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Deep pockets buy into high tech

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CALGARY — The lime-green pipes and valves at EnCana Corp.'s Weyburn oil field in south Saskatchewan are the only visible sign of the revolution taking place 1,500 metres underground.

A kilometre and a half from the surface, the pipes feed a steady stream of carbon dioxide into the rock containing light oil, pushing it sideways toward a wellhead where it can be pumped above ground. At that depth, carbon dioxide turns into a liquid -- and into money, as EnCana and the rest of the oil industry are discovering.

Carbon-dioxide injection will allow EnCana to extract another 140 million barrels of oil from its 51-year-old Weyburn field, an enormous volume at a time when the average new well drilled in Western Canada yields a mere 50,000 barrels. EnCana says it hopes to repeat that feat elsewhere in the Western Canada Sedimentary Basin, which stretches across the Prairies and into British Columbia and the Northwest Territories. "How big is the opportunity? Obviously, we'd love to find another Weyburn," says Jeff Wojahn, president of EnCana's Canadian plains region.

Happy as EnCana is, the company is still leaving a lot of oil in the ground, nearly two-thirds of the total 1.4 billion barrels it knows are in the reservoir. That fact might shock outsiders, but it is a simple fact of life in the petroleum industry that the vast majority of oil never sees the light of day. In Western Canada, for every barrel of oil pumped out of a well, another three remain trapped underground. For some reservoirs, as much as 95 per cent of the discovered oil cannot be extracted, or at least not at a low enough cost to turn a profit.

"I think it surprised me, when I first looked at it," says Eddy Issacs, managing director of the Alberta Energy Research Institute.

An oil reservoir that has been drained to the point of being unprofitable is often called a dry well, but that term is misleading. In fact, it's more like a wet sponge: You can wring it once, and get a lot of water. A second squeeze will extract a bit more. Eventually, your efforts are in vain -- even though that sponge is still wet.

Now, better technology and high crude prices are about to shift an enormous amount of oil into the grasp of the industry. As many as five billion barrels could be added, according to Mr. Issacs. That would more than double Canada's conventional oil reserves.

Others have even higher hopes. Richard Baker, president of Epic Consulting Services in Calgary, says eight billion barrels could be added to reserves, a figure that would include the widespread injection of water into existing wells. "It'd be like finding eight giant reservoirs," says Mr. Baker, who is working on a report for the industry that is aiming to nail down the opportunity presented by enhanced recovery. "It's a question of when it's going to occur, not if it's going to occur."

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The rise of four-dimensional seismic technology -- a 3-D model in real time -- is enhancing the prospects of enhanced recovery. At Calgary's Computer Modelling Group Ltd., 4-D imaging is used to simulate the effect of carbon-dioxide flooding, for instance, on actual reservoirs. Ron Kutney, vice-president of marketing, says he has just one Canadian company at the moment -- EnCana -- among his client list of 200, but that he expects interest to soar along with commodity prices, matching the investment spree in other areas of the oil patch. "Just look at the investment in the tar sands," he says.

For Mr. Issacs, the rising price of crude is the key change. Just as important as today's high prices is the prospect of elevated and stable prices for years to come. That long-term trend is absolutely crucial to give the oil industry the economic cushion to pursue enhanced oil recovery, which by its very nature is more expensive.

He says the excitement over the tens of billions being spent in the oil sands in northern Alberta have overshadowed the possibilities of enhanced oil recovery. Part of the problem is that although the total amount of oil is large, there aren't many reservoirs that are the equivalent of EnCana's Weyburn. Instead, there is a modest volume of oil waiting to be squeezed out of a large number of wells. Profits will be made, but in most cases it will be under-the-radar junior firms doing the work of boosting production by a few hundred barrels a day. "It's more and more the smaller companies," he says.

Yet with prices on the rise, the first experiments are starting up, with big players footing the bill. Earlier this year, Penn West Petroleum Ltd. started a small pilot project at its Pembina Cardium fields about 100 kilometres southwest of Edmonton, the heart of the region that gave birth to Alberta's oil industry.

Penn West has years of experience with enhanced recovery, from its Joffre fields about 150 kilometres south of Edmonton, which get their carbon dioxide from a Nova Chemicals plant that is within sight of its wells. But the Pembina experiment is a different matter. The carbon dioxide for those six wells has to be hauled in by truck, a method as cumbersome as it is expensive. The effort makes no money for Penn West; instead, it is in-the-field research, aimed at honing techniques for the day when a cheaper source of carbon dioxide appears.

"Longer term, we're looking at a pipeline," says Bryan Clake, Penn West's vice-president of corporate development.

And that is one of the great ironies of the enhanced-recovery story. To succeed, it needs a stable and clean supply of carbon dioxide. The most likely source of the gas is the oil sands projects of Fort McMurray -- which under the strictures of the Kyoto Protocol will have a compelling reason to harvest carbon dioxide. So, the environmental accord that the oil industry loves to hate could just end up being the catalyst for a years-long boom.

That would all hinge on a pipeline being built to span the 500 kilometres between Fort McMurray and the older fields south of Edmonton. Mr. Issacs is convinced that the pipeline will be constructed, pointing out that it would be a concrete way to help meet Canada's:



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Fuller recovery:

Enhanced oil recovery techniques could squeeze as much as eight billion barrels of oil out of the supposedly tired Western Canada Sedimentary Basin.

Fort McMurray oil sands:

Could become a plentiful source of carbon dioxide, which can be injected into an oil reservoir and push out more oil.

Pipeline between Fort McMurray and southern fields:

A pipeline to carry CO₂ southward would give the industry a critical boost - but who will pay for it?

Leduc and Pembina fields:

Among the oldest oil fields in Alberta, they also have the biggest potential for using CO₂ to recover crude.