Campbell Company of Canada

Making the most of a new combined heat and power system

Campbell Company of Canada is highly focused on improving its environmental record and reducing its energy use across its Toronto, Ontario, operations. After a comprehensive engineering study determined that a combined heat and power (CHP) system would reduce energy use sufficiently to provide a promising payback period, the company decided to move forward with the project. In 2014, the company began to plan in earnest for the installation of a CHP system that would heat and power the entire facility. Operational since December 2015, Campbell's CHP system is delivering above expectations.

Corporate profile

Campbell produces roughly 225 products from its 51,000 square-metre plant, including 12.4 million cases per year of canned and carton soups. The plant, which has been running since 1930, employs about 700 people at its production facility, head office, and the sales, marketing, and research and development operations.

Campbell uses rigorous quality control measures throughout its facilities. Its 10,000 quality checks per day include simple ones such as making sure a code is correct on the cans and more complex ones to ensure the food reaches the right processing temperatures and times. Across all operations, environmental sustainability is a priority.

Corporate targets for 2020

In 2008, Campbell set an ambitious global target for improving its environmental performance: it pledged to cut its environmental footprint in half by 2020. Campbell planned to accomplish this by seeking out greener energy sources at its facilities around the world, thereby reducing energy use by 35 percent per tonne of product produced, and by sourcing 40 percent of its energy from renewable or alternative energy sources. The company also set aggressive recycling and water-reduction targets.

Photo: Aerial view of building

CASE STUDY SNAPSHOT

Industry: Food and beverage

Energy management system guidance/standard: Energy management information system (EMIS)

Improvement focus: Energy performance improvements with a focus on installing a CHP system

Location: Toronto, Ontario

Products: Canned and carton soups

Payback period: Four years

Number of employees: 700

Energy sources: Electricity, natural gas, gasoline, diesel

2016 energy management objective: 5 percent reduction in energy use per unit of production

Canada

Making the decision

Campbell hired CEM Engineering to analyze the feasibility of implementing a new CHP system. CEM specializes in finding cogeneration and energy management solutions for its clients. Its detailed engineering study showed that a CHP system could reduce electricity consumption by 25.7 gigawatt-hours (GWh) per year and reduce power demand by 3.8 megawatts (MW).

"For Campbell, hiring an experienced engineering firm was key for a project of this scope," says Doug Dittburner, chief engineer and manager of power services at Campbell. "The study quantified everything and gave us a good foundation for selling the idea to our board of directors." The study was funded entirely by the Independent Electricity System Operator (IESO).

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Cogeneration through a CHP system: The details

A CHP system works by burning fuel such as natural gas in an internal combustion engine such as a turbine or reciprocating engine. The engine drives a generator, which produces electricity. The hot exhaust gas is then delivered to a secondary system, which is a key component in any CHP system. If the user needs hot water, the CHP system transfers heat from the exhaust to water via a series of heat exchangers. If the user needs steam, the system delivers hot exhaust air to a heat recovery steam generator, which uses the heat energy to produce steam at a pressure that meets the needs of the user's facility.

The Campbell installation drives its CHP system generator with a gas-fired, Solar® Centaur® 50 turbine generator and a Vilter™ fuel gas booster compressor. It includes a Cleaver Brooks® heat recovery steam generator unit to produce steam. The power output of Campbell's CHP system generator is 4.6 MW. The steam, which Campbell uses for cooking its food products, is generated at the rate of up to 90,000 pounds per hour, at 165 pounds per square inch.

The decision to move forward finally came when several factors converged that made the significant investment in a CHP system worthwhile. First, natural gas became relatively affordable; this is the fuel that Campbell planned to use to power its CHP system. Second, Toronto Hydro agreed to provide $5.1 million in cost sharing toward the project, reducing Campbell's total investment significantly. Third, Campbell recognized a major benefit in improving the reliability of its power supply by installing a CHP system.

Campbell Soup – heat recovery steam generator

"In the past, we had considered other projects, such as selling power to the grid, which meant multiple equipment owners," explains Dittburner. "But this project was simpler. We would run our CHP system and simply make our own electricity." He says that because the price difference between electricity and natural gas has widened in recent years, the project's payback period has become much shorter.

"Also, the reliability factor was huge for us," says Dittburner, mentioning that a major product concern for Campbell is its aseptic packaged product business (Tetra pack). Packaging aseptic products is highly sensitive to lost power because the process must be sterile at all times. If power is lost, sterility is also lost, and all product being packaged must be dumped, the system cleaned completely, and the process begun anew. "Power blips represent a lot of wasted time and money," says Dittburner. With an average of 12 power blips per year of four to six hours each, the financial losses can be significant, he says.

Making the most of the CHP system

Meticulous project management enabled Campbell to start up the CHP plant more than a month ahead of schedule – in December 2015.

Once the CHP system was operating, Campbell undertook a process integration (PI) study, sharing the cost with Natural Resources Canada. The PI study looked for as many opportunities as possible to benefit from the new system.

For example, the study found that more heat from the CHP flue gas could be recovered by installing a second condensing economizer at the CHP system outlet. This recovered heat could heat some of the water Campbell uses to process its products. “The potential steam savings could amount to $97,000,” according to Dittburner.

The CHP system installation is slated for 2016. Dittburner says his goal is for Campbell to produce more than 90 percent of the facility’s steam and power and do so with a high level of efficiency.

Encouraging participation

Campbell requires that dedicated staff have intensive training on all major equipment at its facilities, and the CHP system is no exception. The training plan includes classroom training and hands-on instruction in how to operate the equipment. As Dittburner says, “Do not skimp on training; if you do, you will not be doing yourself favours in the end.”

Campbell also provides a forum for staff to ask questions about the equipment. An environmental team holds monthly meetings that help ensure all staff are informed, not only about the CHP system, but also about the many other environmental initiatives that the company pursues.

As an example, Campbell keeps a dedicated “idea database” for ideas from staff about energy efficiency and recognizes new ideas with prizes. Sixty of 224 entries have been completed to date. The company also engages employees with dedicated environmental education sessions, four of which were set up for 2016. For employees who fix air leaks, Campbell provides a weekly free lunch draw from the completed leak tags.

Key challenges

Scheduling was a major challenge throughout the installation. “We do not have two sets of people to get both our regular maintenance and production and the CHP installation done,” says Dittburner. He says it was a challenge to schedule training sessions for the core CHP system team. Again, a high level of organization and long-term planning were key. “This is not something you can project manage overnight.”

Equipment delivery was another challenge that Dittburner says could go awry without careful attention to detail. “You think everything is going to get here when it is supposed to but delays are inevitable.” His team built extra time into the schedule to accommodate inevitable delays.

Dittburner highly recommends asking extensive questions about methods and modes of delivery – especially who the shipping companies would be – and then contact the shipping companies personally to ensure good service. “The manufacturers are not the shippers. Often, they need permits to have this equipment on the roads and to cross the border. You need to manage the situation so your equipment is not sitting at the border when it should be being delivered to your facility.”

Key results

The CEM study predicted 25.7 GWh per year in savings and reducing the demand for power by 3.8 MW. However, Campbell installed a larger CHP unit that reduced the demand for power by 4.6 MW (greater than the estimate of 3.8 MW), and, in the meantime, gas prices decreased.

The result? “We are over-delivering on the original estimates,” says Dittburner. Because of those two changes and incentives from Toronto Hydro and IESO that covered 40 percent of the project cost, the project payback period will be four years and the return on investment 25 percent.

A shining example

Campbell has shared its story via case studies and the many leadership networks to which it belongs. Already, other companies in the food and beverage sector network of the Canadian Industry Program for Energy Conservation (CIPEC) are visiting the installation and considering CHP systems for their own facilities. Campbell has shared information widely via the Toronto and Region Conservation Authority, Partners in Project Green, and the Energy Leaders Consortium.

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An impressive environmental record

Installing a CHP system was one large step in a succession of sustainability efforts by Campbell Company of Canada. Other projects in recent years have included the following:

- Reducing greenhouse gas emissions by 11,300 tonnes in 2015.
- Implementing the Condensing Economizer Project in 2009, which reclaimed energy.
- Converting most lighting (inside and outside) from metal halide to LED.
- Replacing old motors with variable frequency drives to reduce energy use.
- Upgrading the cafeteria exhaust fans and the HVAC system so that they operate automatically according to the number of people using the space.
- Running an engagement campaign in which employees are encouraged to fix leaks in the compressed air system with the promise of a "free-lunch" lottery every week for eligible employees.
- Holding monthly environmental meetings in which ideas, projects and progress are shared, and guest speakers make presentations.

Keys to success

When Dittburner's team put together its proposal for approval by Campbell's board of directors, it thought of every possible contingency so it could present a comprehensive risk assessment. "You need to think of every question someone might have, and every possible thing that could go wrong – including a change in energy prices, which you cannot control – and then explain how each situation would be remedied. That is how you get board approval."

Campbell made the wise decision to appoint CEM Engineering – the company that did the initial engineering study and built a business case for installing a CHP system – as its project manager. Hiring external help meant that Campbell did not have to sacrifice one of its own staff full time to ensure the project's success.

Lessons learned

Dittburner says that for energy efficiency projects like a CHP installation, working with an expert engineering firm is a good idea. "We are not a company that makes electricity," he says. "We make soup. So we leave the energy efficiency expertise to the actual experts."

Dittburner says scheduling is extremely important to ensure that large equipment installations move forward successfully. "It is harder for some plants than for others to schedule things so that production is not disrupted. You need to look way out into the long term to put new equipment in so you can schedule your outages appropriately."

Aussi disponible en français sous le titre : Compagnie Campbell du Canada : tirer le meilleur parti d'un nouveau système de production combinée de chaleur et d'électricité.

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