

# Pressure Communication

## Industry, government collaborate on gas over bitumen R&D

BY DEBORAH JAREMKO



Slant drilling has helped push bitumen development, but more advances are needed

**B**itumen and natural gas are generally both attractive targets for producers, but not when they are in close proximity. That is, at least, right now. After almost nine years of reports, studies and hearings, more than 900 gas wells in the Wabiskaw-McMurray formation of the Athabasca oilsands are officially shut in to ensure that underlying bitumen can be produced.

The decision, laid down by the Alberta Energy and Utilities Board last November, may be final, but research and development efforts are under way to prove that both the bitumen and the natural gas can be produced in an effective and responsible manner. If this can be proven, like all issues the EUB deals with, the question could be reopened.

In Alberta, bitumen rights are leased separately from natural gas rights, meaning that different companies can have the rights in the same place. The problem is this: in some bitumen-bearing areas of Alberta, a gas cap determines reservoir pressure. These are not the mineable areas, but sites where bitumen is deeper, requiring thermal in-situ methods like steam assisted gravity drainage to produce the resource. Reservoir pressure is a key consideration for SAGD operations, and there has yet to be a proven way to produce the bitumen where there is a depleted gas cap.

“Currently, the only commercial method of SAGD is through higher temperatures and higher pressures,” explains Les Little, representative of Alberta Innovation and Science. “The steam chamber can be viewed as a bubble of energy. That steam chamber has to grow laterally and vertically. [When gas is found over bitumen] eventually it will come into contact with the low-pressure zone.”

Triangle Three Engineering president Dave Theriault calls this a “thief” zone where steam can escape, lowering the effectiveness of the SAGD process.

“When the steam enters a thief zone, the steam won’t touch any new bitumen. The result is reduced bitumen production rates.”

The R&D program designed to solve this problem is called the Gas Over Bitumen Technical Solution, driven by a steering committee made up of representatives from the Alberta Department of Energy, the EUB, Alberta Energy Research Institute, Paramount Resources, Paramount Energy Trust, ConocoPhillips Canada, Devon Canada, EnCana, Petro-Canada and Total.

“We have collaboration from bitumen producers, gas producers and government ▶

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all striving to come up with a solution,” Little says.

Theriault explains that under the program's steering committee, there are four technical subcommittees, involving representatives from steering committee members, the Alberta Research Council, Deer Creek Energy, Husky, Nexen, North American Oil Sands, Suncor, Imperial Oil and Murphy Oil. The subcommittees are separated into four areas: low-pressure SAGD, artificial lift, fluid injection, and lateral and vertical communication. Results from all the projects under the Technical Solution are still confidential.

“In any one of the projects there could be any mix of these companies involved,” he says, adding that the subcommittee's role is to come up with potential projects. “We develop the ideas and the scope of the project, and each individual company makes the decision if they want to participate in it.”

Theriault is facilitator of the Technical Solution program and, as the former director of oilsands at Gulf Canada, now ConocoPhillips, is no stranger to the gas over bitumen question. It was in the late 1990s on Conoco's Surmont lease south of Fort McMurray that the issue first came to light. Surmont is now the site of one of the

program's low pressure SAGD pilots, and also has funding from the Innovative Energy Technologies Program (IETP) that was announced by the Alberta Department of Energy last November.

At Surmont, the pilot is testing SAGD in a reservoir where there is gas over water over bitumen. Theriault says although steam injection began at Surmont in 1997, downhole conclusions are still uncertain. The pilot is designed to demonstrate the

application of artificial lift systems, as well as monitor well productivity, steam chamber growth and cumulative steam to oil ratios.

“The objective is to demonstrate that SAGD can operate effectively in the presence of these low-pressure zones,” Theriault says. “The pressure of the SAGD has to be higher than the reservoir pressure, but less than the fracture pressure because you don't want to part the formation. In the case



Steam generation facility at CNRL's Primrose North development

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of gas over bitumen, the steam chamber pressure must be in balance with the low-pressure gas zone."

At Deer Creek's Joslyn site north of Fort McMurray, another low-pressure SAGD pilot is under way, also with funding from the IETP. Alberta Innovation's Little says the successful application of low-pressure SAGD could have benefits beyond the gas over bitumen issue.

"If you can lower your pressures, the growth of the steam chamber might change, allowing access to thinner pay zones and marginal plays. It could be applied to a wide range of potential SAGD reservoirs, including currently commercial SAGD reservoirs," he explains. "You can lower water use and burn less gas. Everything is better for the environment, and you save money. It is a very important area for us to invest our money in Alberta."

Suncor Energy is also working on a low-pressure SAGD pilot that has funding from the IETP. Theriault says the project fits under the artificial lift area of the Technical Solution. The issue at Suncor's Firebag leases north of Fort McMurray is not actually gas over bitumen, but bitumen over high water saturation over bitumen. The artificial lift pilot is designed to demonstrate low-pressure SAGD using

electric-motored, multi-phase downhole pumps.

"The Suncor joint industry project is focused on the lift aspect," Theriault says.

Artificial lift could enable lower-pressure thermal bitumen production. Little says that at the higher pressures used in current SAGD operations, gas lift can be used, but that is not the case in a low-pressure reservoir.

"After you lower pressure to a certain threshold, gas lift doesn't work anymore."

There are currently three Technical Solution projects dealing with artificial lift: a thermal wellbore simulator, bench scale testing of lift systems, and a low-pressure artificial lift project. The thermal wellbore simulator project kicked off on Nov. 1, 2005, analyzing generic wellbore data sets from a number of participants, with the goal of generating better predictions of what actually happens in reservoirs where gas is associated with bitumen.

"They are trying to develop a simulator that has the ability to model the fluid hydraulics and heat loss within the wellbore," Theriault says. "They want to be able to model the hydraulics for whatever lift system and operating conditions they have."

Bench scale tests of different artificial lift systems are also being conducted at the C-FER facility in Edmonton.

"They are testing pumps at different intake pressures, temperatures and sub-cools," he says, adding that although going to lower pressures will likely detract from the strains on equipment generated by the high temperatures required, there will be new considerations to note. "The big issue is if these pumps can handle higher amounts of vapour. As you get to lower pressures [using SAGD], there is a higher probability of more vapour production."

Fluid injection is another technique being tested to allow for gas production over bitumen, with three projects supported by the IETP. EnCana is piloting air repressuring at Christina Lake, and air injection and displacement at the Kirby Upper Mannville I pool (a project it calls EnCAID). As well, Paramount Resources is working on a gas re-injection and production experiment (a project it calls GRIPE).

Theriault says Devon Energy conducted the first repressuring scheme at Christina Lake when that company owned the natural gas rights and EnCana owned the bitumen.

"They produced the methane and lowered the pressure, so they wanted to put ▶

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flue gas in to repressure the reservoir,” Theriault says, adding the operation had problems with corrosion and the breakdown of equipment. Today, EnCana owns the natural gas rights as well as the bitumen and has changed the process to inject air instead of flue gas.

“That allows them to get over some of the mechanical problems Devon had.”

The first phase at Christina Lake is now complete and is now being monitored. Theriault says EnCana plans to move the project into another section of the leases and then on again to a larger area close by.

The EnCAID project, located on the Cold Lake Air Weapons Range south of Fort McMurray, is a test of gas to gas displacement with air.

“They are injecting air in an attempt to recover the gas as well as maintain or increase the pressure in the gas zone. It’s very similar to Paramount GRIPE.”

Paramount’s GRIPE project is under way at Surmont, where ConocoPhillips owns the bitumen and Paramount owns the gas. The major difference is that Paramount is injecting flue gas, a process it started last October.

“They want to do a gas-to-gas displacement of the methane. The hope is to get high recovery of the methane without

changing the pressure of the gas zone,” Theriault explains, adding one of the key indicators of the GRIPE project performance will be whether nitrogen is present in the production well. Ideally, nitrogen would not be produced until all the methane went up the pipe. “They will be looking for nitrogen here.”

Alberta Innovation’s Little says there is a series of facilities required to enable the injection, but that is not novel.

“The novel point is injecting the waste gas,” he explains. “Carbon dioxide is much more of an ideal gas to use, but at this current time, CO<sub>2</sub> is very expensive and difficult to move.”

There have been recent indications that the lack of CO<sub>2</sub> infrastructure in Alberta could soon be a thing of the past. In November, Environment Minister Guy Boutillier said the province plans to create a \$1.5-billion CO<sub>2</sub> pipeline network. Alberta Environment spokesman Robert Moyles says the plans are still very much conceptual and hinge partly on certainty from the federal government on Kyoto commitments.

“There needs to be some certainty around the value of CO<sub>2</sub>,” he explains. “The pipeline would treat CO<sub>2</sub> as a commodity.”

Little says pilots like GRIPE and EnCAID are an important step in realizing this value.

“There are other things underfoot and these types of tests all help.”

There are also other tests underfoot in the gas over bitumen Technical Solution, including a lab study of bitumen demethanization. The project is sponsored by Paramount Resources and has funding through the IETP.

“They’ve taken two samples of bitumen and they want to compare the bitumen viscosity temperature relationship at dead oil and at saturated condition,” Theriault explains. “Initially, there is gas in bitumen. When you reduce pressure, the gas comes out; and they want to understand the difference between that temperature/viscosity curve.”

The gas over bitumen issue is not a new one for producers and promises to continue being high on the radar. Successful R&D could lead to solutions that mean something not just for the region where gas is currently shut in, Theriault says.

“Outside of the area, there is gas over bitumen being produced,” he explains, pointing to plays around Peace River and Cold Lake. “The board is likely to have to deal with the gas over bitumen issue outside the Athabasca area.” ■

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