



Advice and financial incentives to become more Energy Efficient

Wastewater heat recovery makes up Phase I of Irving Paper's energy reduction initiatives. By identifying waste heat sources and installing heat exchangers and a thermocompressor, Irving Paper cut fossil fuel use by 13%. The capital cost of the project was \$4.1 million with annual savings of approximately \$2.3 million, a payback of less than two years.

For more information:

J.D. Irving, Limited www.jdirving.com

Farshad Piroozmand, Process Engineer
Tel: 506-633-3314
piroozmand.farshad@irvingpaper.com

John Cummings, Project Manager
Tel: 506-632-5877
cummings.john@irvingpaper.com

Efficiency NB's industrial program is designed to help accelerate industry investments. By using energy-reducing practices and new equipment that will lower energy intensity, it will allow industry members to better manage their energy costs in the long term while improving their competitiveness. For more information on Efficiency NB visit www.energycnb.ca.

Capturing waste heat proves profitable for Irving Paper

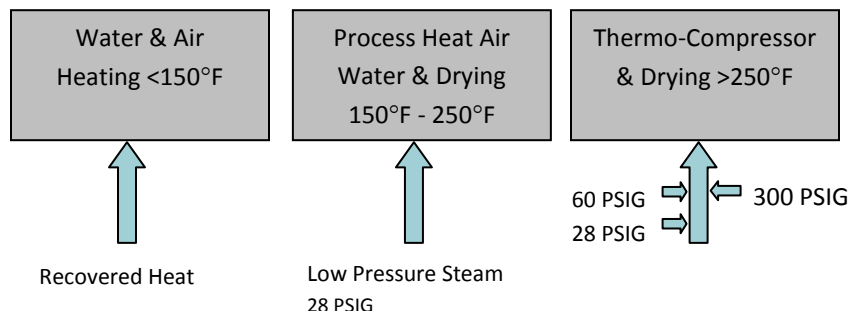
Every year, Irving Paper, a division of J.D. Irving Limited, produces more than 400,000 tonnes of speciality paper at its paper mill in Saint John, New Brunswick.

Energy accounts for 30% of Irving Paper's manufacturing costs. With increasing fuel prices, and in keeping with its environmental policy and ISO14001 certification, Irving developed a long-term strategy to reduce fossil fuel use and greenhouse gas (GHG) emissions at its mill. Phase I, the subject of this case study, describes Irving Paper's heat recovery project.

"Our customers are looking for companies that are at the leading edge of environmental practices," says John Cummings, project manager. "This project allows us to stay ahead."

Waste Heat Recovery

As shown in the graphic below, the strategy for the energy reduction initiatives is to maximize the use of recovered heat for water and air heating, to use low-pressure steam for process heating and to consume steam generated from fossil fuels only where required.



Irving uses a three-level heat recovery model for its energy reduction initiatives.

In this project, heated effluent is first piped to a new recovery tank (pictured at right) where solids in the effluent are screened out and transferred to a biomass boiler for incineration. The collected effluent is then pumped to two spiral heat exchangers to heat the filtered water. The filtered water is then returned to the hot water tanks at the paper machines. The low pressure steam that became available through the process is then recovered using a thermocompressor, which mixes high- and low-pressure steam into a medium pressure that is useable for the paper machine dryers.



Actions

A first step in any energy reduction initiative is to review existing conditions and equipment and determine where the most energy is being used. Farshad Piroozmand, Process Engineer with Irving Paper, began an evaluation of the mill in 2007.

“I was looking for a challenge, so my boss pointed me to the paper mill,” he recalls. “When you see the mill you see all the steam and heat coming off the stacks into the air, so that’s where I started.” At the time, he estimated that heat from the stacks, effluent trenches and sewers could be recovered to replace as much as 40 -45% of the fossil steam energy.

A key factor in the success of this project was the support provided by corporate and management personnel. “The vice-president wanted me to find out what we could do about reducing energy and our carbon footprint,” says Mr. Piroozmand. As a participant in the Efficiency NB *Industrial Program*, the company took advantage of the *Business Case Incentive* in order to address detailed feasibility issues such as the detailed costs, savings and implementation plan for the project. The company also used the *Measurement & Verification Incentive* to prepare a plan for measuring & tracking the savings after project implementation and to fund 50% of the cost of new meters and instruments required for measuring savings. Says Mr. Piroozmand, “Once we came up with the details, the capital for the project got rolling very quickly.”

Installation of the new equipment began in April 2008 with a capital cost of \$4,100,000.

Five sources of wastewater heat were identified during the evaluation. A new tank was installed to collect the wastewater, which is then pumped to two new heat exchangers (*pictured at right*). Filtered water is heated to the appropriate temperature and is pumped to hot water tanks located at each paper machine.



The pressure of the unused low pressure steam that became available was too low a pressure for drying paper. In order to use that low-pressure steam, while reducing the high-pressure steam produced from fossil fuels, a thermocompressor (*pictured at left*) was installed. The thermocompressor mixes the low- and high-pressure steam into a medium pressure that can be used on the paper machine dryers.



A significant amount of the work for the project was done in-house. "A lot of the engineering we did would have required a consultant," recalls Mr. Cummings. Instead, Farshad, with the assistance of the mill process team selected the effluent steams to be captured and the processes to benefit from the recovered energy. He then determined the equipment required for the task and carried out the detailed payback analysis. Following this, a local consultant was contracted to provide a construction cost estimate and detailed engineering. Equipment installation was carried out by local contractors. Programming, start up, commissioning and training were all carried out by mill personnel.



*Advice and
financial incentives
to become more
Energy Efficient*

Challenges & Benefits

One obstacle that became clear early on in the process was the fact that one of the available heat sources contained solids that would plug the heat exchangers. An inclined screen, and an additional tank and pump were installed to separate the fibre from the stream.

“This was actually an advantage,” says Mr. Cummings. “The effluent produces about two to three tonnes of pulp fibre every day that would normally be considered waste. Now that we’re collecting it, it’s free fuel for our biomass boiler and there’s less waste.”

Irving Paper encountered few other obstacles. “There were minor start-up details, such as tank levels changing too rapidly, so we had to tweak the programming,” says Mr. Cummings.

The benefits, on the other hand, are notable. With an estimated \$2.3 million in annual savings, the project will pay for itself in less than two years, even less if the cost of oil rises. “Our estimates are based on a \$50-\$55/barrel price for oil, so if the price goes up, the savings will be even better,” says Mr. Cummings.

In addition, the project reduced the demand for steam so significantly that Irving Paper can shut down one of its two boilers during regular maintenance without it affecting the mill’s output. “We used to have to tie the boiler shut down to a paper machine shut down, so we would be struggling for resources,” Mr. Cummings explains.

For industries that may just be starting on the path of energy reduction projects, Mr. Piroozmand recognizes that not all companies will have access to the capital necessary to do what Irving Paper has done.

“I would suggest that, if that’s the case, they look at implementing an energy management information system (EMIS) because that can give you a lot of benefits for very little money,” he says.

Mr. Cummings agrees. “Once people start using an EMIS they start to think in terms of energy reduction. It can be as simple as keeping the building closed up in winter to retain heat or shutting down unnecessary motors.”



**Advice and
financial incentives**
to become more
Energy Efficient

Next Steps

The next phase of energy reduction projects at Irving Paper will be presented to management in July 2009. Phase II will involve recovering more waste heat from the effluent and stacks, and at this point it looks like it has even more potential for energy reduction than the first phase.

“Management is pushing us to provide the details of the next phase,” says Mr. Piroozmand. “They’re excited about it and want it to go ahead.”

With Phase I, Irving Paper achieved an approximately 13% reduction in fossil fuel usage. “Once all of the planned energy reduction initiatives are in place, we expect that fossil fuel use will be cut by up to 40-45%,” says Mr. Piroozmand.

All photographs and graphics provided courtesy of Irving Paper Limited.