

FINDINGS OF THE TREATMENT OF SOIL FROM A FORMER WOOD TREATING SITE HIGHLY CONTAMINATED WITH PENTACHLOROPHENOL, BENZENE AND PAHS USING COOL-OX™

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This report describes the results of the treatability study performed on soil from the former Escambia Treating Site, Pensacola, Florida the DeepEarth Technologies, Inc., patented Cool-Ox™ Process

Previous studies have shown that this process is particularly effective at producing surfactants via partial oxidation of the hydrocarbons, compared with activated persulfate, and modified Fenton's chemistry (Ndjou'ou et al., 2006; Gryzenia et al., 2009). No surfactants were added to the reactors, as is often done with other ISCO technologies treating hydrophobic contaminants. However, there was clear evidence of surfactant production during treatment with this oxidizer.

The exact mechanism by which surfactants are produced during chemical oxidation is not known. However, ongoing and unpublished research in our lab indicates that the surfactants result from partial oxidation of hydrocarbon contaminants, and perhaps native organics to a lesser degree. Typical oxidation mechanisms include the addition of carboxylic acid and alcohol functional groups to hydrocarbons. Adding a charged or polar functional group adds a hydrophilic moiety to the hydrocarbon. 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. Most of the surfactants produced during chemical oxidation appear to have one or more carboxylic acid groups that have been added to hydrocarbon chains during oxidation. Previous laboratory and field studies have shown that these partial oxidation products are readily biodegradable (Northup et al., 2007; Ndjou'ou et al., 2006; Gryzenia et al., 2009). It is not known why Cool-Ox tends to produce more surfactants than persulfate or modified Fenton's reagent. However, this appears to be the result of the oxidation system having a greater affinity for hydrocarbons and contaminants than partial oxidation products, some of which are surfactants.

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