Researchers demonstrating low-energy remediation with patented microbes

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Savannah River National Laboratory personnel take readings at the site of the demonstration of MicroCED microbial consortium for natural cleanup of chlorinated solvents. Credit: Savannah River National Laboratory

Using funding provided under the American Reinvestment and Recovery Act, the U.S. Department of Energy's Savannah River National Laboratory has launched a demonstration project near one of the Savannah River Site's former production reactor sites to clean up chemically contaminated groundwater, naturally.

A portion of the subsurface at the Site's P Area has become

contaminated with chlorinated volatile organic compounds that are essentially like dry-cleaning fluid. SRNL and Clemson University have patented a consortium of microbes that have an appetite for that kind of material.

"If they are as effective as we expect in cleaning up the chemical contamination in the groundwater, it will be far cheaper than energy-intensive types of cleanup, such as pump-and-treat techniques or soil heating," said Mark Amidon, SRNL's project manager for the demonstration.

The mixture of microbes was found occurring naturally at SRS, where they were feeding on the same kind of chemical that was in groundwater seeping into an SRS creek. SRNL and Clemson University worked together on the discovery and characterization of the microbes. The mixture is called MicroCED, for "microbiological-based chlorinated ethene destruction," and when injected into the subsurface can completely transform lethal chlorinated ethenes to safe, nontoxic end products.

In P Area, the first step was to make groundwater conditions better for the microbes. "In late summer we injected more than 5,000 gallons of emulsified soybean oil, buffering agents and amendments and 108,000 gallons of water to get the dissolved oxygen and acidity right," Amidon said. "Once the conditions were right, we started injecting the store of microbes we've been culturing." An initial application of 18 gallons of the microbes was recently injected to get things started. By the end of the demonstration, approximately 1,500 gallons of the microbes could be injected into the demonstration site.

Amidon estimated that it would take a year or more to see appreciable results. "You can't rush Mother Nature."

The current test site is about 100 by 120 feet at the surface and 85 to 100 feet below ground, and will be used to determine whether this approach should be used for full-scale treatment of the area. "If we were to go full-scale, there would be a 'biowall' about 1,000 feet long and between 50 and 145 feet below ground," Amidon said.

SRNL has been working in bioremediation for many years, using existing microorganisms as part of the strategy. The difference here is the culturing and injection of quantities of a specific mixture of microbes for use on chlorinated solvents. (Another SRNL invention, BioTiger, is a consortium of microbes used on petroleum contamination.)

Provided by Savannah River National Laboratory