



SUMMARY

The following are provided as general recommendations for direct push injection of CAP 18® anaerobic bioremediation product and CAP 18 ME® anaerobic bioremediation product into a subsurface formation. This document is not intended as a replacement for design by an experienced professional. The exact procedures utilized in the field will, of course, vary based upon the equipment staged onsite, unique site conditions, and project design. Injection is usually accomplished via a pressurized system to deliver the required volume of CAP 18 and CAP 18 ME. A number of manufacturers offer direct push equipment that can be utilized for injection of CAP 18 and CAP 18 ME. The following guidance features direct push equipment.

HEALTH AND SAFETY CONSIDERATIONS

Underground and overhead utility markout and drilling conflict identification are important safety requirements. Always identify all underground and overhead drilling conflicts, for employee health and safety as well as to avoid damage. Adjust pre-planned locations as necessary to provide safe clearance of all underground and overhead drilling conflicts.

CAP 18 and CAP 18 ME do not generally require heating prior to injection. However, in cold weather (less than approximately 50°F), the product viscosity will increase and heating may make injection easier. If heating is desired, the easiest method is to use an electrical immersion heater placed in a drum of CAP 18 or CAP 18 ME. If the CAP 18 or CAP 18 ME is delivered to the site by tanker, then a large (200-400 gallon) poly tank can also be used. Do not warm the CAP 18 or CAP 18 ME to a temperature higher than 90°F (to prevent burns in the event of accidental exposure). Immersion heaters designed for 55-gallon drums with programmable thermostat and mounting bracket are available from McMaster-Carr (for example, part nos. 3567K811 and 3567K812 depending upon power supply).

RECOMMENDATIONS

There are various sizes of downhole tooling and specially designed injection equipment offered by direct push vendors for pumping. Probes with either 1.5-inch or 1.25-inch rods can be used for “top-down” or “bottom-up” injection.

Pressurized injection is typically required to deliver sufficient CAP 18 or CAP 18 ME. The CAP 18 or CAP 18 ME supply can be delivered to the probe rods via at least two convenient methods. The most convenient method is to utilize a grout pump. The CAP 18 or CAP 18 ME can be transferred from the drum to the pump hopper with a drum pump, diaphragm pump, or centrifugal pump. If the CAP 18 or CAP 18 ME is staged in a tank truck, it is easiest to utilize an intermediate poly tank to stage the oil prior to transfer to the grout pump hopper. The easiest method to monitor injection volume is to mark the grout hopper volume (use buckets of water to determine mark locations) or use a totalizer on the injection hose or transfer line.

Alternatively, a diaphragm pump (such as the Yamada NDP-15) can be fit to draw directly from the drum and connect to the probe rods. Santoprene diaphragm materials are optimal, however Buna-N, and PTFE are acceptable.

CARUS REMEDATION



CAP 18® and CAP 18 ME® Anaerobic
Bioremediation Products Direct-Push
Application Recommendations

CAP 18® Anaerobic Bioremediation Products
TECHNICAL BRIEF

After positioning the direct push equipment and attaching the tooling, the probe is pushed to the target depth and injection begins. The injection can be conducted from the bottom-up or from the top-down. Advance or withdraw the rods slowly during injection, while monitoring delivery volume, to ensure delivery of the desired amount of CAP 18® or CAP 18 ME® anaerobic bioremediation products into the target zones.

Do not rush the injection; if the aquifer cannot accept the reagent, slow the injection rate or utilize additional injection points to deliver the target volume.

Ensure that pressure inside the injection hose and tooling is gently relieved prior to disconnecting fittings.

As probe rods are removed during retraction, place the rods in a bucket to allow residual CAP 18 or CAP 18 ME to drain (the drained product can be returned to the hopper for injection).

After removal of all tooling, fill the boring to grade with bentonite or cement, or otherwise as required by local regulations.

Tooling can be easily cleaned with dishwashing liquid and warm water. Make sure to cycle the cleaning solution through the grout pump and hopper. Although CAP 18 or CAP 18 ME will not solidify, residual product should be carefully cleaned after each day of injection.

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