BIOREMEDIATION OF MTBE AND BTEX USING SUPER-SATURATED GAS INFUSION TECHNOLOGY

Poster Session at Biological Treatment of MTBE Contamination in Groundwater: Ex-Situ and In-Situ Challenges, Groundwater Resources Association of California; 5th Contaminant Symposium, San Jose, California, October 17, 2003

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MTBE and BTEX compounds been proven to degrade anaerobically in the presence of dissolved oxygen. Natural attenuation of gasoline constituents (MTBE and BTEX) has been growing as a remediation technology since the mid 1990's. Presently there are a variety of technologies available which will introduce low to moderate concentrations (10-20 ppm) of stable dissolved oxygen into ground water. Once this elevated dissolved oxygen mixes with gasoline-contaminated ground water, natural biodegradation occurs and the gasoline constituents are consumed by existing aerobic microorganisms present in nearly all locations. Dissolved gasoline constituents in ground water can be treated by mechanical technologies such as pump and treat systems or air sparging. These technologies are for the most part initially effective, but they can be both expensive and time consuming to operate until site closure is achieved.

Enhanced bioremediation by the use of injected dissolved oxygen has been proven to be an effective technology to reduce both BTEX and MTBE. However many ground water environments that are high in ferrous iron and BOD, for example, will consume large volumes of injected dissolved oxygen before aerobic bacteria can utilize the oxygen as part of the process of consuming BTEX and MTBE. Therefore delivery of super-saturated levels of dissolved oxygen into ground water is essential to insure that an abundance of oxygen will remain for the bioremediation of BTEX and MTBE.

A growing number of remediation contractors in the US, Canada and Brazil are utilizing a Canadian technology called in-situ Submerged Oxygen Curtain (iSOC) that infuses bubbleless oxygen into ground water via monitor wells. The proprietary structured polymer used in iSOC provides large surface area for gas transfer into a 15 inch by 1.75-inch probe, which is placed down an existing 2- inch monitor well. The probe is connected to a regulated supply of industrial compressed oxygen. Field experience has shown that in each monitor well where an iSOC is installed, dissolved oxygen levels of 30-60 ppm can readily be achieved. Oxygen is continuously infused into the aquifer over a period of several months to up to a year. During this time, the large and continuous supply of oxygen infused into the ground water system is able to provide significant enhanced degradation of both BTEX and MTBE. The dissolved oxygen in infused from the iSOC into the monitoring well at a typical rate of 5 to 20 cc/minute. The effective radius of influence of super-saturated ground water leaving the monitoring wells with the iSOC's is typically 10-15 feet. The iSOC system is passive, quiet and does not require site power.

The iSOC technology is currently being used to remediate BTEX levels in excess of 100,000 ppb at sites in Canada and Brazil. In the United States iSOC technology is being used to remediate BTEX and both MTBE and TBA.

Field performance data for a pilot test site in New Jersey with MTBE, TBA and BTEX bioremediation illustrates the iSOC technology. Depth to water is 6 to 12 feet below grade. Groundwater velocity is 0.3 to 0.4 ft/day (conductivity 1.8 to 2.7 ft//day) with a gradient of 0.028. Recovery wells yield up to 1 gpm. Existing air stripper-GAC system has iron clogging problems with ferrous iron at 30 to 80 mg/L. DO concentrations in deep piezometers have increased from low baseline levels to over 1 ppm, a minimum 15 feet downgradient of the infusion point. Shallow piezometers show little DO change from the baseline event.

After 6 months of using gas infusion devices, an effective barrier of dissolved oxygen was established. Data indicate that significant reductions in MTBE (up to 99%), TBA (50%) and benzene (85%) concentrations downgradient of the oxygen barrier.