



Department of Environmental Protection

Jeb Bush
Governor

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

David B. Struhs
Secretary

December 1, 2003

Mr. Jeff Bohlen
Global Green Group, LLC
414 West Sunrise Highway, Suite 163
Patchogue, New York 11772

Re: **IXPER 75C**
(a.k.a. Calcium Peroxide)

Dear Mr. Bohlen:

The Bureau of Petroleum Storage Systems hereby reaffirms its original March 31, 2003 acceptance of IXPEN 75C calcium peroxide, and its acknowledgment of Global Green Group, LLC as a supplier of this commodity chemical to environmental remediation contractors in Florida. This reaffirmation letter supersedes the original March 31, 2003 letter of acceptance, with the major difference being inclusion of recent laboratory results for the chemical analysis of an aqueous 35 percent calcium peroxide slurry.

IXPER 75C is a product of Solvay Interlox Incorporated, Houston, Texas. Calcium peroxide, when mixed with water, slowly releases oxygen that can be used by microorganisms to biodegrade petroleum and other suitable contaminants in groundwater or soil. For several years now, calcium peroxide has been recognized and accepted by the bureau as a chemical that may be used for in situ, injection-type aquifer remediation at petroleum-contaminated sites in Florida.

It is not a requirement that a particular remediation product or process have an official acceptance letter in order for it to be proposed in a site-specific Remedial Action Plan. The plan, however, must contain sufficient information about the product or process to show that it meets all applicable and appropriate rules and regulations, especially those of the Florida Administrative Code.

The acceptance of calcium peroxide as a remediation chemical applies only to the jurisdiction of this bureau, which is the cleanup of petroleum contamination pursuant to Chapter 62-770, Florida Administrative Code (F.A.C.). Other bureaus within the Department of Environmental Protection, or other state agencies and local governments may choose to recognize this bureau's acceptance if their needs and regulations are similar. This bureau, however, is not responsible for applications beyond its jurisdiction.

The Bureau of Petroleum Storage Systems has no objection to the use of calcium peroxide for remediation of petroleum-contaminated sites, provided the considerations of this letter are taken into account, and a Remedial Action Plan is prepared in accordance with Chapter 62-770, F.A.C., for approval by the Department. Enclosure 1 is a transcription of some key information from a Solvay Interlox laboratory chemical analysis of IXPEN 75C

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calcium peroxide and its Solvay Interlox Technical Data and Material Safety Data sheets.

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 Department certification of performance. Additionally, the Department emphasizes a distinction between its regulatory "acceptance" and an 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 IXPEN 75C. To aid those reviewers, the Bureau of Petroleum Storage Systems provides environmental and regulatory information as enclosure 2.

The Department reserves the right to revoke its acceptance of a product or process if it has been falsely represented. Additionally, Department acceptance of any product or 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) 877-1133, extension 29 if there are any questions.

Sincerely,

Rick Ruscito, P.E.
Ecology and Environment, Inc.
Bureau of Petroleum Storage Systems
Petroleum Cleanup Section 6

Rebecca S. Lockenbach
FDEP Section Leader
Bureau of Petroleum Storage Systems
Petroleum Cleanup Section 6

c: T. Conrardy - FDEP/Tallahassee - MS 4530

History:

ppl #213
inn 102.doc
3/31/03

ppl #223
IT 20427
inn 102a.doc
12/1/03

ENCLOSURE 1

Selected Information from the Solvay Interlox¹
Technical Data Sheet² and Material Safety Data Sheet³
for
IXPER 75C (Calcium Peroxide)

<u>PRODUCT PROPERTIES</u>	<u>TYPICAL RANGE</u>	<u>STANDARD SPECIFICATIONS</u>
Appearance		White, yellowish, amorphous odorless powder
Available Oxygen (%)		16.1% to 17.2%
Calcium Peroxide (%) [CaO ₂] (CAS No. 1305-79-9)		75.0 minimum (See note 4)
Food Chemical Codex Specifications (ppm)		
Fluoride		< 50 ppm
Heavy Metals (as Pb)		< 20 ppm
Lead		< 10 ppm
Particle Size Distribution (% Pass through)		
75 micron (US Sieve #200)	99% minimum	
20 micron (US Sieve #325)	50% minimum	
Moisture (%) - moisture balance	< 0.5%	
Bulk Density (g/ml)	0.55 g/ml to 0.65 g/ml	
pH (of a 1% solution)	Approx. 12	

Notes:

1. Solvay Interlox Incorporated, 3333 Richmond Avenue, Houston, Texas 77098.
2. Information taken from Solvay Interlox Technical Data Sheet for IXPER 75C, April 1, 2001 revision.
3. Per Solvay Interlox Material Safety Data Sheet dated March 1, 2000 for IXPER 75C and IXPER 60C.
4. The balance is calcium hydroxide [Ca(OH)₂] (CAS No. 1305-62-0) and calcium carbonate [CaCO₃] (CAS No. 1317-65-3).

IXPER 75C CHEMICAL ANALYSIS *

CHEMICAL SPECIES OR PARAMETER

	<u>AMOUNT</u>	<u>UNITS</u>
<u>Primary Drinking Water</u>		
<u>Contaminants</u>		
Antimony	0.004	mg/L ‡
Arsenic	0.002	mg/L
Barium	0.4	mg/L
Beryllium	0.002	mg/L
Cadmium	< 0.00009	mg/L
Chromium	0.01	mg/L
Fluoride	< 2	mg/L
Lead	0.003	mg/L
Mercury	0.001	mg/L
Nitrate (as N)	7	mg/L
Selenium	< 0.0027	mg/L
Thallium	< 0.0014	mg/L
 <u>Secondary Drinking Water</u>		
<u>Contaminants</u>		
Copper	< 0.00027	mg/L
pH **	12.1	pH units
Total Dissolved Solids	3.56	mg/L

* Laboratory analytical results of a filtered aqueous 35% IXPER 75C calcium peroxide slurry provided by Solvay Interlox Incorporated in correspondence dated July 25, 2003 and September 22, 2003.

‡ mg/L denotes milligrams per liter.

** Rule 62-522.300(2)(c), F.A.C., applies to the pH of an aqueous 35% IXPER 75C slurry to be injected, since pH does not fall within the 6.5 to 8.5 range requirement set forth in Chapter 62-550, F.A.C., as a secondary drinking water standard.

ENCLOSURE 2

IXPER 75C: ENVIRONMENTAL AND REGULATORY INFORMATION

For IXPER 75C applications, the major environmental and regulatory considerations are listed below.

1. Applicable regulations: The onus shall be on users of IXPER 75C to ensure that all applicable groundwater standards will be met at the time of project completion, for petroleum, other contaminants that may be present, any residuals associated with the constituents of the calcium peroxide, and any by-products produced as a result of chemical or biochemical reactions involving those constituents. The following chapters of the Florida Administrative Code are cited: Chapter 62-550, F.A.C., for primary and secondary water quality standards; Chapter 62-520, F.A.C. for groundwater classes and standards, and minimum criteria; Chapter 62-522, F.A.C., for groundwater permitting and monitoring requirements; Chapter 62-528, F.A.C., for underground injection control, particularly Part V, for Class V, Group 4 aquifer remediation projects; Chapter 62-770, F.A.C., for petroleum cleanup criteria; and Chapter 62-777, F.A.C., also for minimum groundwater criteria.

A noteworthy aspect of the minimum groundwater criteria set forth in Chapter 62-520, F.A.C., is that it requires groundwater to be free from substances that are harmful to plants, animals, and organisms, and free from substances that are carcinogenic, mutagenic, teratogenic or toxic to human beings. In effect, these "free from" requirements form a catchall. They close what would otherwise be a loophole in the regulations by preventing injection of a potentially harmful product in the event that any of its ingredients is not regulated as a specific primary or secondary drinking water contaminant.

2. pH: The Bureau of Petroleum Storage Systems, based on the enclosure 1 chemical analysis information provided by Solvay Interlox Incorporated for an aqueous 35% IXPER 75C calcium peroxide slurry, has determined that pH is the only chemical parameter that does not meet the underground injection control requirements of Chapter 62-528, F.A.C., which references the primary and secondary drinking water standards of Chapter 62-550, F.A.C. For such a situation, rule 62-522.300(2)(c), F.A.C., applies, in order to establish a temporary zone of discharge for pH, which is a secondary drinking water parameter, when IXPER 75C is used for the purpose of in situ aquifer remediation. In order to comply with rule 62-522.300(2)(c), F.A.C., in the case of IXPER 75C, a Department-approved remediation plan must specify for pH the size and duration of a temporary zone of discharge, and make provision for the groundwater monitoring of pH. The zone size for in situ, injection-type aquifer remediation projects is usually expressed as a radius of influence from each injection point, and the duration is typically not more than one (1) year from the date of the last injection.
3. Injection well permit: The issuance of a site-specific Remedial Action Plan Approval Order by the Florida Department of

Environmental Protection, for remediation via injection of IXPER 75C into an aquifer, constitutes the granting of the state's permit for a Class V injection well.

4. Addition of nutrients, buffers, or bacteria: The groundwater permitting and monitoring topics discussed in this acceptance letter are based on an assumption that IXPER 75 C is the sole injected substance. If the injection of IXPER 75C is augmented by the injection of bacteria and other petroleum-degrading microorganisms, as a means by which to enhance the effectiveness of IXPER 75C, then those bacteria and other microorganisms must be non-pathogenic and preferably not genetically engineered. And if nutrients and/or buffers, etc. are injected for the purpose of augmentation, then they must meet the underground injection standards of Chapter 62-528, Florida Administrative Code. Depending on the chemical nature of those nutrients and buffers, rule 62-522.300(2)(c) F.A.C., may apply, and/or a variance from rule 62-522.300(3), F.A.C., may be required to establish a temporary zone of discharge during the remediation process.
5. Underground injection control inventory: Remedial Action Plans prescribing in situ, injection-type aquifer remediation 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. Per Rule 62-528.630(2)(c), F.A.C., aquifer remediation projects involving injection wells may be authorized under the provisions of a Remedial Action Plan, provided the construction, operation, and monitoring requirements of Chapter 62-528, F.A.C., are met. A memorandum outlining the inventory information about injection-type aquifer remediation plans to be transmitted by Department reviewers to the Underground Injection Control Section is provided as enclosure 3.

Only the Department, including its district offices, may approve in situ, injection-type aquifer remediation plans for which the approval constitutes a Class V injection permit. Local programs are not authorized to grant such approvals. Reason: An arrangement between the Environmental Protection Agency and the Department allows for delegation of underground injection control authority to the Department, but it does not allow the Department to delegate that authority any further. This includes delegation to the Department's contracted remediation review agencies such as those operated by the counties and other local governments.

6. Avoidance of migration: For in situ injection-type aquifer remediation projects, injection of IXPER 75C shall be performed in such a way, and at such a rate and volume, that no undesirable migration of either the product's ingredients or the contaminants already in the aquifer results, pursuant to Rule 62-528.630(3), F.A.C.
7. Underground injection control operating permit: Although an operating permit is not required for aquifer remediation wells pursuant to Rule 62-528.640(1)(b), and 62-528.640(1)(c), F.A.C., since no movement of the contamination plume is expected to accompany the calcium peroxide 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 Remedial Action Plan proposals as a matter of good and thorough design practice. Briefly summarized, they are: quality of water in the aquifer; quality of the injected fluid; existing and potential uses of the affected aquifer; and well construction details. Additionally, each Remedial Action Plan should clearly indicate the concentration and total volume of calcium peroxide slurry that will be injected.

8. 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 as application wells for IXPER 75C. However, no "designated" monitoring well, dedicated to the tracking of remediation progress (by sampling) shall be used as an application well. This will avoid premature conclusions that the entire site meets cleanup goals. By making sure that designated tracking wells are not also 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.
9. Pilot study: For bioremediation, per rule 62-770.700(2), F.A.C., a pilot study proposal shall be submitted for review, and a pilot test shall be performed prior to designing a treatment system. If conditions or the situation at a site do not warrant a pilot study, then a proposal explaining the rationale for the decision not to perform a pilot study shall be submitted for review. For state funded projects, reviewers are encouraged to use judgment in balancing cost and the need for technical information to be obtained from a pilot study.
10. Bioremediation parameters of potential interest: The following parameters may be useful in determining the potential for bioremediation at a site, or whether bioremediation is already occurring. These parameters were selected from a list that appears in the publication, "In Situ Treatment Technology" by E. Nyer et al., Lewis Publishers, 1996. The parameters are: dissolved oxygen; redox potential; pH; temperature; specific conductance; volatile organic compounds; nitrate; nitrite; ammonia nitrogen; manganese (total and dissolved); iron (total, dissolved, and ferrous); sulfate; sulfide; and total organic carbon. Gaseous parameters include: carbon dioxide, oxygen, nitrogen, and methane. Other parameters that may be helpful are chemical oxygen demand, biochemical oxygen demand, and total organic carbon. Those preparing bioremediation plans and their reviewers should determine which parameters, if any, should be investigated on a site-specific basis.
11. Groundwater monitoring:
 - a. Active remediation petroleum monitoring: During the period of active remediation, groundwater shall be monitored in accordance with the requirements set forth in Section 62-770.700, F.A.C. Two noteworthy rules within that section are 62-770.700(3)(i), F.A.C., for frequency of sampling, and 62-770.700(5)(f), F.A.C., which requires a sampling schedule for bioremediation.

- b. Post remediation petroleum monitoring: At least one (1) year of quarterly post remediation groundwater monitoring shall be conducted at a minimum of two (2) wells, one located in the area of maximum petroleum contamination, the other down-gradient of the area of maximum petroleum contamination, pursuant to Section 62-770.750, F.A.C.
 - c. Underground injection control monitoring: For IXPER 75C, groundwater monitoring of constituents of concern will be necessary before and after injection. Pursuant to rule 62-522.300(2)(c), F.A.C., a department-approved remediation plan for IXPER 75C must address the groundwater monitoring of pH, a secondary drinking water parameter.
12. Bioremediation operating parameters: Rule 62-770.700(9)(h), F.A.C., sets forth frequency requirements for the measurement of bioremediation operating parameters such as dissolved oxygen levels, rates of nutrient addition, temperature, etc. It also includes an option for reduction in the frequency or discontinuation of some measurements in situations when appropriate.
13. Abandonment of wells: Upon issuance of a petroleum Site Rehabilitation Completion Order, or a declaration of "No Further Action", 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 the inventory-tracking list.

Memorandum**Florida Department of
Environmental Protection**

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 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 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): _____

Richard Deuerling
Page Two
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 contaminated site is intended to meet the groundwater cleanup criteria set forth in Chapter 62-777, 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 contaminants 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 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.