



Department of Environmental Protection

Jeb Bush
Governor

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

David B. Struhs
Secretary

November 14, 2001

Mr. John Battistoni
International Enzymes Incorporated
1706 Industrial Road
Las Vegas, Nevada 89102

Re: **FyreZyme**

Dear Mr. Battistoni:

The Bureau of Petroleum Storage Systems hereby reaffirms its original April 23, 1997 acceptance of the bioremediation product FyreZyme. This letter supersedes the original and now reflects International Enzymes Incorporated as the manufacturer. It also deletes what the bureau now believes was an overly conservative requirement in its original acceptance that groundwater be monitored for nitrate, nitrite, and pH. A few other items have been updated, but the letter is otherwise essentially the same as the original 1997 acceptance.

It is our understanding that the product is a proprietary combination of bacterial growth agents, enzymes, and bioemulsifiers that stimulate indigenous aerobic, petrophilic microbes to degrade petroleum-contaminated soil and groundwater, in situ or ex situ, provided ample oxygen is available or artificially supplied for the process. In the case of soil applications above the groundwater table, ample moisture of approximately 20 percent must also be available.

Specifically, but without divulging proprietary information, FyreZyme contains simple sugars, amino acids, 3.5 parts per million (ppm) nitrate, less than 1 ppm nitrite, and food-grade biodegradable emulsifiers. The products of its bioremediation process are carbon dioxide, water, and fatty acids that in turn are biodegraded.

The bureau has no objection to the use of FyreZyme, provided applicable rules within the following chapters of the Florida Administrative Code (F.A.C.) are met: Chapter 62-770, F.A.C., for the cleanup of petroleum contaminated sites; Chapter 62-550, F.A.C., for primary and secondary water quality standards; Chapter 62-520, F.A.C. for groundwater classes and standards; Chapter 62-522, F.A.C., for groundwater permitting and monitoring; Chapter 62-528, F.A.C., for underground injection control (UIC), particularly Part V, for Class V, Group 4 aquifer remediation projects; and any other water quality standards which may apply on a site-specific basis. The onus shall be on International Enzymes Incorporated and users of the FyreZyme to ensure that applicable

underground injection requirements are met for petroleum remediation projects conducted pursuant to Chapter 62-770, F.A.C.

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.

Department acceptance does not imply that this product 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 Remedial Action Plans prescribing the product. In no way, however, shall this regulatory acceptance letter be construed as certification of product performance.

Specifically, for FyreZyme, the items below are of interest.

- a. Groundwater monitoring: Like any other petroleum site remediation project, FyreZyme projects shall include at least one year of quarterly post remediation groundwater monitoring pursuant to section 62-770.750, F.A.C.
- b. 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 the application of FyreZyme. However, no "designated" monitoring well, dedicated to the tracking of remediation progress (by sampling), shall be used to apply FyreZyme. This will avoid premature conclusions that the entire site meets cleanup goals. By making sure that designated tracking wells are not used for treatment, there will be more assurance that the treatment process has permeated the entire site and that it did not remain localized to the area immediately surrounding each injection well.
- c. UIC: FyreZyme Remedial Action Plans shall include information pursuant to Rule 62-528.630(2)(c)1 through 6, F.A.C., for the inventory purposes of underground injection control. In regard to Rule 62-528.630(2)(c), F.A.C., it should be noted that an approval order, by the Bureau of Petroleum Storage Systems, for a petroleum Remedial Action Plan involving underground injection also serves as the state's underground injection permit. A memorandum outlining the information to be transferred from the Bureau of Petroleum Storage Systems to the Underground Injection Control Section within the Department is

enclosed, so that submitters of Remedial Action Plans may know beforehand the information that is needed for Department purposes.

d. Operation:

1. Avoidance of migration: Injection of FyreZyme shall be performed in such a way, and at such a rate and volume, that no undesirable migration of either FyreZyme constituents or petroleum contaminants in the aquifer results, pursuant to Rule 62-528.630(3), F.A.C.
2. Operating parameters: Pursuant to Rule 62-770.700(10)(h), F.A.C., effective August 5, 1999, for bioremediation systems the operating parameters shall be measured, including dissolved oxygen, nutrients, and any other indicators of biological activity as proposed in the approved Remedial Action Plan. In the case of soil remediation projects involving FyreZyme, the bureau notes a suggestion that the moisture content of the soil be checked from time to time.
3. Application: As FyreZyme instructions indicate, FyreZyme is mixed with water to a 6 percent solution (by volume) prior to use, and then applied in five (5) equal parts at five(5)-day intervals. One (1) gallon of the concentrate (before mixing) is sufficient to remediate an 8 cubic foot contamination zone. Oxygen may have to be artificially provided during the application and remediation period, either by air sparging, magnesium peroxide, or other suitable means.
4. Operating permit: Although an operating permit is not required for aquifer remediation wells pursuant to Rule 62-528.640(1)(c), and 62-528.640(1)(b), F.A.C., since no movement of the petroleum contamination plume is expected to accompany the FyreZyme treatment process, the Department requests that the information items listed in Rule 62-528.640(1)(b), F.A.C., be considered and included in FyreZyme Remedial Action Plan proposals as a matter of good and thorough design practice.

In addition to describing the total volume of the fluid injected during the entire remediation effort, pursuant to Rule 62-528.640(1)(b)3, F.A.C., above, we suggest that FyreZyme's own application schedule be included in Remedial Action Plans, describing the amount injected at each injection point.

- e. Abandonment: Upon issuance of a petroleum Site Rehabilitation Completion Order, or a declaration of "No Further Action",

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FyreZyme injection wells shall be abandoned pursuant to Section 62-528.645, F.A.C. The Underground Injection Control Section of the Department shall be notified so that the injection wells can be removed from its inventory-tracking list.

Those who prepare remedial plan documents may 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 and its contracted local reviewing programs 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 this product if the nature of either its ingredients or performance has been falsely represented. You may contact me at 850/487-3299.

Sincerely,

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

c: T. Conrardy - FDEP/Tallahassee

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4/23/1997

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11/14/2001

**Florida Department of
Environmental Protection**

Memorandum

TO: Richard Deuerling, Mail Station 3530
Division of Water Facilities
Underground Injection Control Section
Florida Department of Environmental Protection
2600 Blair Stone Road, Tallahassee, FL 32399-2400

FROM: _____ (Note 1.)

DATE: _____

SUBJ: **Proposed Injection Well(s) for In Situ Aquifer
Remediation at a Petroleum Remedial Action Site**

Pursuant to Rule 62-528.630(2)(c), F.A.C, inventory information is hereby provided regarding the proposed construction of temporary injection well(s) for the purpose of in situ aquifer remediation at a petroleum-contaminated site.

Site name: _____
Site address: _____
City/County: _____
Latitude/Longitude: _____
FDEP Facility Number: _____

Site owner's name: _____
Site owner's address: _____

Well contractor's name: _____ (Note 2.)
Well contractor's address: _____

Brief description of the in situ injection-type aquifer remediation project:

Summary of major design considerations and features of the project:

Areal extent of contamination (square feet): _____
Number of injection wells: _____
Composition of injected fluid (Note 3)
(ingredient, wt. %): _____

Injection volume per well (gallons): _____
Single or multiple injection events: _____
Injection volume total (all wells, all
events): _____

Date: _____

Site name: _____

FDEP facility no.: _____

A site map showing the areal extent of the groundwater contamination plume, and the location and spacing of injection wells and associated monitoring wells is attached.

The following is a summary description of the affected aquifer:

Name of aquifer: _____
Depth to groundwater (feet): _____
Aquifer thickness (feet): _____

The injection well(s) features are summarized below, and/or a schematic of the injection well(s) is attached.

Direct-push or Conventional (*circle the appropriate well type*)

Diameter of well(s) (i.e., riser pipe & screen)(inches): ____
Total depth of well(s) (feet): _____
Screened interval: _____ to _____ feet below surface
Grouted interval: _____ to _____ feet below surface
Casing diameter, if applicable (inches): _____
Cased depth, if applic.: _____ to _____ feet below surface
Casing material, if applic.: _____

The in situ injection-type aquifer remediation plan for this petroleum contaminated site is intended to meet the groundwater petroleum cleanup criteria set forth in Chapter 62-770, F.A.C. Additionally, all other groundwater standards will be met at the time of project completion for any residuals associated with the ingredients of the injected remediation products, and any by-products or intermediates produced as a result of the chemical or biochemical transformation of those ingredients or the contaminating petroleum during their use. Applicable primary and secondary drinking water standards are set forth in Chapter 62-550, F.A.C., and additional groundwater quality criteria are set forth in Chapter 62-520, F.A.C.

The remediation plan estimates that site remediation will take _____ months. We will notify you if there are any modifications to the remediation strategy which will affect the injection well design or the chemical composition and volume of the injected remediation product(s).

The proposed remediation plan was approved on _____ by an enforceable approval order. A copy is attached. The remediation system installation is expected to commence within 60 days. Please call me at _____ if you require additional information.

Note 1. Local programs are not authorized to approve underground injections into aquifers. Reason: Per agreement with EPA, the FDEP cannot delegate this authority. Local programs, after reviewing a Remedial Action Plan or an injection proposal document, should follow the instructions in a March 16, 2000 memorandum to arrange for Department headquarters' execution of an approval order, and then complete this form. This form is primarily for use by state and local program technical reviewers, but petroleum remediation contractors may fill in all blanks except those labeled "FROM", "DATE", and "approval date", and "telephone number" blanks in the last paragraph. Those blanks should be completed only by a state or local program reviewer.

Note 2. If an injection well installation contractor has not yet been selected, then indicate the name and address of the project's general remediation contractor/consultant.

Note 3. Complete chemical analysis of injected fluid is required by Chapter 62-528, Florida Administrative Code. Proprietary formulations shall make confidential disclosure. Injected fluids must meet drinking water standards of Chapter 62-550, F.A.C., unless an exemption or variance has been granted.