IN-SITU REMEDIATION OF HOT-SPOTS USING JETTING TECHNOLOGY

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Jetting technology using high-pressure, low to high volume injection of liquids into the subsurface using a small-diameter wand or lance driven into the subsurface has been widely used for several decades. Jetting technology, at its most basic, uses tree root feeder systems to inject liquids into the ground. The Remediation Injection Process (RIP®), an updated and more powerful, versatile and adaptable jetting delivery system has been used to efficiently implement, or augment, a variety of environmental remediation processes including chemical oxidation, bioremediation, pH adjustment and metals stabilization. Key to success for in-situ projects include a detailed bench or laboratory test, pilot-scale project and full scale remediation. These three steps are critical for significant cost savings can be made when appropriate chemical and/or biological information is designed into an in-situ project.

The hand-held RIP™ lances have been designed to use high-pressure liquid pumps to increase flow at the tip of the wand to pressures exceeding 5,000 psi. At these pressures, the lances are driven downward at velocities up to one foot per second. High pressure injection points placed on close spacing, such as 2 foot centers to 5 foot centers, allows for complete in-situ coverage, vertically and laterally. Radius of influence around injection ports has been documented to exceed 10 feet.

Jetting technology is used to remediate limited access areas such as underneath slabs, railways, and buildings, around tanks, pipelines and subsurface utilities; and into hillsides, excavation pits and stockpiles. The flexibility and accuracy of this injection delivery system provides distinct advantages over both conventional in-situ and ex-situ remediation systems. Hot spots can be effectively treated using this technology. As a result, the jetting technology can provide appreciable savings in cost and time over traditional remediation technologies.

Jetting uses chemical oxidizers to rapidly treat soils contaminated with toxic and persistent organic wastes. The two most common oxidizers used for jetting in soil and groundwater remediation are hydrogen peroxide and potassium permanganate to treat petroleum hydrocarbons (such as gasoline, diesel, motor oil, and jet fuel), volatile organic compounds, munitions, certain pesticides and wood preservatives. Aerobic biological degradation and natural attenuation of fuel hydrocarbons and selected other organic compounds have been remediated by jetting using liquid oxidants, nutrients and other amendments. Under the correct subsurface conditions, soluble metals, such as arsenic and chromium, have been stabilized using sulfide compounds, converting the toxic metals into a low solubility sulfide. Alkalinity, pH, and organic content must be evaluated prior to any in-situ metals stabilization project. Injection ports are grouted with bentonite or neat cement. Case studies will be discussed summarizing

the delivery capability in various soil conditions using oxidation and bioremediation technology featuring a variety of contaminants, including gasoline, diesel, tetrachlorethylene (PCE), trichloroethylene (TCE), dichloroethylene (DCE), and toluene. In one case, free product (6" of diesel) was removed using hydrogen peroxide with one treatment event.

Biography:

James A. Jacobs is a certified Hydrogeologist and has over 20 years of experience. He specializes in soil sampling methods and in-situ remediation systems.