CASE STUDY – ST. THOMAS, USVI DIESEL OIL SPILL SOIL REMEDIATION PROJECT

THE PROBLEM

Staff at a major four-star resort outside St. Thomas in the US Virgin Islands spilled diesel fuel and kerosene during the transfer from a tanker truck to on-site storage tanks. Approximately 67.3 m^3 of soil having an average concentration of 12,000 ppm was contaminated. Because there are no treatment facilities on the Island, the resort was facing significant costs to transport the contaminated soil to the mainland for treatment. Further complicating the issue was the fact that the contaminated soil had been excavated and moved to the side of a hill behind the resort to get it out of sight of clients and tourists.

OUR APPROACH

Whereas the soil had been excavated, it was clear to Nordevco staff that the most cost effective and efficient approach would be to treat the soil in a wet cell using the BactiDomus® Technology and a bioreactor. This would facilitate two-phase treatment – a primary treatment in the bioreactor and a secondary treatment in the wet cell. BactiDomus® Technology product 401 was used for the primary treatment in the reactor and product 208 was used in the wet cell to initiate the breakdown of contaminants, making them more mobile and facilitating their transport to the bioreactor for the more active primary treatment.

Because the effectiveness of the treatment is based on the BactiDomus® Technology, Nordevco staff determined that the most cost effective approach would be to build a simplified bioreactor on site with whatever materials were readily available locally. As a result, a bioreactor was designed using two 50 gallon oil drums welded together, a perforated metal product support plate, some ABS plastic residential plumbing fittings, two fifty gallon aquarium pumps and a small pump. When construction was completed, the bioreactor was loaded with product 401 and water was pumped from a sump in the wet cell to the reactor for treatment and then re-circulated to the cell in a closed-loop.

The actual wet cell was built on the side of the hill using a locally available impermeable liner to line the cell and prevent the release of contamination. The cell was filled using a rubber-tired loader to prevent damaging the liner. Product 208 was spread over the contaminated soil. Following this, the cell was flooded and put into operation.

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THE TECHNOLOGY

Nordevco's BactiDomus® Technology was developed by a diversified group of research scientists working together at Universities in Belgium and France. Their goal was to create a mechanism with the flexibility to delivery biological solutions to a range of environmental issues more effectively and efficiently

The foundation for the success of the BactiDomus® Technology was the development team's clear understands that for any carrier material to be successful it had to meet specific underlying needs of the organisms:

- Regardless of the organisms used, they would be cultured in a sterile laboratory and would require time to acclimate to the environment they were activated in.
- Microorganisms, like humans, do not exist or thrive in isolation of each other but rather rely on others for stimulation and competition;
- Organisms prefer to grow and live in colonies or flocs and prefer to attach to something to anchor these colonies;
- Individual species of microorganisms do not work in isolation to break down organic compounds. To successfully break down any organic completely to CO2 and H20, a variety of different organisms are required;

The result of that work is the BactiDomus® Technology which is based on the use of an inorganic limestone-like porous carrier material. The porosity of the material allows it to be bathed in a nutrient broth, absorbing key micro-nutrients that act as an initial food source when the product is activated. It is then impregnated with a range of different naturally occurring and non-pathogenic organisms, selected for their ability to breakdown specific organic contaminants.

The organisms selected for inclusion are selected based on the understanding that each contaminated environment can be aerobic, anaerobic or facultative anaerobic. Therefore, aerobic, anoxic and anaerobic organisms are selected and used in each product to ensure that they can function successfully in a broad range of environments.

The carrier material's large surface area to size ratio provides the organisms with both internal and external floc points where they grow and create large effective colonies of biodegraders working together to break down the organic contaminant into carbon dioxide and water.
The carrier material's hydrophilic nature allows it to absorb both the water and contamination.
This provides a steady strong contact between the imbedded organisms and organic

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contaminant. This ensures that the organisms have a continuous food source as they grow and create flocs within the protective confines of the capillary network of the carrier material.

THE RESULTS

TREATMENT SUMMARY

Length of treatment	Initial Concentration	Final Concentration	% Reduction in Concentration
33 Days	12,000 ppm	390 ppm	96.8%

Analysis of samples taken by the client's consulting engineering firm, Metcalf & Eddy, after 33 days of treatment indicated that contaminant concentrations had been reduced by 96.8% from 12,000 ppm to 390 ppm. At that point the consultant ruled the treatment successful and the project treatment was terminated.

The Nordevco approach, specifically The BactiDomus® Technology solved the problem saving the client significant amounts of money by allowing the soil to be treated in a remote area without having to invest in costly infrastructure, transportation, or insurance costs. At the completion of the project the client was left with soil that could be reused or disposed of in a landfill. The BactiDomus® Technology allowed for the most cost effective treatment by focusing most of the resources on creatively solving the problem and not on transportation and costly support infrastructure.

The wet cell site

Bioreactor and Re-circulation system

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