Rock-Tenn Company Saves $170,000 by Reducing Energy Losses

Paper Mill Insulates Steam and Condensate Lines

Company	Rock-Tenn Company St. Paul, Minnesota
Results	Reduced energy use, saving $171,000 annually.

The Rock-Tenn Company is an international corporation that produces packaging, merchandise displays, and 100 percent recycled and specialty paperboard. The St. Paul Rock-Tenn paper mill, built in 1908, recycles nearly 1,000 tons of scrap paper every day.

Steam from the Xcel Energy High Bridge power plant is used in the papermaking process. Under Xcel Energy's Metropolitan Emissions Reduction Plan, the coal-burning High Bridge plant is being converted to natural gas fuel. This conversion will eliminate the steam source for Rock-Tenn, requiring the plant to find an alternative steam source. To minimize the size and cost of the new steam source, Rock-Tenn requested a MnTAP intern to help investigate energy saving opportunities in the plant.

Steam and Condensate Line Insulation

Rock-Tenn has nearly 20,000 feet of steam and condensate lines. The steam lines transport the heat energy needed to run electrical generators and dry paper as it progresses through the paper machine. After transfering its heat the steam condenses into warm water. The condensate lines return the warm water to the boiler to be turned into steam again.

Often in older production facilities, such as this one, steam and condensate lines were not insulated because energy used to be inexpensive. Uninsulated steam and condensate lines waste energy because they allow heat to dissipate, similar to the way an uninsulated house wastes energy. Uninsulated steam lines also present a burn hazard to employees if the lines are located where someone could touch them.

Uninsulated lines at Rock-Tenn lost millions of Btus annually—enough heat to keep 350 homes warm through a Minnesota winter—at a cost of $190,000. The MnTAP intern researched steam and condensate line insulation and found that heat loss could possibly be reduced by 90 percent.

As a rule of thumb, insulating steam lines that are currently uninsulated is cost effective. Because of the large size of the Rock-Tenn steam system insulating would require a significant capital outlay, making it important to evaluate the costs and benefits associated with different insulation types and thicknesses. The intern used a software package called 3E Plus, available free from the U.S. Department of Energy, to help with the cost/benefit calculations.

Using a combination of CAD prints, interviews with plant personnel and plant walkthroughs, the MnTAP intern gathered the information needed to run the cost/benefit analysis. This included pipe lengths, pipe diameters, number of elbows and valves (which cost three times more to insulate than a linear foot of pipe), pipe material, pipe temperature, plant temperature, wind speed, energy cost information and return on investment requirements.

The cost/benefit analysis indicated that insulation of 1.5 inches on the steam lines and one inch on the condensate lines would have the shortest payback (15 months). Rock-Tenn had the pipes insulated in a few stages to spread the cost between budget cycles. With a rebate from Xcel Energy as an additional conservation incentive, the payback time was reduced by one month.

Waste Heat Investigation

Non-contact cooling water is used in a number of process steps at Rock-Tenn including electrical

(continued)

MnTAP is funded by a grant from the State of Minnesota to the University of Minnesota, School of Public Health.

MnTAP • University of Minnesota • 200 Oak Street SE, Suite 350 • Minneapolis • Minnesota 55455-2008
612/624-1300 • 800/247-0015 (Minnesota only) • Fax 612/624-3370 • www.mntap.umn.edu

turbine cooling, vacuum pump seal water, compressor cooling water and roll cooling on the paper machine. The heat picked up in the cooling processes is used in other parts of the process by use of heat exchangers.

The MnTAP intern investigated the heat recovery system currently in place and looked for opportunities to improve it. While some limited opportunities were identified, implementation was not approved due to uncertainty about how the plant heat balance will change when the steam source changes and due to the difficulty of making process piping changes in a continuously operating facility.

Software for Analyzing Steam Efficiency

3E Plus

3E Plus Insulation Thickness Computer Program was developed by the North American Insulation Manufacturers Association (NAIMA) to simplify the task of determining how much insulation is needed to reduce energy use. The 3E Plus program can:

- Calculate the thermal performance of both insulated and uninsulated piping, ducts and equipment
- Translate Btu losses into actual dollars
- Calculate greenhouse gas emission and reductions

Download a free copy of the software from NAIMA at <http://www.pipeinsulation.org>.

Steam System Tool Suite

U.S. Department of Energy makes available a suite of tools for evaluating and identifying steam system improvements. In many facilities, steam system improvements can save 10 to 20 percent in fuel costs. The software is available at <http://www1.eere.energy.gov/industry/bestpractices/steam.html>.

Environmental Benefits

In addition to the economic impact at Rock-Tenn, reducing energy use has an estimated annual environmental impact of reducing five million pounds (2,500 tons) of carbon dioxide emissions from coal burning to generate the steam. Carbon dioxide is a greenhouse gas associated with global warming.

For More Information

MnTAP has a variety of technical assistance services available to help Minnesota businesses implement industry-tailored solutions that prevent pollution at the source, maximize efficient use of resources, and reduce energy use and cost. Our information resources are available online at <mntap.umn.edu>. Or, call MnTAP at 612/624-1300 or 800/247-0015 from greater Minnesota for personal assistance.

This intern project was conducted in 2004 by MnTAP intern Steffen Springborn, a chemical engineering senior at the University of Minnesota.