Old Technology Meets New Thinking: Calgary Company Poised To Commercialize Small-Scale LNG

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A Calgary startup has improved on a 160-year-old refrigeration technology to make LNG a winning formula for small-scale applications.

After proving the patent pending process in a southeast Calgary pilot project, **PTX Technologies Inc.** is ready to take the technology commercial with a 90,000 gallons per day facility in northern Alberta. The company sees initial markets for the technology in supplying remote

Photo credit: Maurice Smith.

mining operations and communities with cheaper, cleaner power supplies as well as liquids recovery for natural gas producers in Alberta.

The technology is based on a modified aqua-ammonia absorption refrigeration process first patented in France in 1859 to **Ferdinand *Carré***, *who is credited with the* invention of the first refrigeration equipment to produce ice. The company has been working since early 2015 to improve on the technology, which is capable of providing ammonia refrigerant chilling down to -75 C at a chiller operating pressure of five kilopascal absolute.

In the process, a mixture of water and ammonia is pumped to pressure, heated to release ammonia vapour, distilled and condensed to produce ammonia refrigerant, the company said. It reduces the scope of overall mechanical rotating equipment required, resulting in significant capital and operating cost savings.

“We found a way to supercharge this old technology,” said **Colin Nikiforuk**, PTX president and chief executive officer. “The refrigeration system is usable in many different applications, but particularly in deep cut gas processing, because we can achieve -75 degrees Centigrade on our ammonia chilling system, so it’s an option against expensive and capital-intensive turbo expansion equipment.

“The Deep Basin is a really nice primary target for this right now to help Canadian producers have a more cost-effective way to do deep cut gas processing. We think this can improve the economics,” added Nikiforuk, a professional engineer with 30 years of experience in the oil and gas industry, including stints managing gas processing facilities in the Northwest Territories and supervising some 70 gas processing plants for **AltaGas Ltd.**

The process is well suited for small to mid-scale markets, with an upper end of processing train estimated to be about 100 mmscf/d. As the refrigeration technology is thermally driven, it provides the opportunity to co-locate alongside industrial facilities with waste heat and gas supply, such as a natural gas-fired power generation plant. “There is also a lot of waste heat in the Industrial Heartland” near Edmonton, he said.

“It's got a very good operating cost structure because all of the low temperature cryogenic equipment is stationary — there is no rotating cryogenic equipment. And the other thing is it’s got a very high operating window — about a 10:1 turndown. You don't have

that kind of flexibility typically in deep cut gas processing… As domestic LNG becomes something that we want to use, this technology is very good in the small to mid-scale, so you can get into an LNG business right here in Canada."

The LNG configuration of the process is referred to as the dense phase liquefaction cycle (DPLC). Since 2015, **Sonoma Resources Ltd.**, a wholly owned subsidiary of **Cool Ventures Inc.**, has funded the further development of the process. The small-scale pilot facility, capable of producing 500 gallons per day of LNG, was commissioned in 2016, with results found to be in line with the simulated process design, the company said.

PTX Technologies was incorporated in 2017 to establish a joint ownership position in the new technology with the inventor. The rights to the refrigeration technology and the LNG pilot/demonstration facility are owned by PTX, which has entered the national patent application phase to register its rights to the refrigeration technology in over 40 countries.

An independent technical review conducted by **Jacobs Consultancy** in 2017 found the DPLC process to be well suited for small to mid-scale LNG production applications, and that the technology was sufficiently developed to warrant a scale-up to commercial operations as envisaged by the company for Sonoma's Talbot Lake natural gas processing site in north central Alberta.

The review included the testing and validation of the LNG pilot/demonstration facility, a comparison to currently used small to mid-scale LNG processes and an evaluation of the commercial applicability of the DPLC process to produce 90,000 gallons of LNG a day at Talbot Lake.

Further upgrades to the process include replacing manual operations with automated controls and adding a second chiller to configure the pilot plant to replicate the proposed Talbot Lake LNG refrigeration design.

Sonoma already has regulatory approval from the **Alberta Energy Regulator** (AER) to convert the plant to an LNG supply facility and can secure natural gas feedstock via a nearby meter station connected to **TC Energy Corp.**'s distribution system. The facility can be readily expanded to 250,000 gallons per day to meet future growth in LNG demand, the company said.

The Talbot Lake site is an ideal location from which to supply LNG to remote northern mines and communities that typically rely on costly diesel or fuel oil for their energy needs, said Nikiforuk. Low natural gas prices make LNG an extremely cost effective alternative, he said.

The company estimates LNG can be supplied on an energy density basis for as little as $2.50 per gigajoule, compared to $24 for propane and $25 for diesel. By energy content, 1.7 litres of LNG equals one litre of diesel.

LNG would also produce more than 35 per cent less CO2 emissions and 90 per cent fewer particulate emissions than diesel or fuel oil, is less hazardous to transport due to its low containment pressure and narrow flammability range, is non-toxic and non-corrosive, and if spilled, it evaporates, leaving no residue.

The company is hoping to supply a new cobalt mine located about 1,000 kilometres north of Talbot Lake, which would require about 27,000 gallons per day. It estimates it would save the mine about $10 million per year in fuel costs. Several other mines and communities in the Northwest Territories and Yukon are also in its sights.

“The result is, a natural gas producer gets to sell their gas as a more valuable product because it’s competing against and displacing diesel, there are less emissions and there are economic savings on the customer side,” said Nikiforuk.

Sonoma plans to secure offtake markets and financing for the initial phase of the Talbot Lake LNG project with commercial operations anticipated by late 2020. PTX is also looking to diversify by promoting the licensing of its refrigeration technology.

Nikiforuk sees a bright future for new technologies that create value for Western Canada’s low-priced and abundant natural gas resource. “People are finally waking up and understanding that we are dealing with a structural change in Alberta. It’s not a cycle,” he said.

“The [fracking] technology in the U.S. has changed structurally the movement of energy in North America, with the shale gas displacing our western Canadian gas. I think we finally have some people who are realizing that, and that maybe they need to do something different — and now we are finding there is a lot of interest in what we are doing in terms of our technology.”

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