Department of
Environmental Protection

Jeb Bush
Governor

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

David B. Struhs
Secretary

January 27, 2003

Ms. Lucy Long
Shangyu Chemical Industry Corp.
Room 1403B&C
No. 308 ZhongBei Road
Hangzhou, China

Re: **Shangyu Magnesium Peroxide**

Dear Ms. Long:

The Bureau of Petroleum Storage Systems hereby acknowledges an indication by Shangyu Chemical Industry Corporation to offer itself as a supplier of the commodity chemical magnesium peroxide to environmental remediation contractors in Florida. Magnesium peroxide, when mixed with water, or contacted with hydrous material, releases oxygen that can be used by microorganisms to biodegrade petroleum and other suitable contaminants in groundwater or soil. In Florida, magnesium peroxide is usually used for in situ remediation of contaminated sites. For several years now, magnesium peroxide has been recognized and accepted by the bureau as a chemical that may be used in cleanup of petroleum-contaminated sites.

It is not, however, 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 magnesium peroxide as a remediation chemical applies 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 magnesium 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 copy of the magnesium peroxide specifications provided by Shangyu Chemical Industry Corporation.

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 Shangyu magnesium peroxide. 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 850/245-8911 if there are any questions.

Sincerely,

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

c: T. Conrardy - FDEP/Tallahassee

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ENCLOSURE 1

Magnesium Peroxide

Molecular Formula: MgO_2
Molecular Weight: 56.3
CAS Number: 1335-26-8

Specifications

Composition	MgO_2, MgO $Mg(OH)_2$
Magnesium Peroxide,	25% Min.
Calcium,	1.0% Max.
Cl^-	0.035% Max.
SO_4^{2-}	0.4% Max.
Heavy Metals (As Pb)	0.004% Max.
Ferric	0.05% Max.
Bulk Density	500-800 g/L
PH Value	11 Approx.
Moisture	4.0% Max.
Appearance	White fine powder

Application

Magnesium Peroxide is a compound that slowly decomposes to release oxygen when mixed with water or contacted with hydrous media. The compound can be used for environmental remediation, especially for underground water treatment and soil remediation, promoting the activity of microorganisms in order to degrade contamination into harmless by-products. For example, it can be used in remediating the contaminated soil in an oil field or at sites where petroleum storage systems have leaked.

Magnesium peroxide produced by Shangyuchem meets high standards. In addition to environmental remediation purposes, it can be used in pharmaceutical and consumer products. It functions as a source of oxygen in agricultural, horticultural and forestry applications, in bakery use, and in flushing water to treat aquatics during emergencies.

Packing

Net 25kgs in woven bag with polyethylene liner or in carbon-drum.

Contact us

Shangyu Chemical Industry Corp. HangZhou Branch
Tel: 0086 571 85774293 Fax:0086 571 85774298
E mail: lucy_long@shangyuchem.com
URL: www.shangyuchem.com

ENCLOSURE 2

SHANGYU MAGNESIUM PEROXIDE: ENVIRONMENTAL AND REGULATORY INFORMATION

For Shangyu magnesium peroxide applications, the major environmental and regulatory considerations are listed below.

1. Applicable regulations: The onus shall be on users of Shangyu magnesium peroxide 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 magnesium 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 which 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. Bureau's evaluation: Based on the specifications provided by Shangyu, which lists the maximum concentration of impurities that may be present, the Bureau of Petroleum Storage Systems has performed a conservative calculation of impurity concentrations, assuming that a 35% by weight slurry of Shangyu magnesium peroxide will be injected, and then compared the results to Florida's current injection standards for groundwater. Based on this comparison, and other information already known by the bureau about magnesium peroxide, there are items that should be addressed by users of Shangyu magnesium peroxide in order to comply with the underground injection control requirements of Chapter 62-528, F.A.C. Users must clearly understand that they are responsible for compliance.

   As the first step to compliance, a sample of the Shangyu magnesium peroxide slurry should be sent to a laboratory for analysis, at the slurry concentration to be injected. The bureau suggests that the slurry sample be prepared using <u>distilled</u> water to ensure that only the impurities in the Shangyu magnesium peroxide are analyzed, and not those that could be present in local tap water. Also, in order for the analysis to be as representative as possible of the effect

of Shangyu magnesium peroxide on groundwater quality, the bureau suggests that the laboratory filter the slurry sample prior to analysis, and then analyze the filtrate for parameters of concern. At the least, the filtrate should be analyzed for the secondary drinking water parameters total dissolved solids, sulfate, pH, and iron; the primary drinking water parameter lead; and any other heavy metals that are primary drinking water or minimum groundwater contaminants that Shangyu has reason to believe could be present. Examples of other heavy metals are antimony, arsenic, beryllium, cadmium, chromium, mercury, molybdenum, thallium, and vanadium. This list of other heavy metals shall not be construed as exhaustive, nor does the bureau imply that they are necessarily present in Shangyu magnesium peroxide. A complete listing of all contaminants and all heavy metals of concern in drinking water and groundwater in Florida, and their maximum allowable concentrations, can be found in Chapter 62-550 and 62-777, F.A.C.

The laboratory chemical analysis of the slurry to be injected does not have to be performed every time a user proposes Shangyu magnesium peroxide in a remediation plan. This can be a one-time analysis, with the results serving for the use of Shangyu magnesium peroxide in future cleanups at other sites, provided those future applications do not exceed the slurry concentration for which the analysis was provided.

The results of the chemical analysis of the Shangyu magnesium peroxide slurry to be injected should be compared to the drinking water standards of Chapters 62-550, F.A.C., and the groundwater standards of 62-777, F.A.C. If the standards are not met, then 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 needed as permission to establish a temporary zone of discharge during remediation.

In the case of in situ injection-type remediation using Shangyu magnesium peroxide at an assumed concentration of 35% by weight, the bureau has determined that rule 62-522.300(2)(c), F.A.C., applies to the following secondary drinking water parameters: iron, pH, sulfate, and total dissolved solids. This rule requires that a Department-approved remediation plan address the size and duration of the zone of discharge, and groundwater monitoring of each of these parameters. 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.

As for other rules that may apply, the bureau, at this time, in the absence of a laboratory analysis of heavy metal impurities that are primary or minimum groundwater contaminants, cannot determine whether users must obtain a variance from rule 62-522.300(3), F.A.C. The variance, if necessary, would be for a temporary zone of discharge for the heavy metals. Reason: in the case of Shangyu magnesium peroxide, rule 62-522.300(2)(c), F.A.C, while applicable to secondary groundwater contaminants, does not permit a zone of discharge for heavy metals that are primary groundwater contaminants but not prime constituents of the magnesium peroxide reagent needed to remediate a site. Those metals, in this case, are impurities that serve no purpose.

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 Shangyu magnesium peroxide into an aquifer, constitutes the granting of the state's permit for a Class V injection well.

4. Addition of nutrients, buffers, or bacteria: This acceptance is based on use of Shangyu magnesium peroxide only. If bacteria are used to augment existing indigenous microbial populations at a remediation site, then those bacteria must be non-pathogenic and preferably not genetically engineered. If nutrients and/or buffers, etc. are to be injected they must meet the underground injection standards of 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 for permission to establish a temporary zone of discharge during the remediation process.

5. Underground injection control inventory: Remedial Action Plans prescribing in situ aquifer injection-type 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 remediation plans for which the approval constitutes a Class V injection permit. Local programs are not authorized to grant such approvals. Reason: Although an arrangement between the Environmental Protection Agency and the Department delegates underground injection control authority to the Department, 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 Shangyu magnesium peroxide 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 magnesium 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 magnesium 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 Shangyu magnesium peroxide. 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 Shangyu magnesium peroxide, groundwater monitoring of constituents of concern will be necessary before and after injection. Per rule 62-522.300(2)(c), F.A.C., a department-approved remediation plan must address the groundwater monitoring of the secondary drinking water parameters iron, pH, sulfate, and total dissolved solid. And per the specification provided in enclosure 1, and also per the discussion in paragraph *2* above, it appears that a variance from rule 62-522.300(3), F.A.C., and groundwater monitoring may be necessary for lead, at the least. Additionally, per the results of the slurry analysis discussed in paragraph *2*, a variance and its associated groundwater monitoring may have to include other heavy metal impurities that may be present in excess of their maximum allowable primary drinking water concentrations set forth in Chapter 62-550, F.A.C. Also, the variance and groundwater monitoring may have to address molybdenum, if present, which is classified as a minimum groundwater criteria contaminant. Its maximum allowable concentration of .035 milligrams per liter is set forth in Chapter 62-777, F.A.C.

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): _____

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 groudwater 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.