

A SPECIAL
REPORT ON ENERGY
EFFICIENCY FOR
PULP AND PAPER
MILLS

POWER DOWN!

Strategies for energy management

During a roundtable discussion, this group came up with some strategies and common challenges related to improving energy efficiency at Canada's pulp and paper mills. These range from the strategic (complete shutdown to avoid peaks of electricity demand) to the mundane (check for air and steam leaks at least once a month, and fix them!), and everything in-between (energy managers, funding programs, measuring and monitoring systems, and employee buy-in).

By CINDY MACDONALD, EDITOR



The Bottom Line on Conservation



In many respects, Ontario's businesses have led the way in creating a culture of conservation in the province. Companies, both large and small and across all sectors, are investing in energy saving and seeing the results in their bottom line. In 2014 alone, business conservation efforts through the IESO's saveONenergy programs resulted in almost 600 GWh of energy savings.

The business case for conservation is pretty clear – it cuts costs. But conservation also delivers broader benefits for all Ontarians – reducing the need to build new infrastructure and lowering the wholesale price of electricity. We are helping to make our province more competitive for business while also contributing to a cleaner environment.

That's why the province has moved to a new framework that puts conservation first before all other supply options. This opens up a myriad of opportunities for businesses that are able to shift or reduce their demand for electricity. Through the IESO's saveONenergy programs, there are numerous opportunities for businesses to reduce their overhead costs through retrofits, energy audits, lighting and equipment upgrades, and participating in demand response.

This success, however, is only possible by business, industry, associations and public agencies working together to use their collective strengths to increase our conservation and business competitiveness.

We need this collaboration to continue. Over the past four years, we have seen businesses step up their conservation efforts – not only to capture cost savings but also to capture the strategic value that conservation can offer their organizations.

Now we need to push further. The province has set new conservation targets – ones that are more ambitious than in previous years. Our research shows that there remain more than enough opportunities for us to work with businesses to achieve these results. We need to develop more comprehensive solutions – including embedding sound energy management practices within the very core of business decisions.

This publication aims to further this conversation. There are many dedicated individuals with great ideas about how to enhance our province's conservation capability – you will learn their stories here.

To find out what conservation can do for your business, visit saveonenergy.ca/get-started.

Terry Young

*Vice-President, Conservation and Corporate Relations
Independent Electricity System Operator*

Managing power consumption has become a complex game of strategy for pulp and paper mills in Canada, with high stakes. The advent of time-of-day pricing, peak mitigation programs and deregulated electricity markets in various jurisdictions across the country means large energy users have to be constantly aware of their electricity usage, and constantly weighing the costs vs. the benefits.

At pulp and paper mills in Alberta, operators in the control room monitor electricity pricing on a continuous basis, and shut down production when the cost becomes prohibitive. Similarly, in Nova Scotia, one integrated mill does its energy-intensive pulping at night, and shuts that process down during the day.

In Ontario, a mill can participate in the Industrial Conservation Initiative delivered through the Independent Electricity System Operator (IESO) or their electric utility to curtail their peak demand during five peak hours through the year in order to reduce the global adjustment paid on their monthly electricity bills. This curtailment is often achieved by anticipating the peak periods and either shutting systems off or shifting production schedules to lower energy used during these times.

In concert with these types of strategic decisions, pulp and paper companies are implementing smaller energy conservation measures throughout their plants to bring electrical consumption down.

To get a better understanding of how the industry is addressing the challenges of energy conservation, *Pulp & Paper Canada* hosted a roundtable discussion on Feb. 25, 2015, made possible by the IESO. That discussion forms the basis for this special report. The panelists, listed at right, consisted of operations personnel, energy managers, one machinery supplier and one technical specialist. They brought a wide range of experience and expertise to the table.

In his role as president of Kadant Canada, Mike Soucy has visited and evaluated many North American mills. He says the level of awareness and effort directed toward energy efficiency varies from mill to

mill. "I find it's truly hit or miss. Some mills do an excellent job at it; for other mills, it's almost non-existent."

And yet, electricity is one of the most significant costs for a pulp or paper producer. "It is the highest controllable monthly cost that we have," says Bahram Shabbazin of Resolute Forest Products.

Adam Muree, an energy manager with Atlantic Packaging, calculates that electricity is 36% of the operating costs for the company's linerboard mill in Toronto.

Cultivate a culture of awareness

In the industrial environment of a pulp and paper mill, achieving energy efficiency gains requires the engagement of both people and technology. An energy efficient producer must create a culture that takes action, and employees must understand technology and use it to minimize consumption of resources – electricity, air, water, heat.

Tom Browne, as a research leader with the national research and innovation organization FPInnovations, has vast experience with process optimization at mills. "The most efficient mills are not necessarily the newest ones," he observes. "It has to do with the employees and the management style."

In other words, efficiency is directly influenced by the culture at each mill.

One approach to boost employee engagement is to piggyback energy topics onto the safety culture. At Cascades, it is a suggestion from headquarters that energy should be brought up at safety meetings, says Marzieh Baghi, a project manager with the company. "Once you have everybody sitting together and talking about safety, why don't we talk about what our targets are, why don't we talk about the project we just did, how much savings we achieved. This has been very successful because it is very hard to steal some time during the week from the operations side. Getting energy tied into the safety meeting has helped us to promote more energy saving opportunities."

Adam Muree of Atlantic Packaging suggests that an energy team should adopt some of the practices of a safety team,



(from left to right): Marzieh Baghi, Mike Soucy, Cindy Macdonald, Adam Murree, and Tom Browne. Missing: Said Mozaffari, Bahram Shabbazin.

All photography by Lemon Sky Images Photography.

ROUND TABLE PARTICIPANTS

MARZIEH BAGHI, project manager (energy), Cascades GIE Inc.

TOM BROWNE, research manager in biorefinery and energy, FPInnovations

SAID MOZAFFARI, pulping/ETP manager, Resolute Forest Products, Thorold mill

ADAM MURREE, energy manager, Atlantic Packaging

BAHRAM SHABBAZIN, process engineer, Resolute Forest Products, Thorold mill

MIKE SOUCY, president, Kadant Canada



specifically, regular meetings and walks around the plant floor to conduct audits. “We have an energy team for Atlantic Packaging. We have prizes, we have a suggestion box, we’re giving employees ideas for their home, to save energy. We’re hoping that this will generate some interest and add to some other projects that we’re working on.”

At Resolute Forest Products’ Thorold mill, the concept of reporting “near misses” has been adapted

for energy conservation. Bahram Shabbazian explains: “We try to inform our operators and everybody in the mill that the “near miss” concept is not just for safety, but for any incident that they see in the mill. In terms of air leaks or steam leaks, or other concerns, they have to write down the near miss and inform [the appropriate] managers.”

“Actually, one thing that I find Resolute does really well,” adds Mike Soucy, “is that after an energy savings project is complete, the company has a form, like a project summary, which documents the savings and

the mill manager signs off on it. Then it is circulated to all the other mills.”

This sharing of information among all mills is also a policy among Resolute’s safety teams.

Audits lead to savings

Sometimes, it simply takes a fresh set of eyes to identify energy saving opportunities and initiate changes. The impetus to take action can come from something as simple as questions from a visiting technical service representative, or from a mill-wide audit by an external consultant.

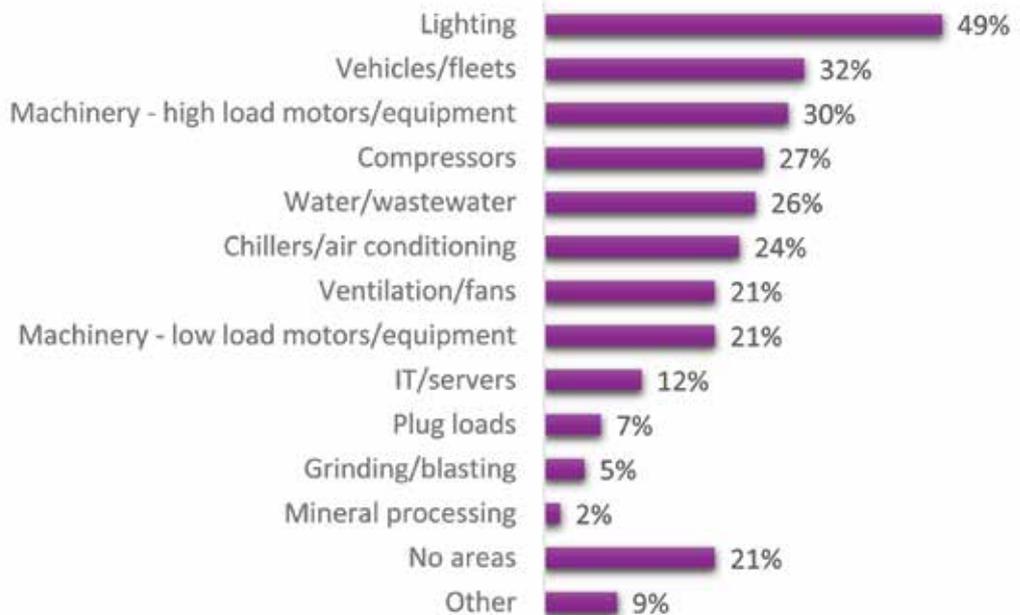
Among mills participating in the *Pulp & Paper Canada* roundtable discussion, energy audits are a common occurrence. But this appears not to be the case for the majority of businesses across Canada.

A recent poll conducted among readers of the Annex-Newcom network of business-to-business publications found that only 38% of respondents reported that their company had conducted an energy audit in the past five years. The survey had 510 respondents, representing the manufacturing, transportation and resource sectors, as well as service providers, and wholesale and retail trades.

Among those whose companies did conduct an energy audit, nearly half (43%) reported that the audit was conducted by an “energy consultant or certified auditor.” Just over a quarter (28%) reported it being



In what areas of your operations do you track consumption?



Source: Annex-Newcom multi-market survey on energy efficiency, 2015.

conducted by internal staff. Nearly all respondents (85%) indicated that the energy audit led to savings at their company, and 77% of respondents reported that energy efficiency changes were implemented as a result of the energy audit.

In Ontario, the saveONenergy program provides incentives for energy audits and engineering studies. These are often the first step for businesses looking to improve energy efficiency. As well as identifying the energy savings of a potential project, audits can calculate the capital cost, identify non-energy related benefits in areas such as productivity and safety, and summarize the return on investment of each project.

"I think most mills know they could be more efficient, but staffing being what it is, they don't have the time [to act on it]," says FPIInnovations' Tom Browne. "So, having someone come in and actually document the opportunities is always good. It's even better if they can say, you ought to re-pipe this way, or you ought to replace the siphons, or you ought to adjust your air dampers, or you don't need to run your headbox so hot." He believes an audit report should include not just benchmarking, but concrete actions that the company can take that would improve efficiency. And it should be followed up by a phone call in six months to see if it has fallen off the radar or not, he concludes.

"I think that Cascades has been a pioneer in

energy management and studies," says Baghi. The company has a group at the corporate level that is focused on energy management and energy saving opportunities for all of Cascades' North American facilities. "We have done more than 100 different projects to reduce energy. We constantly monitor our energy consumption, and we do benchmark to make sure that we stay within the industry standards.

"We actually have added a mandate for all of our North American facilities to fix all of our air/steam leaks," she comments.

Cascades' energy experts also do third-party consulting for other companies in the industry.

Mike Soucy of Kadant Canada says that quite often, energy savings are the deciding factor in the sale of Kadant's equipment. "The next question is – how will we do it? That's where we come in [to a plant] and basically offer suggestions to the customers. We'll say here's where you're losing energy and here are



Powerful help: Incentives to bring ideas to reality

There are many reasons to focus on upgrading or modernizing systems for energy efficiency, ranging from reduced operating costs and increased sales to improved employee comfort and effectiveness. Fortunately, there are also incentives and rebates available to encourage businesses to take advantage of opportunities to improve efficiency and competitiveness, as well as non-financial tools and resources.

In Ontario, these incentives and resources can be accessed through the saveONenergy program.

Energy audits and engineering studies

This is often a first step for businesses looking to improve efficiency. They are used to identify opportunities for improvements and provide business cases. They can:

- Classify energy savings by potential project
- Identify potential non-energy related improvements including productivity, safety, yield, sales, etc.
- Identify the capital cost of the projects
- Summarize the return on your investment for each project and prioritize the projects based on capital cost, lifecycle cost savings and non-energy related financial benefits.

Use this to provide return on investment, savings to investment ratio, payback periods, etc.

SaveONenergy can cover up to 50% of the cost of audits.

Once opportunities are identified with an audit, more detailed

engineering studies can define what exactly is required and provide more accuracy on the potential savings and costs. 100% of the cost of engineering studies is covered by saveONenergy.

Retrofits

Once a business is ready to upgrade to high-efficiency systems for lighting, HVAC systems, pumps, motors, fans and other plant equipment, funding is available through saveONenergy. Companies can receive up to 50% of their project costs through the program.

Energy managers

Free energy manager resources may be available through local utilities' Roving Energy Manager Program. If you prefer to hire a full-time energy manager, incentives worth up to 80% of the salary may also be available.

Energy management training

Businesses can receive a rebate worth up to half the cost of certified Energy Manager, Commissioning Agent and Measurement & Verification training.

Find out more at saveONenergy.ca/business or get your local electric utility to contact you at saveONenergy.ca/get-started



some ideas on how we can improve the energy and from there it's up to people like Marzieh and Adam (energy managers) to take it to their people and make it happen."

Monitoring and reporting on the rise

At Resolute's newsprint mill in Thorold, Ont., the company has conducted audits of

energy, fibre and water usage, but Said Mozaffari says the day-to-day emphasis is more on monitoring energy consumption. "We have process engineers who follow

energy consumption, and operators who monitor the megawatts they use. What we have is what you would call an EMS, an energy management system. It does help, because basically, you know exactly how many megawatts you are using. It's

what I call the bread and butter of what you should do."

"One thing that has helped us is doing energy maps," says Baghi. An energy map helps companies to move from the big picture of how much electricity and gas comes into the mill, to the details of where the mill is consuming these resources, in order to drive understanding of the main energy users in the mill.

Once the main energy consuming processes are identified, incentives and rebates from governments and utilities may be available to assist with retrofits. In Ontario, this type of funding is available through saveONenergy.

On the equipment sales side of the pulp and paper industry, Soucy says he's noticed that the energy-related projects Kadant performs for clients are often subsidized by local gas or power companies. "As a result, we're being requested to add a lot more instrumentation to these projects. So now we've got meters that if we were just doing a project on our own, normally we would leave out. Now that we have these subsidies involved, clients want to make sure that [the new equipment] is meeting the targets it is supposed to meet."

An added benefit is the mill has more information available for troubleshooting and equipment monitoring going forward.

However, one of the challenges of monitoring resource consumption of existing equipment is that the wiring or piping may not have been set

up in a convenient fashion.

"I remember a number of years ago, we did some benchmarking work across a range of mills," says Browne. "Most of it was on the thermal side, but the problem we had on the power side, which we thought would be easy to measure, was that in a lot of mills you'll have pumps from all different parts of the process going into one cabinet. So how do you tell how much energy you are using in pulping and how much you're using in paper making? You can't because it's all been wired up differently." For example, he says, maybe all of the pumps for white water chests are wired to one panel. So when a new paper machine is installed, its energy monitoring system only captures the dryers. In the reports, it looks really efficient, but that's because all the agitators are allocated to the old machines.

Muree agrees it can be challenging in an older mill to measure energy consumption by each process area or piece of equipment. He says Atlantic Packaging has spent more than \$100,000 in recent years to address this problem at one mill in Toronto.

IESO experts suggest wireless amp meters can be effective for providing feedback from process equipment to a monitoring or data collection system.

Monitoring of energy consumption has an indirect benefit in terms of sustainability reporting and making employees feel good about their contributions to conservation. At Resolute's Thorold mill, says Shabbazin, energy is considered a part of the sustainability program. There is a push right now to include energy performance in the monthly report so that it can be distributed to all staff at the mill.

Cascades has targets for energy and water reduction in its sustainability development plan, says Baghi, but that's not all. "On top of that, we get challenged by our CEO. So every year we have a target to meet, and in terms of the energy reduction, our challenge is to meet and exceed that target. That has motivated our group and energy managers to look deep into our process and find better opportunities."

Conservation needs an advocate

Having an energy manager on-site is another important tool for building energy efficiency. In some parts of the country, there are programs that subsidize the salary of an energy manager. Muree and Baghi, for example, are in that situation. They are employees of Atlantic Packaging and Cascades, respectively, but their salaries are funded in large part by saveONenergy, an Ontario energy conservation program.

"Personally, I have been responsible for 7900 megawatt hours of reductions in the last three years, achieved through 45 projects," Muree says proudly.

An energy manager acts as an advocate, keeping energy savings on the front burner when executives in

"The most efficient mills are not necessarily the newest ones. It has to do with the employees and the management style."

— Tom Browne



other areas of the company have other priorities.

When presenting energy saving ideas, production is king, says Muree. "If I can show an increase in production, or a close second would be keeping production the same but lowering operating costs, that's the best project. That's the first one they want to look at. It jumps off the page at them."

Tom Browne agrees. "In my experience, the mill manager wants tonnes out the door, at the minimum acceptable quality, with no one getting hurt. Then energy is priority number four."

Companies that are successful at energy conservation generally are characterized by a strong drive from the upper levels of management. At Cascades, says Baghi, top executives are very supportive of energy savings projects. "We actually have monthly meetings with the CEO of the company, in which we present energy reduction projects and based on the payback, and based on the priority, we get the budget directly from our CEO rather than going to the different groups involved."

Mozaffari says that Resolute has quarterly and monthly conference calls among all its mills to discuss fibre initiatives, water conservation and energy projects.

Industry has made progress

The pulp and paper sector has improved its environmental performance in recent years, and has made a commitment to achieve a further 35% reduction in its environmental footprint by 2020. The Forest Products Association of Canada, in its Vision 2020 Report Card:

2010-2012, states that energy use by the forest products sector decreased by 8% during the 2010-2012 reporting period. According to FPAC, the sector continues to invest in energy reduction projects, including the installation of energy-efficient equipment to improve mills' competitiveness and increase the production of green energy.

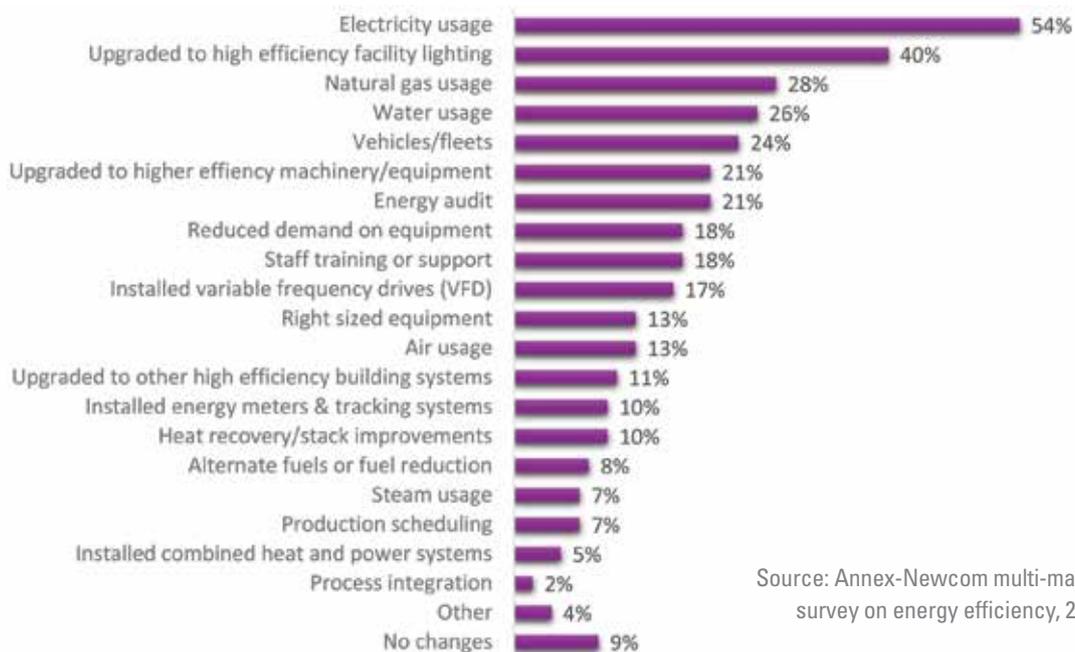
This newer equipment has also served to improve the quality of air emissions with a reduction in particulate matter (PM) (11%), sulphur oxide (SOx) (6%) and nitrogen oxides (NOx) (11%).

Pulp and paper companies are in a unique position among Canadian manufacturers because some are producers of electricity as well as consumers. Many are facing a complex balancing act to optimize electricity consumption, steam generation, process efficiency, thermal energy and water usage. To succeed, it takes an engaged workforce to implement the small, shop-floor level energy conservation measures, as well as strong leadership from top executives to champion and fund larger-scale capital projects.

PPC



What energy efficiency or energy cost reduction projects has your company focused on over the past five years?



Source: Annex-Newcom multi-market survey on energy efficiency, 2015.

Once he reduced his energy costs by 55% after installing a VFD, savings in other parts of his business went into overdrive.

Once you start seeing the benefits from our incentives for installing premium efficiency motors and VFDs, you'll want to look into making other parts of your business like lighting, HVAC and compressed air systems more efficient too. When you do, you'll be joining thousands of organizations across Ontario who are already enjoying the savings that our programs deliver.

Take a look at their stories and our incentives at saveonenergy.ca/business

