WAVEFRONT
PRIMAWAVE

Electron Donor Injection

Location	Former UST Site in Massachusetts, USA
Operator	Local Contractor and Consultant
Formation	Unconsolidated Silt and Clay
Aquifer Target	Dissolved Petroleum Contaminants
Application	Dissolved Mass Reduction via Slow Release Oxygen Products Injection
Tool used	Surface Deployed Sidewinder Tool
Date installed	June 2010

Introduction

Primawave, a proprietary technology of Wavefront Technology Solutions, Inc was used to maximize injection efficacy in an aquifer that has historically proven difficult for remedial injections. Groundwater at a former site had been impacted by the release of petroleum hydrocarbons (BTEX), and was treated via enhanced *in situ* bioremediation via injection of two slow release oxygen products.

Injection Issue

At this active automotive repair facility, high BTEX concentrations in the aquifer required treatment. Due to previous experience with remedial injections into silt and clay in the treatment zone, the proposed approach called for measures to avert product surfacing while maximizing subsurface distribution.

Primawave Installation

The Primawave Sidewider was attached to the top of direct push rod strings, and the remediation products were pumped through the Sidewinder, down through the rods, and out into the aquifer at depths of approximately 12 to 18 feet below ground surface.

The injection pressures used to deliver the products averaged about 40 psi, and delivery rates averaged about 1.25 gallons per minute (gpm) with Primawave and less than 0.8 gpm without Primawave. A sufficient amount of product was injected to achieve the remediation design goals.

Results

The successful injection of project with Primawave eliminated surfacing of the product during injection upon application of Primawave. The injection contractor was able to inject the targeted 25 gallons of product when pumping through the Primawave Sidewinder tool only. When Primawave was not used, the success rate for injection points fell to 50%. Half of the injection points that did not use Primawave were unsuccessful due to surfacing of the products either around the injection rods or directly adjacent to the injection point.

The implementation of Primawave resulted in the successful *in situ* injection of slow release oxygen products at a higher injection flow rate. The time to inject the 25 gallons of product was reduced from 30 minutes with traditional injection to 20 minutes using Primawave enhanced injection. The results from the Primawave application were immediate, and longer-term benefits will be monitored:

- Product surfacing was totally eliminated with the Primawave Sidewinder.
- Overall injection efficiency was maximized with Primawave. The targeted volumes of product were delivered with Primawave and required much less time compared to previous injection events using traditional technologies.
- The maximum practical injection rate increased using Primawave enhanced injection, without significant day-lighting.
- A reduction in BTEX concentrations is anticipated, and will be measured during post-injection monitoring.