



TechData Sheet

Naval Facilities Engineering Service Center
Port Hueneme, California 93043-4370



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Advanced Fuel Hydrocarbon Remediation National Test Location

In-Situ Bioremediation of Methyl Tertiary Butyl Ether (MTBE)

Conducted by:

Equilon Enterprises Ltd. (Shell/Texaco) Houston, TX
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The Equilon's Westhollow Technology Center teamed with Arizona State University to evaluate an in-situ process for bioremediation of methyl tertiary butyl ether (MTBE). MTBE is a gasoline additive that was introduced in fuels to reduce emission of a number of air pollutants including carbon monoxide (CO). Since MTBE is required in regions of the country that exceed ambient standards for CO, it often is found in urban areas. The Environmental Protection Agency (EPA) issued a health advisory for MTBE in 1997 indicating that the drinking water level should be less than 40 ug/L based on odor and taste thresholds.

Recently, laboratory experiments and limited field studies have demonstrated that MTBE can be aerobically degraded by the Shell Development Company's mixed bacterial culture BC-4. BC-4 naturally grows in activated sludge at industrial wastewater treatment plants. The BC-4 culture is a mixture of ordinary soil bacteria such as coryneforms, pseudomonads, and achromobacter species that have been acclimated to MTBE for more than a year.

Bioreactor studies with BC-4 in the presence of oxygen have shown 99 percent removal of MTBE from groundwater, based on a 25-hour retention time. The end products of the degradation are carbon dioxide and water.

The field trial, which is the first of its kind for treatment

of MTBE, is focusing on the use of BC-4 as an in-situ bio-barrier to downgradient MTBE migration. MTBE has been detected at concentrations of 2,000 to 10,000 ug/L in the test area. No other contaminants are present in the area of the field study location. The project design calls for the injection of a narrow band of BC-4 slurry into the aquifer, followed by injection of oxygen (Figure 1).

Groundwater is found at a depth of about 8 feet below ground surface in the test area and the MTBE plume has been determined to have a 10- to 12-foot thickness.

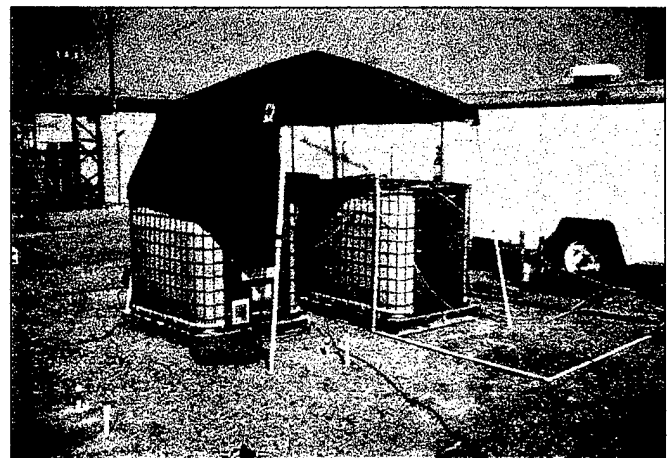


Figure 1. BC-4 culture slurry.

The field-test layout includes three 20- by 40-foot long test cells aligned with the direction of ground water flow (Figure 2).

Each test cell will contain a total of 12 monitoring wells (Figure 3). These will prove MTBE concentrations in upgradient of the direction of groundwater flow, within the treatment zone, and downgradient.

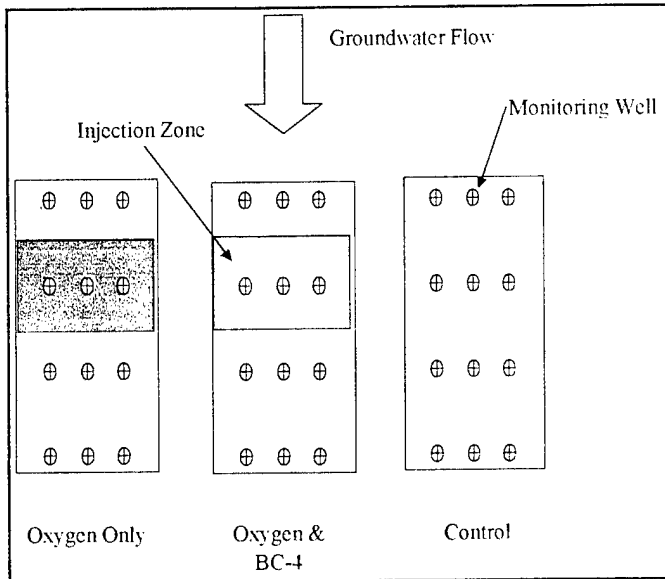


Figure 2. BC-4 barrier test plot layout

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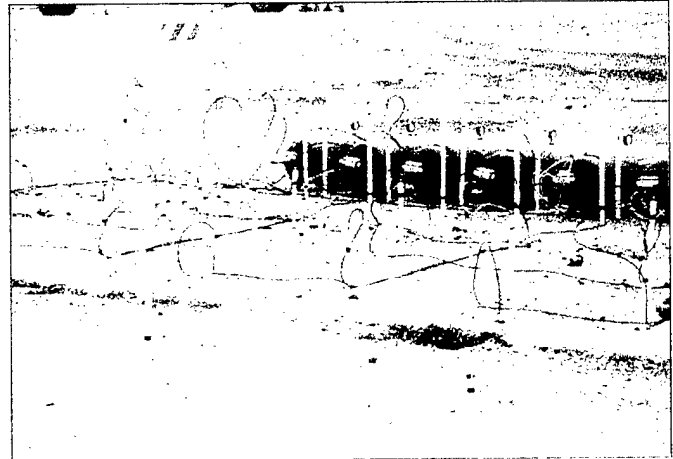


Figure 3. BC-4 bio-barrier and oxygen only test plots injection and monitoring wells.

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13. ABSTRACT <i>(Maximum 200 words)</i> <p>Equilon's Westhollow Technology Center teamed with Arizona State University to evaluate an in-situ process for bioremediation of methyl tertiary butyl ether (MTBE). MTBE is a gasoline additive that was introduced in fuels to reduce emission of a number of air pollutants including carbon monoxide (CO). Navy sites where MTBE contamination is present. Since MTBE is required in regions of the country that exceed ambient standards for CO, it often is found in urban areas. The U.S. EPA issued a health advisory for MTBE in 1997 indicating that the drinking water level should be less than 40 ug/L based in odor and taste thresholds.</p> <p>Recent laboratory experiments and limited field studies have demonstrated that MTBE can be aerobically degraded by a bacterial culture, BC-4, developed by the Shell Development Company. BC-4 grows naturally in activated sludge at industrial wastewater treatment plants. The BC-4 culture is a mixture of ordinary soil bacteria such as coryneforms, pseudomonads, and achromobacter species that have been acclimated to MTBE for more than a year.</p> <p>Bioreactor studies with BC-4 in the presence of oxygen have shown 99% removal of MTBE from groundwater, based on a 25-hour retention time. The end products of the degradation are carbon dioxide and water. The field trial, which is the first of its kind for treatment of MTBE, is focusing on the use of BC-4 as an in-situ bio-barrier to downgradient MTBE migration.</p>			
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