ABSTRACT

BIOREMEDIATION OF A TOXAPHENE CONTAMINATED SOIL

by

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A treatability study was conducted from July 1998 through January 1999 to establish a methodology for remediation of toxaphene from soil. The study involved subjecting soil within 6-test cells to variations in oxygen conditions, microbial populations, and organic and inorganic nutrient amendments.

Variations in toxaphene concentration exceeded 200 ppm between sampling events on several occasions. Increases in concentration occurred due to increased solubility of metabolic breakdown products. One test cell, subjected to conditions favoring indigenous aerobic microbial populations and amended with an inorganic nutrient source, resulted in an average overall increase of 85-ppm from the baseline concentration. A second aerobic cell with inorganic nutrients, inoculated with Pseudomonas putida and Pseudomonas fluorescens, resulted in an average overall decrease in toxaphene concentration of 16-ppm. A cell with conditions favoring aerobic microbial populations and amended with organic nutrients and red worms tested the
efficacy of worms in the degradation of toxaphene and resulted in an average increase in toxaphene concentration of 24-ppm. An additional cell, amended with the inorganic nutrient source, remained flooded throughout the project duration to favor the presence of indigenous anaerobic bacteria. The soil subjected to this environment demonstrated an average increase of 2-ppm from the baseline concentration. The second anaerobic cell was amended with an organic nutrient source and resulted in an average decrease from the baseline of 40-ppm. The third anaerobic cell, amended with alfalfa silage, resulted in the most significant decrease in toxaphene concentration. This decrease of 231-ppm was likely due to the organic nutrient source and increased anaerobic microbial populations supplied by the alfalfa silage.

The soil subjected to test conditions favoring anaerobic bacteria and amended with alfalfa silage, an organic nutrient source, resulted in the only consistent and significant decrease in toxaphene concentration. The increased anaerobic microbial populations and increased concentration of nutrient amendments provided by the silage resulted in greater contaminant biodegradation.