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**Service-Disabled
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Small Business**

SOLVENT-ENHANCED IN-SITU CHEMICAL OXIDATION PROCESS DESCRIPTION

MEC^X, LP (pronounced M-E-C-X) has developed an innovative solvent-enhanced In-Situ Chemical Oxidation (ISCO) technology for the destruction of viscous, high molecular weight, organic contaminants and free product, non-aqueous phase liquids (NAPL). Our proprietary MEC^X process includes sequential application of solvent and ISCO reagents to effectively destroy recalcitrant contaminants in both soil & groundwater.

It is a well-known fact that ISCO reagents cannot directly destroy NAPL, light (LNAP) or dense (DNAPL). Fortunately, NAPL can be phase transferred into the aqueous dissolved phase where it can be readily oxidized there by ISCO chemical reagents. Transfer of NAPL into the aqueous dissolved phase can be achieved using chemically induced dissolution via altering in-situ thermal conditions (i.e., generating exothermic heat by catalyzed hydrogen peroxide-CHP) or via chemical stripping of NAPL from soil particles. Unfortunately, there are formations & operational situations where creation of in-situ heat via controlled exothermic chemical reactions is not practical or effective enough to transfer NAPL into dissolved phase.

Thus, MEC^X has developed a proprietary solvent-enhanced process for use along with ISCO whereby NAPL (free-phase or residual) is effectively stripped and desorbed from soil particles. This process introduces natural organic-based solvent solutions, such as a citrus-based and/or soy-based solvent, into target treatment zones prior to introduction of active chemical oxidants. After transferring NAPL and sorbed materials into the aqueous phase, the dissolved phase contaminants and the introduced solvent are both oxidized by subsequent application of ISCO chemical reagents.

Due to its persistence and ability to oxidize a wide range of contaminants and concentrations, MEC^X typically uses FMC's Klozur™ sodium persulfate as the primary oxidant in our typical ISCO processes. Klozur™ sodium persulfate can be activated using a variety of methods, thereby making it adaptable to virtually any site conditions.

Given significant variability in geologic formations from site to site, proper design & application of the reagents (both natural organic solvent & ISCO reagents) is critical for the successful elimination of NAPL using the MEC^X technology described herein. The first step in designing an effective solvent-enhanced ISCO process is to perform a design parameter evaluation (DPE) to observe and measure dissolution and oxidation effectiveness of various combinations and dosages of solvent & ISCO reagents. MEC^X performs DPEs in a controlled laboratory environment so the desired parameters can be measured as well as visibly observed throughout the treatment process.

ISCO is a "contact sport", which means that solvents (if any are used), ISCO reagents and contaminants must all come in direct contact a treatment program to be effective. Therefore, sufficient reagent distribution must be achieved within the treatment zone. Given heterogeneous nature of subsurface and low permeability of some soils, effective distribution of reagents can be one of the biggest hurdles to overcome on ISCO projects. Thus, MEC^X designs & implements groundwater recirculation programs to advance distribution of reagents in the subsurface.

Our MEC^X process is closed-loop, whereby extracted groundwater is combined with concentrated reagents prior to applying reagents to the target subsurface zone. By using a simple system of a few recirculation/extraction well points, MEC^X can preferentially deliver reagents to designated lateral and/or vertical zones. This process also has an added benefit of providing hydraulic control of the treatment area and prevents unintended escape of reagents outside of the desired treatment zone.

For more information regarding potential application this MEC^X process at contaminated sites, please contact Richard Cartwright (richard.cartwright@mecx.net; 713.412.9697), Doug Carvel (doug.carvel@mecx.net; 281.850.2153) or Isaac Aboulafia (isaac.aboulafia@mecx.net; 281.850.2153).

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