



## **Direct-Push Slurry Injection Recommendations**

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The following guidance is provided as general recommendations for direct-push injection of StimulOX™ slurries into a subsurface formation. This document is not intended as a replacement for design and oversight by an experienced professional. The exact procedures utilized in the field will, of course, vary based upon the equipment used, unique site conditions, site-specific health and safety issues, and project design. Injection is usually accomplished via a pressurized system to deliver the target volume of StimulOX™ slurry. A number of manufacturers offer direct-push equipment that can be utilized for injection of StimulOX™ slurries. The following guidance features Geoprobe® equipment.

### **Health and Safety Considerations**

- (1) Underground and overhead utility markout and drilling conflict identification are important safety requirements. Always identify all underground and overhead drilling conflicts, for employee health & safety as well as to avoid damage. Adjust pre-planned locations as necessary to provide safe clearance of all underground and overhead drilling conflicts.
- (2) StimulOX™ is an oxidizer and must be handled accordingly in the field. Ensure the Material Safety Data Sheet and site-specific safety plan is reviewed by all personnel, and that all personnel are trained and experienced with the field equipment and blending procedures. StimulOX™ is shipped to you as a fine powder. Field personnel must take precautions to avoid inhaling the powder, including working upwind and/or wearing eye and respirator protection as necessary.

### Slurry Preparation

- (1) StimulOX™ slurries should be prepared in small batches, typically no more than what can be used in approximately 15-30 minutes. DBI typically recommends that the batches be mixed after the direct-push tooling is advanced and ready for injection to begin.
- (2) The percent solids utilized in the slurry will vary based upon site conditions and StimulOX™ volume requirements. Typical slurries consist of approximately 30-60% solids. DBI recommends in most cases that field operators should begin with a 50% solids slurry and then modify as needed in order to accomplish the injection.
- (3) Slurry batches are easily prepared in 5-gallon buckets using cordless drill-operated paint blenders to mix. A bathroom scale is convenient for weighing the StimulOX™ and either weighing or measuring water volume. Five-gallon plastic buckets are useful for blending and as containers for weighing and measuring volumes.
- (4) Add the required volume of water to the bucket, and then blend in the required volume of StimulOX™. Always add StimulOX™ powder to water, rather than vice versa.
- (5) Blending ratios for different slurry concentrations are as follows:

% Solids in Slurry	Amount of Water		Amount of StimulOX™
	Gallons of Water	Pounds of Water	
60%	0.8 gallons	6.7 lbs	10 lbs
50%	1.2 gallons	10 lbs	10 lbs
40%	1.8 gallons	15 lbs	10 lbs
30%	2.7 gallons	23 lbs	10 lbs

- (6) Once blended, do not allow the slurry to stand without regular mixing to prevent the solids from setting out of the slurry.
- (7) Keep the StimulOX™ reagent containers closed and sealed when not in use. Prevent the product from getting moist or wet before use.

### Slurry Injection

- (1) Geoprobe manufactures various sizes of downhole tooling and specially-designed injection equipment for pumping slurries. Typically the smaller (1 to 1.5") rods are easier and quicker to

handle, and contain less internal volume. A Geoprobe GS-series grout pumps are very effective pumps.

- (2) Drive the probe rods to the desired maximum depth, using a sacrificial tip on the lead rod.
- (3) Disconnect the sacrificial tip and attach a grout injection pull-cap.
- (4) Blend the slurry and transfer to the grout pump hopper. If mixing is incomplete, lumps may be present that can clog the tooling and hoses. Geoprobe offers a screen that fits their grout pump hoppers to prevent the lumps from entering the pump.
- (5) Withdraw the drill rods approximately 3-4 feet to disengage the sacrificial tip and expose the formation.
- (6) Pump the pre-determined quantity of StimulOX™ into the formation. Watch pump pressures to ensure the formation is accepting the slurry. Rising pressures indicate the formation is refusing the slurry. In the event of refusal or unacceptably high pressures, try to modify the percent solids in the slurry or utilize additional points with a smaller volume per point.
- (7) Withdraw the rods as needed to detach rod segments. Observe system pressures before removing tooling to prevent the slurry from splattering when the threaded fittings are loosened. Rod segments will contain the slurry; allow the slurry to drain into the grout hopper for use.
- (8) Repeat steps 5-7 as needed to cover the target injection interval.
- (9) After completing the injection, remove the tooling from the probe hole and seal the open borehole with bentonite slurry or cement.
- (10) Rods and other equipment should be rinsed soon after withdrawal.

**For FREE Technical Support on these  
recommendations or other questions regarding  
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