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ELECTRO-THERMAL DYNAMIC STRIPPING PROCESS HOPES TO MAKE A NAME FOR ITSELF IN THE ATHABASCA OILSANDS

BY PAUL WELLS

AT ITS MOST BASIC LEVEL, THE PATENTED Electro-Thermal Dynamic Stripping Process (ET-DSP) technology that Bruce McGee developed and is currently field-testing in the Athabasca oilsands seems simple enough — drill some holes within the oilsands and deploy electrodes within the holes to heat the tar-like bitumen and then retrieve the resource with relative ease, at least when compared to current extraction and recovery methods such as steam-assisted gravity drainage (SAGD).

For good measure, according to McGee, ET-DSP will also allow producers to complete the aforementioned tasks in a comparatively environmentally-friendly way, use less water and energy, and realize oil recovery in a cost-effective, timely manner.

Too good to be true? McGee doesn't think so, and he's confident the field test currently being conducted by his company, E-T Energy, will verify his belief. Simple technology? Far from it; the physics are complicated, the research intensive and a multi-disciplinary team totalling about 20 employees — including environmental, petroleum, chemical, electrical and power engineers — is required on an ongoing basis.

"Essentially, we pass electrical current through the water base that exists naturally within the oilsands," McGee says. "The current flows through the water base. It's like a resistor — it heats up and transfers that heat to the oil and then you produce oil out of the water matrix."

The field test, being conducted on a one-hectare (14.5-section) site approximately four kilometres north of Fort McMurray, is focused in an area McGee says "is too deep to mine and too shallow to inject steam." Or, in other words, perfectly suited for ET-DSP.

"As a company and a technology, our focus is on exploiting those oilsands that are too deep to mine and too shallow for SAGD," McGee confirms. "Two-thirds of the total deposits in the Athabasca oilsands resource basin are too deep for surface mining and too shallow for steam injection…. It's substantial."

Obviously, then, the results and success of the field test is top-of-mind for McGee and ET-Energy.

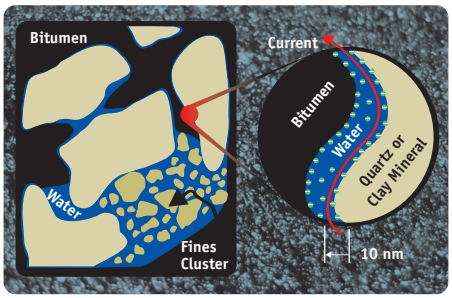
"To date, we've raised almost $30 million to do the field test, to acquire acreage and to do a considerable amount of field testing and proving the concept of this technology," he says, adding that initial core samples showed average oil saturation of 84%, or, as he puts it, "really nice" bitumen.

"We want to prove we can have an equivalent steam-to-oil ratio of 0.6 versus a steam-

How ET-DSP Works

The ET-DSP process involves passing electrical current from surface power distribution equipment down to hollow steel electrodes suspended in the McMurray formation. For the field test, the electrodes are six-metres-long, 30.5-centimetre diameter sections of steel pipe. The current passes between electrodes through the natural connate water that exists in the formation and acts to heat the bitumen.

Vertical electrodes wells are drilled into the formation in a grid pattern. The spacing of the electrode wells is optimized to provide the most efficient heating of the formation. Vertical production wells are drilled into the formation to bring the heated liquid to surface storage facilities.



to-oil ratio for SAGD of 3.0. We want to confirm that we can do this project in one year as opposed to 10 years, we want to confirm that we use a quarter of the water and we want to confirm our operating costs," McGee adds.

For McGee, the light bulb moment that led to ET-DSP originated in research done by Fred Vermeulen and Steve Chute at the University of Alberta in the 1970s, where McGee learned of the concept as a student when, in 1980, Vermeulen gave a presentation on the research to date.

"They broke the ground, they blazed the trail. A lot of the research they did was funded by Alberta Oil Sands Technology [and] Research Authority back in the 70s, and they were able to answer the question of whether or not it would be possible to electrically heat oilsands."

McGee, who received his B.Sc. in 1980, M.Eng. in 1984 (electrical heating of oilsands) and PhD in 1998 (electrical heating of heavy oil reservoirs with horizontal wells) from the University of Alberta, was intellectually and professionally smitten by the potential of the science that culminated from the work of the two professors, his mind's eye keenly focused on the commercial possibilities and the environmental pluses that might be achieved.

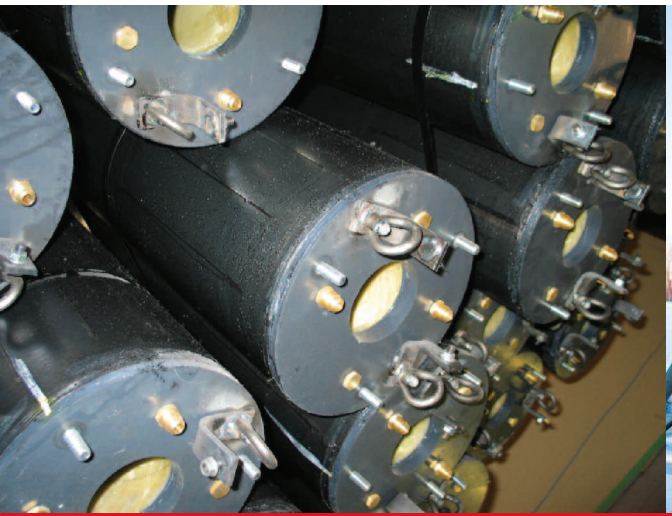
As such, McGee set forth to refine and improve upon the original research, eventually discovering how best to transfer heat between electrodes and essentially solving a long-standing scientific dilemma — the finite length electrode problem.

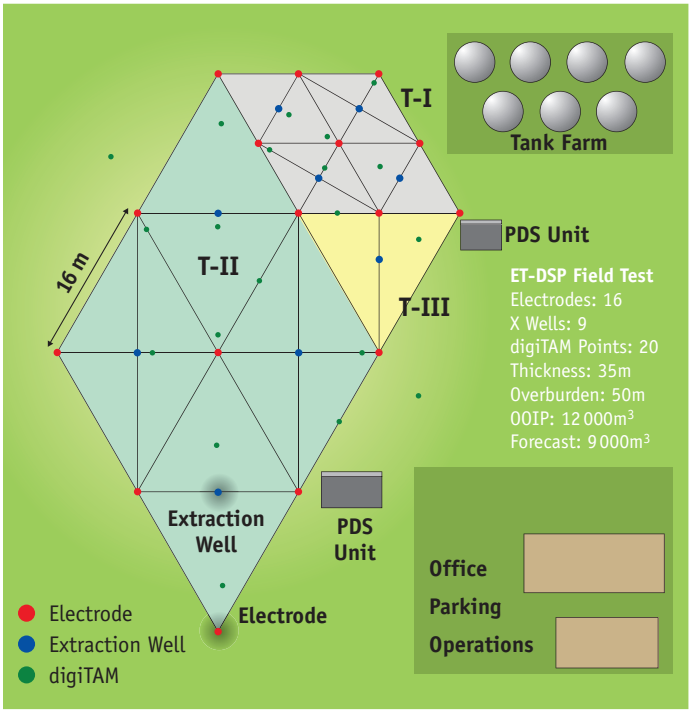
An electro-thermal technology, ET-DSP combines the majority of the dominant heat transfer mechanisms (electro-thermal, conduction and convection) into an effective and environmentally benign method for heating soils like the Athabasca oilsands. The ET-DSP invention results from the use of electro-thermal methods for heating soils in the environmental industry in combination with years of thermal reservoir engineering experience in the energy industry.

The field test is designed to demonstrate that ET-DSP can heat and recover bitumen from the Athabasca oilsands in an efficient, economic and environmentally benign manner.

ET-DSP has already achieved commercial status in the environmental industry as a technology that restores contaminated sites to useable real estate in less than six months as opposed to decades. The technology has grown from a few pilot tests just five years ago to a portfolio of

SHOCKING SOLUTION
Left to right: ET-Energy's field test site in northern Alberta; coring crew on site; core sample; electrodes; a surface pump; and surface equipment installations. ET-Energy estimates each section of land with a bitumen net pay of 34 metres can produce 10,000 bbls of bitumen per day for 25 years.





ELECTRIFYING EXTRACTION
Field test site layout showing the optimized grid locations of the electrodes, extraction wells and DigiTAM temperature sensors (or digital thermometers) on the approximately one-hectare area.

projects with a cumulative budget of close to $200 million (US).

When the opportunity arose to use the concepts and prove their viability outside the lab in the mid-1990s, McGee was more than happy to oblige.

"When I went back and did my PhD, there was a group out of the Lawrence Livermore National Laboratory at the University of California-Berkley who were doing some research on heating contaminated soils — soils that were affected or impacted by chemicals that were leaking out of an underground storage tank," McGee explains. "This particular location was just south of San Francisco and the chemicals leaked out of this tank and got hooked up with the groundwater and started flowing into this very high net worth residential community. People would turn on their taps and they could smell benzene, which is a carcinogenic chemical. Of course, that was a huge liability, a huge problem."

Researchers at Lawrence Livermore initially came up with the idea of using a dynamic underground stripping process that would use steam injection. However, some of the chemicals had melded with a clay formation and clays cannot be injected. They then considered the possibility of using electrical current to heat the clay sections and vapourize the chemicals into a zone where they could then be swept up with steam. Familiar with McGee and company's work at the University of Alberta, the researchers contacted the university seeking a helping hand.

"To make a long story short, 80% of the cost was in the steam process and 20% of the recovery [of the contaminants] was in the steam. Conversely, 20% of the cost was in the electrical heating and 80% of the recovery was in electrical heating," he says.

"It was a beautiful homerun. This particular project was recorded in the Scientific American journal and from there, myself and our lab got a great reputation. People were coming in and saying they don't want to use steam, just electrical heating [to reclaim tainted lands]."

Having confirmed the technology's effectiveness and made believers out of investors, McGee founded McMillan-McGee Corporation (McC2). At the time, the company's sole focus was to use ET-DSP to reclaim contaminated sites, although McGee always planned on using the technology in the oilsands to extract and recover bitumen.

"I got involved in cleaning up dirty soils and the business grew and grew. It's where the technology got commercialized and was proven out in the environment," McGee explains. "The principles are the same regardless of what ET-DSP is used for," he adds. "You heat the soil and the chemicals will vapourize. They can then be collected and extracted from the soil. Oil gets hot and it flows easier. It's the same process, but the end-product is usable."

After proving ET-DSP's worth as an effective tool to remediate land, McGee set his sights on transferring the technology to the oilpatch. It's a move he believes will pay off. "I know this process will work," he says.

Following the successful completion of the field test and phase one, a decision will be made on how to proceed to phase two of development to produce and sell bitumen.

Under E-T Energy's current estimates, each section of land having a bitumen net pay of 34 metres is capable of producing 10,000 barrels (bbls) of bitumen per day for approximately 25 years. The company's strategy is to expand the commercial production of bitumen in manageable increments of 10,000 bbls of bitumen per day. The initial 10,000 bbls per day of production developed under phase two will then be followed by additional phases of development that will each increase production levels by roughly 10,000 bbls per day.

McGee says this stepwise approach would increase until the operational output rises to 50,000 bbls per day. E-T Energy believes this stepped approach to development will allow it to manage the operational and financial requirements of the project, funding the later phases of development out of cash flow wherever possible.

"At this point, we are still a private company but we have approximately 75 to 80 outside shareholders who are mainly institutional shareholders with sophistication in investing in oil and gas projects," McGee says. "They believe in the technology as being one that is environmentally benign, uses much less water than other technologies and one where there are no CO_2 or greenhouse gas emissions in the process of producing bitumen."

A case in point is Dominion Equity Management, which believed enough in the technology that it invested in ET-Energy during the first quarter of 2005. "Dr. McGee has earned a reputation in the contaminated soil reclamation business through the development and implementation of a patented extraction process that uses electricity to super-heat contaminated soils for the recovery of waste products resident in the soil," Dominion said.

"[ET-Energy] has a lease in the Alberta oilsands on which the patented process will be used to recover oil from bitumen. Certain of the many oilsands lessees are monitoring E-T's application. However, the real prize is the substantial amount of recoverable hydrocarbons resident on the E-T lease. The leverage to the partnership is substantial."

Currently dedicating about 75% of his working hours to ET-Energy, McGee says he expects to focus entirely on the company in the near future. "We're up for the challenge. We'll make it work; there's no doubt about that." ntm

CONTACT FOR MORE INFORMATION

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