



Department of Environmental Protection

Jeb Bush
Governor

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

David B. Struhs
Secretary

March 27, 2002

Mr. Russell Schindler
American Remediation
8666 East Traverse Highway
Traverse City, Michigan 49684

Re: **Enhanced Dissolved Oxygen Technology System (E-DOT)**

Dear Mr. Schindler:

The Bureau of Petroleum Storage Systems hereby accepts the Enhanced Dissolved Oxygen Technology System (E-DOT) as an innovative system that produces dissolved oxygen for in situ biodegradation of petroleum and other aerobically degradable contaminants in groundwater and soil. As indicated by the information you submitted, this patent-pending system uses a tank of pure liquid oxygen as the oxygen source, and produces dissolved oxygen concentrations in groundwater ranging from 35 to 40 parts per million.

The liquid oxygen changes to a high-pressure gas as it flows from the tank. The pressure is sufficient to force the pure oxygen through the flow meters, fittings and tubing that deliver it to the subsurface groundwater and soil to be remediated, thereby eliminating the need for a pump and the electricity to operate a pump.

The bureau recognizes E-DOT as a viable system for the bioremediation of petroleum contaminated sites in Florida. There are no objections to its use provided a Remedial Action Plan for the cleanup of petroleum contamination, pursuant to Chapter 62-770, F.A.C., is approved by the Department.

While the Department of Environmental Protection does not provide endorsement of specific or brand name remediation products or processes, it does recognize the need to determine their acceptability from an environmental standpoint with respect to applicable rules and regulations, and the interests of public health, safety, and welfare. Vendors must then market the products and processes on their own merits regarding performance, cost, and safety in comparison to competing alternatives in the marketplace. In no way, however, shall this regulatory acceptance letter be construed as certification of product performance. Additionally, the Department emphasizes a distinction between regulatory "acceptance" and approval. Products and processes are accepted but they are not approved.

Those who prepare Remedial Action Plans are advised to include a copy of this letter in the appendix of plans they submit, and call attention to it in the text of their document. In this way, technical reviewers throughout the state will be informed that you have contacted the Department of Environmental Protection to inquire about the environmental acceptability of this product.

The Department reserves the right to revoke its acceptance of any product or process it has accepted if its nature, performance, or any other aspect has been falsely represented. Additionally, Department acceptance of a product or

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process does not imply it has been deemed applicable for all cleanup situations, or that it is preferred over other treatment or cleanup techniques in any particular case. A site specific evaluation of applicability and cost-effectiveness must be considered for any product or process, whether conventional or innovative, and adequate site-specific design details must be provided in a Remedial Action Plan. You may contact me at 850/487-3299 if there are any questions. Additional information is provided as enclosure 1

Sincerely,

Rick Ruscito, P.E.
Bureau of Petroleum Storage Systems

c: T. Conrardy - FDEP/Tallahassee

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ADDITIONAL INFORMATION ABOUT E-DOT

1. Nature of the system: The E-DOT system is simple and uses very little equipment: a liquid oxygen tank; small diameter hoses and tubing; flow meters; fittings; gauges; and small diameter injection points. The manufacturer indicates it is a low cost system to install and operate.
2. Safety: For E-DOT, like any other system used for the remediation of petroleum contaminated sites, the Department expects attention to safety. For the remediation of petroleum contaminated sites with E-DOT, the safety concerns may include but are not necessarily limited to: fire; the safety of personnel and passersby; the proper storage, handling and use of liquid oxygen; appropriate pressure ratings for hoses, tubing, fittings, instruments and gauges; and safe operating conditions.

Although the pressure in a liquid oxygen tank is high, technical reviewers should note that a large pressure drop occurs as the oxygen passes through a pressure regulator and a series of distribution flow meters near the tank. The subsequent downstream components of the distribution system and the oxygen injection points operate at a substantially lower pressure.

The Bureau of Petroleum Storage Systems is of the opinion that the manufacturer of E-DOT has taken safety into account. In a presentation to the bureau, the manufacturer has indicated its awareness that: a mixture of oxygen and petroleum vapor is flammable in the range between the lower explosive level (LEL) and the upper explosive level (UEL); underground utilities at a petroleum cleanup site can serve as conduits for the transport of flammable fuel/air vapor mixtures; it is desirable to avoid the production of an oxygen-rich environment that facilitates combustion; it is desirable to keep oxygen tanks away from underground petroleum storage tanks and dispensers; there should be a fence around the oxygen tank; and the oxygen tank needs to be secured into position.

3. Utilization of wells: If a remediation site happens to have an abundance of monitoring wells, then the Department has no objection to the use of some wells for E-DOT oxygen-injection purposes. However, no "designated" monitoring well, dedicated to the tracking of remediation progress (by sampling) shall be used as an E-DOT well. This will avoid premature conclusions that the entire site meets cleanup goals. By making sure that designated tracking wells are not used for the introduction of oxygen, there will be more assurance that dissolved oxygen has permeated the entire site and that it did not remain localized to the area immediately surrounding each E-DOT well.
4. Design considerations: As is the case with most in situ remediation strategies, the spacing of injection wells will be depend on site-specific conditions. The manufacturer provides information to its customers about injection point depth and spacing, so that they are commensurate with the depth, thickness, and extent of the contamination to be remediated.
5. Oxygen usage: As a rough rule-of-thumb the manufacturer of E-DOT indicates that a 280-liter tank of liquid oxygen at a typical

cleanup site lasts approximately one month, and currently costs approximately \$220. (280 liters is approximately 74 gallons). The manufacturer's brochure indicates that the current price of 99 percent pure oxygen is approximately \$0.50 per pound.