

Surfactant Use to Enhance Performance of Chemical Oxidation Remediation

Dan Socci (dsocci@ethicalchem.com), Jen Holcomb (jholcomb@ethicalchem.com), and Geeta Dahal (gdahal@ethicalchem.com) (EthicalChem, South Windsor, CT, USA)

Background/Objectives. Remedial approaches using chemical oxidation deliver aqueous phase oxidant treatment fluids into the contaminated subsurface. These approaches are limited to primarily addressing contamination present in the groundwater while hydrophobic contaminants remain sorbed to soil. This remaining, soil sorbed contamination will in time transfer to the aqueous phase after the chemical oxidation treatment is completed, causing groundwater contaminant concentrations to increase, resulting in what is referred to as “contaminant rebound”. Rebound is typically addressed with multiple rounds of follow up chemical oxidation treatments. Contaminant hydrophobicity and sorption to soil limits the availability of contaminants to the aqueous phase oxidant. Using a combined oxidant-surfactant solution, liberation of the sorbed hydrophobic contaminants and emulsification into the aqueous phase as small particles can significantly increase surface area available for reactions with oxidants, thereby improving soil and groundwater remediation. This presentation will discuss independent third party comparative research by the University of Madrid on the performance of combined surfactant and activated oxidant, versus activated oxidant alone treatment of contaminated soil. Additionally, field case studies on successful implementation of S-ISCO® (surfactant enhanced in situ chemical oxidation) will be discussed.

Approach/Activities. Research by the University of Madrid comparing the performance of combined surfactant and oxidant versus oxidant alone treatment of contaminated soil will be discussed. Information will also be presented from multiple sites remediated with surfactant-enhanced in situ chemical oxidation (S-ISCO) where soil was impacted with heavy hydrocarbon contamination. Project outcomes will be discussed and shared showing the advantages and site conditions which best justify use of the S-ISCO technology

Results/Lessons Learned. Results from a third-party 25 day oxidation treatment stated that without surfactant, 30% of the TPHs remained in the soil posttreatment while all TPH were oxidized in the oxidation treatment using an EthicalChem oxidant compatible surfactant . Results from field implementations include 90% contaminant mass destruction and a certificate of completion for the NYC area coal tar contaminated roofing materials manufacturing site and, at a pipeline pumping station in Texas, achievement of the site objective of over 99% contaminant destruction.