

Treatment of MTBE and BTEX at a Local Refinery: Bench and Field Studies

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Abstract. Methyl *tert*-butyl alcohol (MTBE) is a gasoline additive that is also a common groundwater contaminant because of its high water solubility and the tendency of underground storage tanks to leak. Benzene, toluene, ethylbenzene and xylenes (BTEX) are gasoline components that commonly co-occur with MTBE at the source of a spill. Biodegradation is an attractive treatment option for MTBE, however, two main challenges are insufficient dissolved oxygen in the plume and the potential of BTEX to inhibit MTBE biodegradation. In this study the feasibility of treating MTBE in the presence of BTEX at a local refinery was investigated. In the first phase of the study, a bench-scale test was conducted comparing the effect of BTEX and inoculum on MTBE biodegradation in batch reactors. It was observed that culture MO (originally enriched with MTBE only) degraded MTBE at a faster rate than culture MB (originally enriched with MTBE and BTEX), however, neither of the two cultures was able to degrade MTBE in the presence of BTEX in the batch reactors. It was hypothesized that the accumulation of metabolic intermediates inhibited the biodegradation of MTBE in the presence of BTEX. As a follow-up study, a semi-batch reactor inoculated with the MO culture was initiated and simultaneous degradation of MTBE and BTEX was observed. This suggests that a continuous flow system, such as a wetland, will improve MTBE and BTEX biodegradation. Therefore, in the second phase of this study, pilot-scale wetlands treating refinery water are being tested. In this study the effect of biostimulation and/or bioaugmentation is being explored. It is expected that the surface-flow conditions of the wetland will also help improve dissolved oxygen levels in the upper layers, which may also assist MTBE bioremediation.

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