#### ENVIRONMENTAL TECHNOLOGY

## GREENSCENE



### **Degrease Is The Word**

Alberta company applies green method of removing hydrocarbons from soil

**AN ALBERTA COMPANY SAYS** it can do what no other bioremediation company can: clean up hydrocarbons quickly and harmlessly with only one application and no other manipulation.

F4 Environmental Inc. has discovered an environmentally friendly surfactant that, combined with a microbe that has an affinity for hydrocarbons, gets results in just three to six months.

The patented process of remediation, Bio-Reclaim, contains a highly purified, naturally occurring bacteria that can mineralize petroleum hydrocarbons and toxic organics into  $CO_2$  and water. F4 Environmental provides the product and the service out of Stony Plain, Alta., 30 kilometres west of Edmonton.

Three companies have used Bio-Reclaim in Rainbow Lake, Mayerthorpe, High Prairie and Edson (all in Alberta), and Hay River, B.C. The applications were for two pipeline breaks in muskeg, three oil drill sumps and multiple well centres.

Canadian Natural Resources Limited is one of those companies. It used Bio-Reclaim in 2010 on three wellsites in Alberta—High Prairie, Mayerthorpe and Edson—abandoned between 1991 and 2006, and found to contain buried drilling sumps that held benzene, ethylbenzene, and F2 and F3 (longer-chain) hydrocarbons. "We initially estimated that Bio-Reclaim could cost up to 20–25 per cent less for these particular sites when compared to a dig and dump option—digging up the impacted material and hauling it to a disposal site," says Jocelan Ladner, Canadian Natural's team lead for reclamation.

"In addition to the immediate cost savings, there was reduced risk associated with not transporting the impacted material to a disposal site and bringing in clean fill for the excavation," says Ladner. "And if the project was successful, there would be certainty that there would be no liability left associated with the impacted material."

The impacted material was excavated and placed on a liner. It was run through a conveyor belt system where the "superbug" was applied by F4. The material was then placed back on a liner and sampled monthly, excluding winter months, by a third party.

It was successful on two locations. "The third site was not successful; however, I'm not sure I would categorize it as a disappointment," Ladner says. "F4 was experimenting with different application rates of the superbug and the third site was the site with the lowest concentration of bugs and water applied. Unfortunately, the site was sold before F4 could return and reapply the bug at a higher rate to show that it was just a case of not enough mixture being applied." >

#### **BIO-RECLAMATION**

By treating contaminated soil on site, F4 allows companies to avoid hauling and disposal costs.

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Ladner says she would use F4's remediation technology again.

"The results we have seen on our first few projects show this technology has the potential to provide a cost-effective, safe and reasonably quick method to eliminate the liability associated with hydrocarboncontaminated soils," she says. "We would like to see it used in different soil types, weather conditions and on material impacted with higher levels of heavier-end hydrocarbons."

The total project costs were less than what Canadian Natural estimated they would have been had they hauled the impacted material to a disposal site. "Also important, we eliminated all liability associated with the formerly impacted material as opposed to transferring the liability from our wellsite to a disposal site," she says.

F4 charges about \$45-\$65 per cubic metre of soil remediated. Its technology can be applied in cases of hydrocarbon contamination of land and water, bulk fuel station sites and underground storage tank leaks, as well as to heavy equipment, fleet and automotive maintenance facilities.

"What we've done that's different from what anyone's been able to do is take the right bacteria that actually have an affinity—they like hydrocarbon—and attach to the hydrocarbon molecule, and convert it into water and a very minute amount of CO<sub>2</sub>," says Marlin Rudolph, F4's president and founder.

But converting the microbes was only one part of solving the puzzle, he says, because the microbes have a lifespan of only 20 minutes. "So to get them into Fort McMurray or something like that, I have to get them there within 20 minutes. Otherwise, when they arrive, there's a container of microbes that are no good to anyone," he says.

F4 has been able to put the bacteria colonies into what it calls a "live vegetative state," using a proprietary process.

And Rudolph found a surfactant that reduces surface tension and allows the microbial activity to move through the porosity of the heavy clay. The surfactant doesn't kill the microbe but destroys the hydrocarbon, and his research team put the surfactant and the microbes together.

Before making the product commercial in 2010, it was tested on 12 sites in 2009 to clean up a total of about 9,000 cubic metres of soil. Only one site did not meet the necessary criteria. The site was previously treated by someone else and the process was not compatible with what F4 did, explains David Hartum, F4's general manager.

Also, during the research and development phase in 2009, there were many different processes and amounts of product used until the combination that worked best was found, says Hartum.

Rudolph hit on the idea of his magical surfactant and microbes from researching a way to clean machine parts without harming the person washing them. A heavy-duty mechanic by trade, Rudolph experienced firsthand the bleeding knuckles and "all kinds of stuff" that besets people who spend the early years of their mechanic careers degreasing parts for the journeymen.

His parts-washing machines are now being used by the Department of National Defence, in the construction industry and as far away as New Zealand.

Dave Parke was an environmental consultant in northern Alberta when he learned of the machine through a hockey buddy who was a mechanic using it at a car dealership in Vermilion, Alta. Wondering if the hydrocarboneating technology would transfer to the oilfield, Parke tracked Rudolph down.

Parke's faith in the future of the product was so strong, he's now part of the company's management team.

Lynda Harrison

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