

Provect-OX® and Provect-OX2™

Self-Activating ISCO + Enhanced Bioremediation Reagent

APPLICATION INSTRUCTIONS

Provect-OX® / Provect-OX2™ 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® and Provect-OX2™ oxidize a wide variety of organic compounds present in impacted soil, sediment, and groundwater, including chlorinated solvents, petroleum hydrocarbons, and pesticides. Provect-OX® and Provect-OX2™ can be applied via injection, soil mixing, and excavation placement.



RECOMMENDED EQUIPMENT

As with other oxidizers, Provect-OX® and Provect-OX2™ are classified as DOT 5.1 Oxidizers and should be handled according to all local, state, and federal regulations that apply to this type of material. Although Provect-OX® and Provect-OX2™ are non-exothermic, near neutral pH and low viscosity reagents, 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 (Hydra-Cell).
- ◆ Pumps should be constructed of materials with reasonable chemical resistance to corrosive fluids (see pump manufacturer information for general guidance on housing and internal part compatibility). For example, 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, cylindrical poly tanks of appropriate size and volume with recirculation or agitation capabilities for mixing of Provect-OX® and Provect-OX2™ solutions.

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® and Provect-OX2™ are single component products 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® and Provect-OX2™ are typically mixed from 1 to 30 wt. % (w/w) solution. This solution can be created by adding the recommended mass of Provect-OX® and Provect-OX2™ to the corresponding volume of clean water in a chemical compatible tank (**see Table 1**). This solution should be recirculated or agitated sufficiently. Please note water temperature can affect solubility of chemicals. The Provect-OX® and Provect-OX2™ solutions 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® and PROVECT-OX2™			
per 50 lb bag		per 2,000 lb super sack	
Target weight %	USG water required	Target weight %	USG water required
1	593	1	23,727
5	114	5	4,554
10	54	10	2,157
15	34	15	1,358
20	24	20	959
30	14	30	559

DIRECT PUSH APPLICATIONS

Drive tooling to predetermined depths and inject Provect-OX® or Provect-OX2™ solutions using either top down or bottom up at the appropriate dosages. 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

Please contact Provectus to discuss Provect-OX® and Provect-OX2™ applications utilizing permanent injection wells.

SOIL MIXING APPLICATION

- ◆ **Bermed Work Area:** Work should be conducted within a bermed area to facilitate water management.
- ◆ **Prepare Provect-OX® or Provect-OX2™ Solutions:** Mix Provect-OX® or Provect-OX2™ with water to attain prescribed concentration (e.g., 10 – 30 wt. %).
- ◆ **Application of Provect-OX® or Provect-OX2™ Solution:** Apply Provect-OX® or Provect-OX2™ to the soils as an aqueous slurry (not as a dry powder to avoid dust issues, unless open excavation placement is occurring) using an Allu-type mixer equipped with spray attachment.

- Mixing – Mix the Provect-OX® or Provect-OX2™ 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 – Provect-OX®-treated soils/Provect-OX2™-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 3 mil clear plastic tarp for protection.
- Incubation – Treated soil can be left static for at least 15 days.
- Confirmational Sampling – Once RAOs have been achieved, soil can be modified as required.

When using Provect-OX® or Provect-OX2™ 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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