USING FUNCTIONAL GENES IN GASOLINE REMEDIATION

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Evaluations of corrective actions designed to enhance biodegradation of petroleum hydrocarbons and fuel oxygenates should include chemical, geochemical, and microbiological lines of evidence. Monitoring and analysis of trends in dissolved benzene, toluene, ethylbenzene, xylene (BTEX) and methyl tert-butyl ether (MTBE) concentrations are routinely used to document contaminant loss and provide an indicator of enhanced biodegradation. Likewise, monitoring geochemical parameters to document changes in availability of electron acceptors such as dissolved oxygen can provide a second indicator of enhanced biodegradation. However, the most direct line of evidence to evaluate the ability of a remediation technology to stimulate biodegradation is quantifying the specific genes encoding enzymes responsible for biodegradation of the contaminants of concern. The calcium-based bioremediation product EOx™ was used to address impacted groundwater at a gasoline impacted site in central Indiana. CENSUS® quantification of phenol hydroxylase and toluene dioxygenase showed increases in microbial populations responsible for BTEX biodegradation after injection of EOx™. The traditional groundwater analyses combined with monitoring select aromatic oxygenase genes provided the three lines of evidence needed to demonstrate the effectiveness of EOx™ for promoting enhanced aerobic bioremediation at this site. Data from this site and a service station in Kaohsiung, Taiwan will be discussed.

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