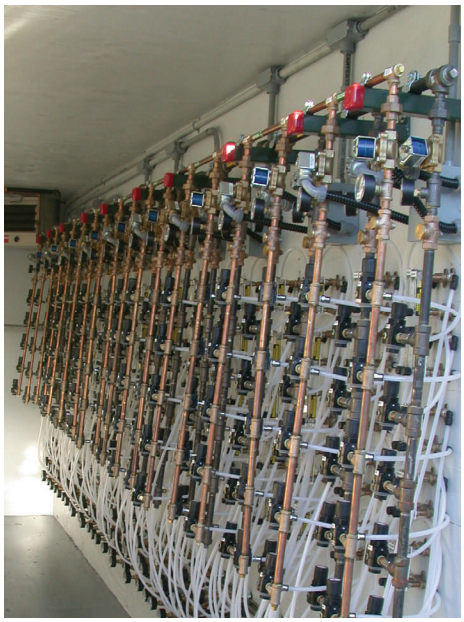
OXYGEN SPARGING FOR ENHANCED AEROBIC DEGRADATION AT A FORMER MANUFACTURED GAS PLANT SITE

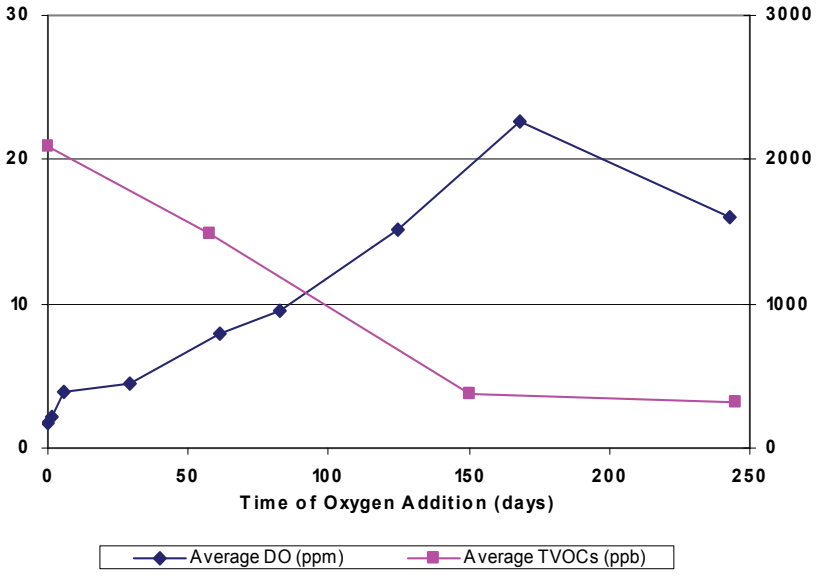
INNOVATIVE ENGINEERING SOLUTIONS, INC. designed, installed and is operating a low flow oxygen sparging system at a former manufactured gas plant (MGP) in the Northeast United States. The oxygen sparging system was installed as part of the "management of migration" effort which, coupled with source reduction/elimination, was the selected remedial alternative. Studies conducted indicated that the plume of dissolved contamination was degrading aerobically; however, the lack of oxygen in the aquifer was limiting the effectiveness.

A transect of ten sparging well clusters was installed across a 250-foot wide section of the impacted aquifer. Each cluster has three sparge wells varying in depth from between 30-100 feet below grade. Oxygen is generated on-site at 90% purity (~10% nitrogen) using atmospheric compressed air passed through a molecular sieve for injection into the subsurface. The system is automated using a programmable logic controller with local and remote interfaces. The system injects into the sparge points on a cyclical basis delivering approximately 300 standard cubic feet per hour (SCFH) of 90% oxygen. The time interval for oxygen delivery varies for each well based on local contaminant concentrations. The low flow, cyclical injection reduces the potential for short circuiting of injected oxygen and allows for a smaller compressor and oxygen generator to be used, reducing noise, cost, and space requirements. The system is contained in an 8 foot by 20 foot shipping container.

The preliminary results show increased oxygen levels and decreased contaminant concentrations adjacent to and down gradient of the sparge transect. Dissolved oxygen levels at the edges of the plume have reached as high as 52 ppm at depths of 65-feet below grade where the oxygen demand has been met. TVOC decreases of 98% have been observed down gradient of the sparge transect in the center axis of the plume at the deepest levels where the highest levels of contaminants are present and the oxygen demand is greatest.



The injection manifold allows for expansion and precise oxygen distribution to target varying contaminant levels.



Sparge system operation affected DO and TVOCs down gradient of the sparge transect, increasing average DO to 20 ppm, and decreasing average TVOCs from 2,100 ppb to 320 ppb.

The total cost of installation of the wells and the oxygen sparging system was $360,000. Operation and maintenance costs (which include quarterly groundwater monitoring and regulatory agency reporting) are averaging about $10,000 per month. This project demonstrates biological degradation of contaminants from coal tar in deeper aquifers using oxygen gas in a sparging system is an effective approach.

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