

Provect-OX®

Self-Activating ISCO / Enhanced Bioremediation Reagent

APPLICATION INSTRUCTIONS

Provect-OX is a patented *in-situ* chemical oxidation (ISCO) / accelerated bioremediation reagent that uses ferric iron (Fe III) as a safe and effective means of activating persulfate (**US 9,126,245 B2**). Provect-OX oxidizes a wide variety of organic compounds present in impacted soil, sediment and groundwater, including chlorinated solvents, petroleum hydrocarbons, and pesticides. Provect-OX can be applied via direct push injection, infiltration wells/galleries and soil mixing).



RECOMMENDED EQUIPMENT

As with other oxidizers, Provect-OX is classified as a DOT 5.1 Oxidizer and should be handled according to all local, state and federal regulations that apply to this type of material. Although Provect-OX is a non-exothermic, near neutral pH, highly water soluble, low viscosity reagent, equipment compatibility should always be considered when applying an oxidizer for a remedial application. Provectus recommends the following equipment capabilities at a minimum:

PUMPS

- ◆ Common pumps utilized for oxidant injection include, but are not limited to, double diaphragm (Wilden, Versa-Matic, Rupp, Yamada, etc.) progressive cavity (Moyno,) and positive displacement (Hydracell,) pumps.
- ◆ Pumps should be constructed of materials with reasonable chemical resistance to corrosive fluids (see pump manufacturers for general guidance on housing and internal part compatibility). I.e. Stainless steel housing with Nordel Elastomers.
- ◆ Pumps should be capable of 75 psi or greater with flow rates of 20 gpm at a minimum.



TANKS

- ◆ Clean poly tanks of appropriate size/volume with recirculation or agitation capabilities for mixing of Provect-OX solution.



HOSES

- ◆ Clean chemical resistant hoses with appropriate materials of construction (i.e. chemical compatibility and pressure rated specifications).
- ◆ All hoses should be constructed/outfitted with appropriate safety fittings and whip checks where appropriate.



MIXING GUIDELINES

Provect-OX is a single component product with an integrated activator to eliminate multi-step mixing processes. This aids in field preparation time as well as health and safety issues associated with other types of activation methodologies. Provect-OX is a highly water soluble reagent that is typically mixed from 1 to 30 wt. % (w/w) solution. This solution can be created by adding the recommended mass of Provect-OX to the corresponding volume of clean water in a chemical compatible tank (**see Table 1**). This solution should be recirculated or agitated sufficiently to dissolve all persulfate solids. (Note water temperature can affect solubility of chemicals). The Provect-OX solution should be periodically mixed (e.g. stirred, agitated) to keep the very small ferric iron particles in suspension. Proper PPE should be worn during the mixing process to prevent splash hazards as well as dust inhalation.

TABLE 1. FIELD GUIDE FOR MIXING Provect-OX®			
per 50 lb. bag		per 1000 lb. super sack	
Target weight %	USG water required	Target weight %	USG water required
1	600	1	12000
5	120	5	2400
10	60	10	1200
15	40	15	800
20	30	20	600
30	20	30	400

DIRECT PUSH APPLICATIONS

Drive tooling to predetermined depths and inject Provect-OX solution using either top down or bottom up tooling at the appropriate dosages following tooling manufacturers' guidelines. As with any reagent, use appropriate safety devices and pressure/chemical compatible equipment. At completion of the injection, flush with clean water, allow pressure to dissipate, remove tooling and abandon borehole as to prevent short circuiting during future injections.

INJECTION WELL APPLICATION

Prior to use as an injection well, check well construction for materials of construction, screened interval and slot size (minimum of 0.010 screen slot is recommended.) Careful consideration should be taken to verify that pressures and volumes can be introduced safely through the injection wells. All wells should be sealed in a manner that no material can escape through the annular space.

Similar to DPT guidelines, make sure appropriate hoses, fittings and connections are utilized and introduce the prescribed mass and volume of Provect-OX. At the completion of the injection, follow with a clean water flush and allow pressure to dissipate before removing connections.

SOIL MIXING APPLICATION

- ◆ Bermed Work Area: Work should be conducted within a bermed area to facilitate water management.
- ◆ Prepare P-OX Solution: Mix Provect-OX with water to attain prescribed concentration (e.g. 10 – 30 wt. %).
- ◆ Application of P-OX Solution: Apply the Provect-OX to the soils as an aqueous slurry (NOT as dry powder to avoid dust issues) using an Allu-type mixer equipped with spray attachment
 - Mixing – Mix the Provect-OX and soils uniformly within each portion of the soil pile. Mix uniformly to attain the prescribed soil moisture saturation levels of ca. 90% WHC (wet but efforts made to limit free water).
 - Staging – soil/Provect-OX-treated soils can be staged in piles ca. 5 ft high on top of a liner (to collect any leachate) within a bermed area.
 - Weather – If precipitation is expected/anticipated the soil pile should be covered with a 3mil clear plastic tarp for protection.
 - Incubation – treated soil can be left static for at least 15 days.
 - Confirmation Sampling – once RAOs have been achieved (anticipated a single treatment event at dosing to be validated by bench tests in progress), soil can be modified as required (i.e., pH via agricultural lime).

SOIL MIXING APPLICATION

When using Provect-OX it is important to start and finish each day with clean equipment. All tooling, tanks, hoses and pumps should be rinsed with clean water to remove residual material per manufacturers' recommendations. Extended contact with oxidizers and equipment will result in reduced longevity. A biodegradable cleaner such as Simple Green may also be used during this process.

CONTACT US FOR A COMPLIMENTARY SITE EVALUATION

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