



Imperial Oil's Cyclic Solvent Process: A 'Game Changing' Alternative to the Thermal Recovery Process

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Summary

Imperial Oil, Canada's oldest and second largest petroleum company may have developed an alternative to thermal recovery processes that would eliminate the need for water and, therefore, the need to burn natural gas to generate steam, resulting in a reduction of greenhouse gases by more than 90 percent.

The Cyclic Solvent Process (CSP) eliminates the need for large amounts of energy and water to generate steam by using solvents to produce bitumen located in underground deposits so deep they must be developed in situ, meaning underground. A multi-year, \$100-million pilot project is now underway at Cold Lake to determine and advance the commercial potential of the company's patented cyclic solvent process.

This alternative is the culmination of decades of research, laboratory and field tests undertaken by Imperial. The company has spent about \$35 million on the development of CSP and much larger expenditures lie ahead as Imperial works towards commercial implementation.

Market Overview

From a business perspective, CSP has the advantage that it will increase the bounty of the Cold Lake oil sands deposit. Despite numerous improvements over the years to the Carbon Capture and Storage (CCS) technology used at the Imperial project, the company still recovers only 30% to 40% of the oil in place. Imperial Oil spokesman Pius Rolheiser believes that with the application of solvents and some other follow-up processes, oil recovery can climb to the 50-60% range. If everything goes according to plan, after the bitumen has been produced, the solvent will be recovered and reused.

The company estimates that at its Cold Lake leases alone, there are about one billion barrels of bitumen in deposits that are not thick enough or not heavily enough saturated with bitumen to be produced economically using the existing steam stimulation method. CSP could bring these marginal resources within reach of commercial production and with a technology that is much more environmentally friendly.

To put that in perspective, one billion barrels of bitumen is roughly equal to the total amount that has been produced at Cold Lake since commercial production began more than a quarter-century ago. The carbon intensity of CSP-produced bitumen will be below the average intensity of crude now being used in North American refineries. As a result, CSP has the potential to be a game-changer for concerns about greenhouse gas emissions from Canada's oil sands.

Cyclic Solvent Process (CSP): Field Pilot

The field pilot, the fourth and by far the largest CSP pilot the company has undertaken since 1996, involves drilling three horizontal wells into an underground deposit that is not heavily enough saturated with bitumen to allow efficient recovery using its existing cyclic steam process. Each of the wells will be used both to inject solvent – mainly propane, although a variety of other mixtures will be tested to determine their effectiveness – into the reservoir and to produce the resulting fluids which will be processed in existing plant facilities. The injection and production cycles will continue for up to five years, followed by a two-year period to maximize propane recovery.

Given the research nature of this project, it is not surprising that it will involve extensive measurement and testing. Six observation wells, which have already been drilled, will take a wide variety of temperature, pressure, and seismic measurements. Through the use of sensitive geophones, the company hopes to actually hear the movement of solvent through the reservoir.

Advanced 3-D seismic instruments using sonic pulses generated from and captured in the underground observation wells will provide a more precise map of solvent movement in the reservoir than seismic observations taken from the surface. As a result, they're hoping that these measurements and tests will give them a very accurate picture, in both space and time, of what is going on in the reservoir.

Market Demand

Canada is the United States' largest supplier of oil and the trade relationship is one of the strongest in the world, with the aforementioned oil sands a major contributor. It has been said that over the next 25 years, Alberta's oil sands are expected to generate \$521 billion (CAD) of economic activity in the United States. American jobs have been and will continue to be created through Alberta's oil sands.

The Canadian Association of Petroleum Producers (CAPP) claimed that \$54 billion was spent in 2011 in Alberta's oil sands and are estimating a one billion dollar increase in spending for 2012. By 2021, raw oil sands production is expected to grow by 3.7 million barrels of oil per day (bopd), and natural gas production will decrease to less than 7 billion cubic feet per day (bcfd).

Alberta's oil sands are located in three major areas in North Eastern Alberta, totaling 140,200 square feet. The Canadian oil sands are the third largest proven crude oil reserve in the world (171.3 billion barrels).

Market Data

Canada has an estimated 175 billion barrels of crude oil reserves, placing them second behind only Saudi Arabia for the World's reserves. When it comes to producing crude oil, Canada comes in 6th place, behind China and ahead of Mexico, with Saudi Arabia being the number one crude oil producer in the World. It is important to note that because Canada's reserves mostly come from the oil sands, it is much more costly and challenging to produce. Crude oil and natural gas are found all across Canada, with the highest concentration located in the Western Canadian Sedimentary Basin (WCSB), spanning from North-eastern British Columbia, Alberta, Southern Saskatchewan, and Southwestern Manitoba.

Key Suppliers

- Instrumentation
- Testing and measurement instruments
- 3-D Seismic instruments
- R&D on reduction of greenhouse gases

Upcoming Trade Events

Event: LAGCOE 2013

Location: Lafayette, Louisiana, USA

Dates: October 22-24, 2013

Event: POWER-GEN 2013

Location: Orlando, Florida, USA

Dates: November 12-14, 2013

Event: National Supply Chain Forum 2013

Location: Calgary, Alberta, Canada

Dates: November 12-14, 2013

Event: All Energy Canada Event 2014

Location: Toronto, Ontario, Canada

Dates: April 9-10, 2014

For More Information

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