ENERGY Refined

Conservation strategies in oil and gas production

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Energy Efficiency in Oil and Gas

A NEW WAY OF THINKING ABOUT ENERGY EFFICIENCY

Conventional wisdom used to be that increased demand for electricity was a great indicator of economic growth. The logic was simple—the more we produce, the more energy we must need. Not anymore. Today, businesses throughout Ontario have embraced energy efficiency as a key to greater competitiveness. For them, using less energy actually powers new business opportunities.

Between 2011 and 2014, Save On Energy business programs saved 4,077 GWh of energy and 389 MW of demand in the province. With energy efficiency, businesses can realize substantial energy savings, but also improve their cost structures, processes and overall competitiveness. Some businesses see improved employee engagement, for others it means reinforcing ties with their community, and for others still, it translates into a better customer experience. And perhaps most of all, many value the opportunity to contribute to the health and well-being of their communities by using energy wisely.

To help businesses continue to move forward toward greater efficiency and competitiveness, the province has introduced a new approach that puts energy efficiency ahead of all other supply options. This approach, "Conservation First," is designed to take us to the next level of energy savings.

With ambitious new energy reduction targets in place, the bar is set higher now than it's ever been. Save On Energy programs delivered by local electric utilities have been re-designed to ensure that, together, businesses can meet provincial goals while at the same time reaping the rewards of sound internal energy management practices. Looking ahead, there will be even greater opportunities for businesses to reduce their overhead through retrofits, energy audits, lighting and equipment upgrades.

This publication will help you find ways to take advantage of the many benefits of using energy wisely. In reading about different approaches to energy management and business leaders' determination to turn great ideas into great results, perhaps you'll find the inspiration to do the same. To find out more about what energy efficiency can do for your business, visit saveonenergy.ca or contact your local electric utility (ieso.ca/findutility).

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

Brought to you by the Independent Electricity System Operator and your local electric utility

Participants in Roundtable (left to right)

Marty Raaymakers, President, MIG Engineering

Alex Palimaka, Corporate Services & General Counsel, Bluewater Power Distribution Corp.

Peter Smith, Energy Consultant & Associate at the Bowman Centre

Graeme Wallace, Engineering Manager, Lanxess Inc.

David Mackay, Conservation Coordinator, Bluewater Power

Darrell Roberts, Sarnia Operations, SNC-Lavalin Inc.

Clement Bowman, Chair of Progrid Ventures Inc.

Sylvia Gaidauskas, Business Manager, Industrial, Independent Electricity System Operator (IESO)

Dean Edwardson, General Manager, Sarnia-Lambton Environmental Association

Katherine Walker, Director of Marketing & Technology, IMAP Audits Inc.

John Ward, Vice-President, BlueGreen Innovation Group

Energy Refined

CONSERVATION STRATEGIES IN OIL AND GAS PRODUCTION

By Phil Egan

Manufacturers are always challenged to reduce operating costs and, at a time when low oil prices are eroding profit margins in the oil and gas sector, that couldn't be truer. The drive to curb spending and greenhouse gas emissions—as Ontario shapes a carbon cap-and-trade policy—makes a compelling case for energy efficiency.

Getting projects off the ground within large refineries can be challenging, no doubt. This is a sector too often measured by production volumes and speed of return on investment. With that in mind, a group of industry representatives met for a roundtable discussion in Sarnia, Ont., home of Canada's 'Chemical Valley.'

The roundtable—hosted by CanadianManufacturing.com with support of the Independent Electricity System Operator (IESO), drew a seasoned group of oil and gas veterans, utility representatives, consultants and equipment providers.

"It's taken us a long time to get [the] industry to be comfortable talking to us, to use us as a resource. But after five years now we're finally there," said Alex Palimaka, vice-president of corporate services with Bluewater Power (BP), the local electricity distribution company, who's noticed increasing interest among industrial companies in ways to avoid energy costs.

The notion was echoed by John Ward, who previously worked with Suncor, Nova Chemicals, DuPont and others before being part of the launch of BlueGreen Innovation Group, a Sarnia, Ont.-based consultancy focused on conservation. Ward has noticed lower oil prices and mounting inventories are pushing energy companies to get leaner.

"When you can sell every ton you make, your only focus is on making tons. But when you can't sell every ton, efficiency is the only way you can make any money," Ward said. Not to say the sector has been "dodging" energy efficiency, "it's just been somewhat patchy," he clarified.

"During the 1970s oil crisis… I can remember recovering the energy from cooling water [in a petrochemical plant] and using it to generate electricity," he said. "In the 1970s [conservation] was a big thing. It went away during the 80s and came back in the early 90s."

Marty Raaymakers, president of MIG Engineering Ltd., a consulting engineering firm in Sarnia that handles projects such as petrochemical pipelines, said another issue is the a tendency in the energy sector to focus on price certainty over conservation.

"What I'm really hearing in the valley is there's more effort put into trying to control the cost of energy than actual saving energy. Because once they've got a project… they just want to know [energy] is going to be that price for the next five years," he commented.

Cogeneration on the rise

In recent years, projects such as Imperial Oil's cogeneration facilities in Sarnia are building the business case for conservation. Operating for more than a decade, the project produces about 80 megawatts of electricity annually—and can meet approximately 60 per cent of the refinery's energy needs, according to the company.

Cogeneration uses clean-burning natural gas to generate electric power and steam simultaneously. Waste heat from a gas turbine generator is recovered to produce steam—curbing energy use and reducing emissions.

This is an area in which Sylvia Gaidauskas, business manager, industrial, with the IESO, sees growth. Gaidauskas works with transmission-connected companies in sectors including petrochemicals, offering IESO incentives to industrial companies through the Industrial Accelerator Program (IAP). Cogeneration projects are quickly gaining traction, she noted during the roundtable.

"Behind-the-meter generation is very popular and it's probably one of the most frequent applications [for incentives] that we get. Some are cogeneration applications using natural gas," she said. "We [also] like to encourage the use of waste energy. Process improvements are what is really needed. Successful organizations really mine all of their waste thermal energy to produce electrical energy."

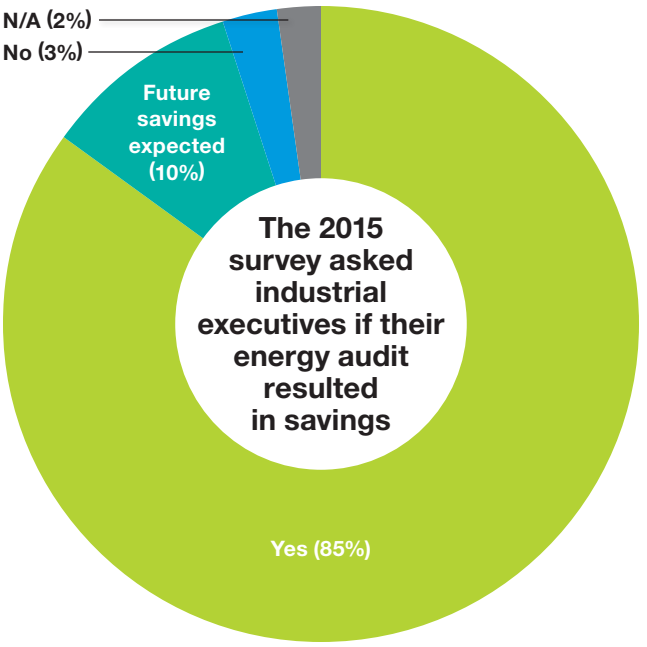
Indeed, preventing or reusing waste energy emerged as one of the leading strategies for petrochemical manufacturers during the roundtable discussion. Katherine Walker, director of marketing and technology with IMAP Audits Inc. in Sarnia, is focused on detecting and reducing heat loss in industries such as oil and gas.

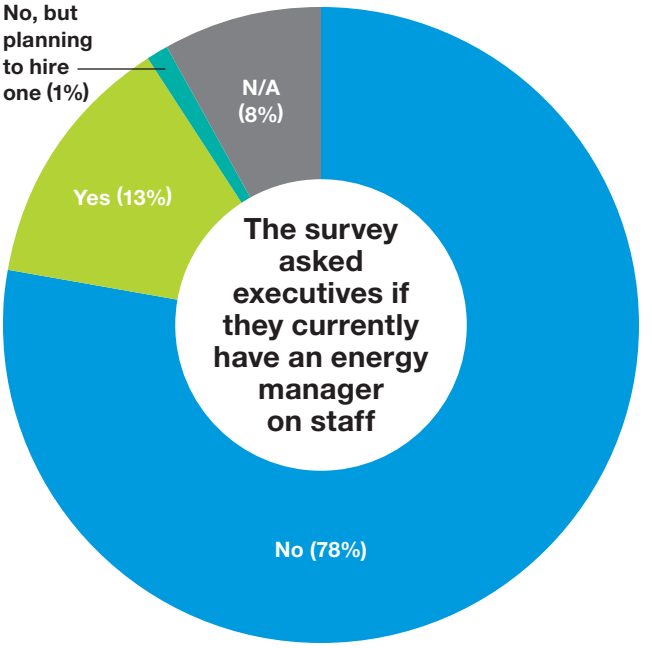
Thermal insulation can boost equipment operating efficiency, improve the life cycle of systems and prevent injuries to workers, according to IMAP. Saving energy is a big part of an optimized insulation program, Walker explained.

"The best approach is to take an inventory of your existing systems, to see where your highest heat processes are, and the condition of those systems. That will immediately draw a picture of where you can find the most efficiencies. There are a number of [incentives] available for the assessment."

Energy audits

These assessments and energy audits can yield impressive benefits. According to a 2015 survey of more than 500 manufacturers across sectors conducted by CanadianManufacturing.com and supported by the IESO, 85 per cent of respondents who had conducted an energy audit said it resulted in savings.





Yet audits aren't common practice in Canadian industry. The survey found only 38 per cent of respondents had conducted an audit during the past five years, a strong indication there's plenty of 'low hanging fruit' in energy conservation waiting to be identified.

In addition to establishing a baseline through an energy audit, Walker pointed to the importance of tracking energy performance beyond the initial assessment. "We don't just show up, do an energy audit, give them a report and walk away. That data is maintained. So over the lifecycle, we go back and monitor it. There is technology out there that can easily give the customer that information, as long as they do it right in the first place."

David MacKay agreed. As conservation coordinator with Bluewater Power, he emphasized the importance of being able to track predicted and actual savings resulting from a conservation project.

"Our big process-driven incentives and projects have a long lead-time and a lot of it is upfront… So that when it comes to the post project, you try to erase as many of the issues that may come up… so that we can get their incentive out."

Energy managers

The group agreed that having "energy champions" on staff is another hallmark of success. In the oil and gas industry, it's common to see energy management under the watch of a process engineer for an individual production unit, but the group cited the benefits of a site-wide manager, focused on conservation across the facility.

"Without somebody specifically looking at [energy] nothing much happens," said Peter Smith, a retired engineer who spent much of his career at Chemical Valley plants, often working on energy management. "Individual production facilities may have somebody that has some kind of responsibility for it. But without that overall control I think you're kind of flailing."

Picking up on the theme, Gaidauskas pointed to the benefits of energy managers—dedicated employees who take charge of energy efficiency. Often, they're the vital missing link in energy management programs and can quickly galvanize the company around cost avoidance and other benefits, such as optimized maintenance.

The 2015 survey however, showed only 13 per cent of respondents have an energy manager—another area where improvements could be made. Larger companies, such as oil and gas firms, merit their own dedicated energy managers, and there are energy manager programs available through the IESO and LDCs.

"The IESO currently provides funding for energy managers," said Gaidauskas. "So if there's an organization struggling to make energy a priority, there are incentives available to put someone in place."

IESO incentives are also available for LED lighting upgrades, fixing leaks in air compressors and installing variable frequency drives (VFDs) on equipment. VFDs allow motor speeds to be controlled to match varying demand requirements. According to the IESO, this feature can result in 55 per cent energy savings.

"A lot of participants in [Sarnia] have identified a long list of projects that have a four to five year payback. And those are exactly the ones that we're trying to target with our incentives. Perhaps our incentives can help to bring those to a two-year payback."

The two-year payback is the sweet spot for petrochemical companies, added Darrell Roberts, process specialist with SNC-Lavalin, who has been involved in oil and gas projects ranging from tank farms to refineries for 25 years. He recalls when a payback of 15 years was acceptable in the industry; but that has since contracted. Despite the added pressure, he's seen an increase in conservation efforts.

"All new projects require some type of process input and energy seems to be the highlight," he said. So we do whatever we can to reduce energy costs or implement improved energy with the projects."

Tracking savings

Roberts pointed to the reality of changing energy prices over project lifetimes. These fluctuations can make it difficult to forecast savings. Another challenge is the savings aren't always tracked, he added.

"What ends up happening inadvertently, is once the project is done, nobody looks at the actual energy savings that you've created. So three years after the project has been installed, the CEO comes along and looks through his books and says, 'Oh, this project had energy savings. How much did we save?' Nobody knows."

Yet, consistent measuring, tracking and reporting on energy savings can help justify the next conservation project, and build long-term enthusiasm, the group agreed. Roberts also noted the importance of 'right-sizing' refinery equipment.

"New production, or new capital could be looking at keeping the equipment sizes more in line with energy [needs], so that you don't oversize your equipment. Compressors [for example] have been oversized for years. They figured everything was going to keep [increasing]. And all of a sudden now the level of production went down and now the equipment is oversized. So your equipment is now inefficient."

For IMAP's Walker, another call to action is providing credit where it's due. For example, operations might pay for an energy conservation project out of its budget but maintenance ends up being the bigger beneficiary. "It's an internal issue," she said. The group agreed non-financial benefits—such as reduced maintenance—should be recognized in energy management projects, to spur ongoing interest and executive support.

Often, the resources to drive projects forward can be found within employee groups. Such was the case with Peter Smith, who led a conservation project using existing resources.

"We took young engineers out of each of the production facilities," Smith explained, "and into the energy efficiency team and worked with them to find ways to change some of the process parameters." Smith said this saved up to 10 per cent in some instances. "The young engineers don't need to be convinced of the need for conservation – they seem to understand and accept that need instinctively."

Global Adjustment

The discussion also focused on the Global Adjustment (GA). The price of electricity delivered in the province includes the wholesale price from the power generators and the Global Adjustment (GA).

For consumers who pay the Hourly Ontario Energy Price or signed a retail contract, they will see a GA line on their electricity bills. This charge accounts for the difference between the market price and the rates paid to regulated and contracted generators and for conservation programs.

Through the Industrial Conservation Initiative (ICI), companies with a demand over 5MW (or 3MW within certain sectors) have the option to be charged Global Adjustment based on the percentage a company's electricity demand contributes to the top five Ontario system peak hours.

One participant in the roundtable noted the savings—for avoiding those five peaks—could be millions of dollars. This creates an obvious incentive to shut down energy-intensive processes and equipment such as big compressors, switch to on-site generation and take other actions to curtail demand on the energy grid.

"It drives the industry to find ways to save," said Dean Edwardson, general manager with the Sarnia-Lambton Environmental Association. "Even for that one hour period, it forces industry to do things that it [rarely] does—shut things off… And then it opens up ideas for, 'Oh, how can we do this on an ongoing basis?'"

The Global Adjustment is certainly a key motivating factor for energy reduction. Regulations, such as Ontario's emerging carbon policies will also carry influence in the years ahead, the group noted.

"The game changer could be cap and trade," Ward said. "That really could give an economic incentive to look at a lot of these projects." Despite sentiment that energy prices are high in Ontario, they're relatively inexpensive compared to jurisdictions such as Europe, he added.

He cited the Bayer plant in Leverkusen, Germany, where energy is more expensive compared to North America. Conservation has become ingrained in the plant's culture over the past 50 years. Ward says it's evident from just looking at the plant that major energy conservation measures are in effect.

Investor appeal

Clement Bowman—known in the energy sector as the 'father of the oilsands'—brought the discussion home to the big picture. Conservation projects are good for the bottom lines of individual energy companies, but they also speak to the competitiveness of Sarnia overall.

"The emphasis should be on our region, what we can do in [Sarnia] about building leading-edge plants. Some case studies of existing plants here that have achieved these high levels of performance would be a great thing to add to our marketing package," said Bowman, who throughout his career, worked with companies such as Imperial Oil and Syncrude and is now chair of consultancy, Progrid Evaluation Solutions.

Among other distinctions, he started a project that formed the basis of today's steam-assisted gravity drainage (SAGD) oilsands bitumen extraction process. Reflecting on Sarnia's industrial strengths, Bowman said the focus should be on capturing new industry and maximizing the efficiency of the entire industrial community. In Sarnia, with its benefits of water, electricity, and its position on

shipping lanes, there's an opportunity for new industry to build plants offering leading-edge efficiency, he said.

"Canada has got to get to the point of putting some big projects in place. The return on investment will force the [facility] design to be leading edge with very high levels of efficiency, and very high levels of environmental protection… What can we say to attract new industry here?"

Bowman said the area would be perfect for a new bitumen upgrader refinery due to all of the community's advantages in existing infrastructure, service land and construction labour. Attaining high efficiency would expand upon Ontario's downstream oil and gas manufacturing, he noted.

Regardless of the motivation—cost avoidance, corporate sustainability, employee well-being or a combination of all these factors—the roundtable group agreed the time has come for formal, sustained energy management in the oil and gas sector.

Low interest rates are making the cost of capital projects far less expensive and, as the experienced group demonstrated, there are numerous strategies requiring minimal resources—along with attractive incentives—to move these projects forward.

Powerful incentives 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 available as well as non-financial tools and resources.

In Ontario, these incentives and resources can be accessed through the Save On Energy program (for distribution-connected businesses) and the Industrial Accelerator Program (IAP), for transmission-connected customers.

The IAP is designed to assist eligible transmission connected companies to fast-track capital investment in major energy projects conservation projects. Both the IAP and Save On Energy facilitate retrofits, energy managers and other conservation projects.

Program	Industrial Accelerator Program (IAP)	Save On Energy
Retrofits	**Prescriptive Track:** Provides the ease of selecting from a defined list of end-use measures that come with a corresponding per-unit incentive. **Engineered Track:** A series of pre-set calculation worksheets that help estimate the reduction of electricity consumption through more energy-efficient equipment. **Custom track:** Available for more complex or innovative solutions not covered in the prescriptive or engineered tracks.	**Prescriptive Track:** Ideal for quick system upgrades. **Engineered Track:** For more complex equipment upgrades; provides the potential for higher incentives. **Custom Track:** Designed to provide flexibility for more comprehensive projects with opportunities for increased energy savings. Incentives are based on energy savings over pre-project baselines.
New construction	The High Performance New Construction (HPNC) initiative provides design assistance and financial incentives for facilities that exceed typical electricity efficiency standards.	The High Performance New Construction initiative provides design assistance and incentives for building owners and planners who design and implement energy efficient equipment within their new space.
Process and systems	• Detailed engineering study • Preliminary engineering study • **Energy Manager program (New)** Process and Systems applications can involve capital investments for a single project, a small capital project, a portfolio of projects, or a self-generation project.	• Capital incentives • Energy Managers • Engineering studies • Opportunity accelerator • Monitoring and targeting

For more information on the above programs visit www.industrialaccelerator.ca or saveonenergy.ca