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Seaman Paper Company

Resource Conservation Case Study

Energy Efficiency Measures Save Resources and Money

Summary

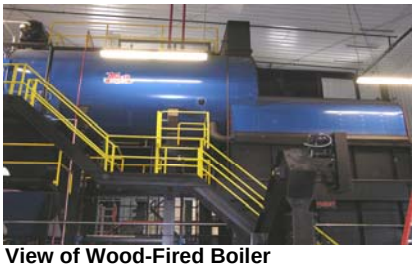
Seaman Paper Company is a leader in resource conservation that has significantly reduced energy use and fuel consumption over the last 10 years by making changes to its operations. The company implemented an energy conservation program that reduced electricity use by 2.6 million kilowatt hours (kWh) per year and oil use by nearly 1.7 million gallons per year. In addition, Seaman is installing a backpressure steam turbine/generator, which will enable the cogeneration of electricity and process steam and lead to further energy savings. All of these changes have saved Seaman Paper more than $1.5 million in yearly operating costs.

Background

Seaman Paper Company of Massachusetts, Inc. (http://www.satinwrap.com) is a privately owned paper company located in Otter River, Massachusetts, employing 100 people. The plant operates around the clock, seven days a week, producing on average 70 tons per day of decorative tissue paper. Some of the paper produced in Otter River is transferred to nearby plants in Gardner and Orange for printing and converting into specialty products. Seaman produces tissue reams, crepe streamers, doctor exam rolls and waxed foodservice papers.

Energy Use and Savings

Seaman uses electricity to drive its equipment and steam to dry the paper. On a monthly basis, the Otter River plant purchases 2 million kWh of electricity and produces 17 million pounds of steam. It also uses 900,000 gallons of water each day. Measures taken by Seaman have reduced annual electrical energy use more than 8%, and oil use by nearly 1.7 million gallons per year, equivalent to an annual removal of 13,634,360 pounds of carbon dioxide emissions from the atmosphere.



View of Wood-Fired Boiler

Energy Conservation Measures

Since 1999, Seaman has aggressively pursued an energy conservation program. This reduced electrical energy use by 2.6 million kWh per year – a 10% reduction per ton of paper produced and a reduction in steam use of 21% per ton of paper, which saved an estimated 432,000 gallons of oil per year. They later added a wood-fired boiler, which further reduced oil use by 1.2 million gallons per year.

Steam: Seaman uses steam to heat large, cylindrical dryers that process the newly made paper. Some of the steam passes through without condensing, and thus without transferring its latent heat. This is called "blowthrough" steam. To capture this heat, Seaman installed thermocompressors, which repressurize the low pressure steam, so that it can be reused in the dryers. Seaman is also recovering energy from some of the condensate stream. When hot condensate in a pressurized system is released at a lower pressure, some of the condensate will become steam. This is called flash steam, which Seaman once vented, producing a waste energy stream. Seaman installed a heat exchanger to recover this waste energy and now uses it to preheat boiler feedwater makeup and incoming process water. Seaman also recycles 28% of its wastewater effluent back to the intake of the plant for reuse in the process, which reduces the energy needed to heat fresh water. This has reduced Seaman's fresh water demand by 131 million gallons per year. In the winter, the differential between the river water and the recycled effluent can be as high as 26° F, representing a significant energy savings.

Baghouse for Control of Particulate Emissions from Wood-Fired Boiler

Electricity Reduction: Seaman achieved electrical energy use reductions by various means. More efficient lighting was installed throughout the plant: T8 fluorescent bulbs are brighter and have a smaller diameter than common fluorescent bulbs. In addition to saving energy, the lamps provide a superior quality of light. The company also installed 58 variable frequency drives (VFDs). These drives use sensors to determine power needs and to match the output of the device (such as a motor) to the job it needs to do. This is accomplished by varying the electrical frequency of the current applied to the device. Using a variable speed drive allows the elimination of such devices as throttles or dampers, which modify the application of the power of the device to the need, but in a way that wastes energy. Seaman eliminated dampers in boiler forced draft and induced draft fans, and throttling valves in several pumping applications. VFDs were used in combination with brakes known as regeneration brakes, replacing friction brakes on the tissue winders. Regeneration brakes absorb the power of braking as recaptured electrical energy instead of dissipating it as heat, as friction brakes do. These brakes also experience less physical wear than friction brakes and thus have a longer life. Seaman also replaced some eddy current drives with VFDs. The eddy current drives used magnetic clutches that had slip and were less efficient than the VFDs. The payback period on these improvements was between one and three years.

T8 Lamps in production area

Biomass: In 2007, Seaman Paper installed a waste wood-fired boiler, which reduced the company's fuel oil use by 70%. Seaman now saves about 1.2 million gallons of oil per year by burning chipped waste wood in a 20,000 pound per hour boiler equipped with a baghouse for particulate emission control. This also eliminated 10 tons of nitrogen oxide emissions and 95 tons of sulfur dioxide emissions annually.

Future Plans

Currently Seaman is moving ahead with plans to install a backpressure steam turbine to cogenerate electricity and process steam. Superheated steam from the wood-fired boiler will be expanded through the new turbine/generator producing electricity at a cost far below the current utility rate. The turbine exhaust steam will then be used in the paper making process. The estimated payback period for adding the turbine/generator and related systems is two years.

Benefits of Cleaner Technology

According to Seaman Paper's president, George D. Jones, these measures have saved the company millions of dollars. "I would have done all of these things even if they weren't good for the environment because they have kept us competitive in the global marketplace," said Mr. Jones. "We're very pleased to look back at what we've done, and see the significant reductions in carbon dioxide and other emissions. It feels good to see that because everyone has to try to play a part in addressing these important issues." Jones also expressed appreciation for useful advice received from a free assessment provided by the Industrial Assessment Center at UMass Amherst, a program funded through a partnership between the state and the Department of Energy.

Boiler Feedwater Pump (Controlled by a VFD)

This case study is one in a series prepared by the Office of Technical Assistance and Technology (OTA), a branch of the Massachusetts Executive Office of Energy and Environmental Affairs. The Office of Technical Assistance and Technology (OTA), the Commonwealth's center for technical information and assistance, helps businesses and other organizations improve their environmental performance and conserve energy, water and other resources. OTA promotes the implementation of management strategies, systems and technologies that enable businesses to enhance their competitiveness as they reduce use of toxic chemicals, prevent pollution, conserve resources, and ensure worker health and safety. This information is available in alternate formats upon request. OTA's **non-regulatory** services are available at **no charge** to Massachusetts businesses and institutions. For additional information about this or other case studies, or about OTA's technical assistance services, contact:

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