow the mill to shut off the feed water heater. This could lower the mill's steam load by 8,600 lbs/hour, yield-ing annual energy savings of approximately 97,000 MMBtu and $721,000.

LONG-TERM OPPORTUNITIES

- Use Alternate Fuel—At the time of the assessment, the mill depended primarily on natural gas that it fired in two boilers. The mill's use of No. 6 fuel oil was limited by air permit restrictions. The assess-ment modeled a fuel mix of 60% natural gas and 40% No. 6 fuel oil and concluded that this combi-nation would be less expensive and more efficient than the current use of natural gas. The new fuel mix would increase average boiler efficiency yield-ing annual fuel savings of approximately 17,000 MMBtu and cost savings of $129,000. However, West Linn staff realized that greater use of No. 6 oil would produce adverse environmental impacts. In addition, sustained use of No. 6 oil would be capital-intensive because soot blowers would need to be designed and installed.

"The Save Energy Now Assessment was a great way to help us quantify the opportunities we knew were out there and dis-cover additional opportunities we hadn't seen before. It helped us prioritize the work and sell it to mill management. Training with the Steam System Assessment Tool program also gave us a consistent method to evaluate new projects. It was time well spent."

–Robert Hart, Engineering Manager, West Linn Paper Company

- Install a Feed Water Economizer on Boiler #2—The assessment found boiler #2 had no heat traps and operated with a high flue gas temperature. An economizer installed to boost the temperature of the deaerated feed water before entering the boiler would reduce the flue gas tem-perature for the boiler. The efficiency of the system would be improved by enabling the boiler to use more heat, thereby reducing the amount of fuel it required. Estimated energy and cost savings were 27,000 MMBtu and $223,000 per year.

If all the above recommendations were implemented, the total annual energy cost savings was estimated at approximately $1.5 million.

RESULTS

Encouraged by the findings in the assessment, mill personnel implemented several of the recommenda-tions by taking the following actions:

- Extended the 40 psig boiler room steam header to the 40 psig steam header going to paper machine #3 and installed the blow down heat recovery system.
- Commissioned a technician to retune the boil-ers and reset the new combustion controls. This reduced the excess oxygen levels from 4.28% to between 2.5% and 3%.

- Surveyed all the steam traps in the mill and repaired 30.
- Used DOE's 3E-Plus software to estimate steam losses from lack of insulation on portions of the 200 psig header, and then added the insulation needed to minimize heat losses. The calculated energy savings from the additional insulation was approximately 1,200 MMBtu per year with annual cost savings of nearly $8,000.

As a result of all these projects, the mill's steam load now averages 164,000 lbs/hour. Although natural gas costs declined since the assessment, the mill achieved annual cost savings of $379,000 and energy savings of 58,200 MMBtu—approximately 3% of the plant's energy use before the assessment. With total implementation costs of $176,000, the mill achieved a simple payback of about 6 months.

Due to the lower natural gas costs since the time of the assessment and the increased emissions that greater use of No. 6 oil would cause, substituting No. 6 oil for natural gas was found to be unfavorable. The two remaining long-term recommendations from the assessment were under serious consideration at the time of publication. A proposal and funding request has been made to install a feed water economizer on boiler #2. If approved, the mill will be able to remove the feed water heater fairly easily, saving an additional estimated 27,000 MMBtu and $223,000 per year.

LESSONS LEARNED

A strong commitment to energy efficiency can lead to significant energy savings. At the West Linn paper mill, the absence of a formal energy management program did not prevent mill employees from taking meaningful steps to improve the efficiency of the steam system. This included installing new controls, adding insulation, and repairing steam traps. While the Save Energy Now assessment found more oppor-tunities for energy savings in the mill's steam system using the SSAT, it also reinforced efforts already in progress to improve energy efficiency and helped justify the implementation of those projects.

In addition to the SSAT, other DOE software tools can be used to analyze industrial systems and pro-cesses and generate energy efficiency opportunities, including: AIRMaster+, the Fan System Assessment Tool (FSAT), MotorMaster+, the Process Heating Assessment and Survey Tool (PHAST), the Pumping System Assessment Tool (PSAT), and 3E Plus.