THE LITTLE KNOWN AND LESS UNDERSTOOD CHARACTERISTICS OF ISCO AS AN ODOR ELIMINATION TOOL AT MGP, REFINERY, AND WOOD TREATING SITES

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This paper describes remedial activities conducted at six (6) sites (one wood treating facility, three (3) MGP sites, a petrochemical plant and a marine bulk terminal) where ISCO technology was employed to control and eliminate odors resulting from in-situ, ex-situ and excavation remedial activities. Although the primary objective at all of the sites was the remediation of contaminants (which was successfully accomplished), the technology was shown to be very successful at eliminating odors that are usually generated by these activities. The key to the success of this technology is the conversion of contaminants to surfactants by the oxidation mechanism. The conversion of contaminants to surfactants has been documented in studies conducted by several researchers.

Ndjou'ou and Cassidy have demonstrated that surfactants are formed by the hydroxylation of organic contaminants. These oxygen-containing functional groups on a hydrophobic hydrocarbon skeleton result in surfactant-like behavior (Tadros, 2005). Ohlenbusch et al. (1998). The mechanism by which surfactants are produced during chemical oxidation is becoming better understood. Ongoing research indicates that the surfactants result from partial oxidation of hydrocarbon contaminants. In this way, a contaminant molecule that was originally completely hydrophobic is converted into one that is amphiphilic (i.e., has both hydrophilic and hydrophobic parts). These amphiphilic molecules are surfactants. Laboratory and field observations have shown surface tension (ST) decreased from background values of seventy-two (72) dynes/cm to between thirty (30) and thirty-five (35) dynes/cm (the typical ST of a saturated soap solution) soon after addition of the oxidants. This is a clear indication of the production and accumulation of surfactants. Foaming, another sign of the presence of surfactants, was also observed both in laboratory studies and field applications.

The paper will demonstrate how these reactions actually convert the contaminants themselves to surfactants and thus, eliminate the need to introduce artificial surfactants either as emulsifiers or soil covering agents; and how the process is the first step in the progression of phases necessary for clean closure of sites.

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