Air Sparging: New Thoughts and Controls for an Old Remedial Technique

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Background/Objectives. Air sparging in groundwater is a relatively mature remedial technique, with first applications reportedly occurring in the 1970s. The use of air sparging has increased rapidly since the early 1990s and is now likely the most practiced engineered in situ remediation option for treatment of hydrocarbon impacted reservoirs (Leeson et. al., 2002). The feasibility, assessment, pilot testing, design, and operation of air sparging system has remained largely empirical, with variability in approaches by many practitioners (Bruell et al., 1997; Johnson et al., 1993; Johnson et al., 1997; US EPA, 1992). This study provides a brief review of historical design concepts, construction techniques, operational and monitoring techniques, and overall results to identify optimal techniques and practices that maximize remedial effectiveness and minimize annual and lifecycle project costs.

Approach/Activities. Published literature was reviewed to prepare a summary of air sparging concepts, key design parameters, theories of how injected air moves through saturated soil, and how pulsing (or not) affects air delivery and distribution. Practices and results achieved using air sparging in the Southeastern US over the past 20 years were also reviewed to identify some of the best approaches and techniques for component design, instrumentation, controls, construction, operation, and monitoring. A case study was performed to evaluate the benefits and results achieved when using several recommended construction, monitoring, and operation practices.

Results/Lessons Learned. Several best practices and lessons learned through decades of constructing and operating air sparge systems are reviewed. These practices include using a programmable logic controller (PLC) to control system operation and log key operational and process data, installing sensitive instrumentation in an equipment building instead of in well vaults, using air flow control valves to achieve stable flow rates, and using data logging pressure transducers in monitoring wells to document groundwater mounding during pulsed sparging. A case study is presented where these lessons learned were employed and the monitoring data was used to improve and optimize air sparge system operation.