United States
Environmental Protection
Agency

EPA/540/F-94/509
September 1994

SUPERFUND INNOVATIVE TECHNOLOGY EVALUATION

Emerging Technology Bulletin

New Jersey Institute of Technology

GHEA Associates Process

Technology Description: The GHEA Associates process applies surfactants and additives to soil washing and wastewater treatment to make organic and metal contaminants soluble (figure 1). The process components include a 25-gal extractor, solid-liquid separation, rinse, mixer-settler, and ultrafiltration systems. This technology can be applied to soil, sludges, sediments, slurries, groundwater, surface water, end-of-pipe industrial effluents, and in situ soil flushing. Contaminants that can be treated include both organics and heavy metals, non-volatile and volatile compounds, and highly toxic refractory compounds.

In soil washing, soil is excavated, washed, and rinsed to produce clean soil. Wash and rinse liquids are combined and treated to separate surfactants and contaminants from the water. Contaminants are separated from the surfactants by desorption and are isolated as a concentrate. Desorption regenerates the surfactants for repeated use in the process. The liquid treatment consists of a sequence of steps involving phase separation, ultrafiltration, and air flotation. The treated water meets all National Pollutant Discharge Elimination System groundwater discharge criteria, allowing it to be 1) discharged without further treatment, and to be 2) reused in the process itself or reused as a source of high quality water for other users.

In wastewater treatment applications, surfactants added to the wastewater adsorb contaminants. The mixture is then treated in the same manner as described above for 1) water purification, 2) separation of the contaminants, and 3) recovery of the surfactants. The process results in clean soil, clean water, and a highly concentrated fraction of contaminants.

Project Description: The performance of the pilot plant was tested on various PCB contaminated soil matrices, including soils in excess of 30% clay. The tests consisted of parametric studies of the extraction, solid-liquid separation, rinse, and ultrafiltration systems. The project objectives were to establish the operability and mechanical integrity of the pilot system and to generate engineering data for commercial scale-up. The test runs were performed with total recycle of the wash water and regenerated surfactants.

Results: The results of the treatability study show that the GHEA process was able to meet New Jersey PCB cleanup requirement of 2 mg\kg in soils with more than 50% silt and clay. Bench and pilot-plant tests were conducted on various soils sludge and water samples (Table 1). Most of the samples were from New Jersey sites which contain petroleum hydrocarbons,

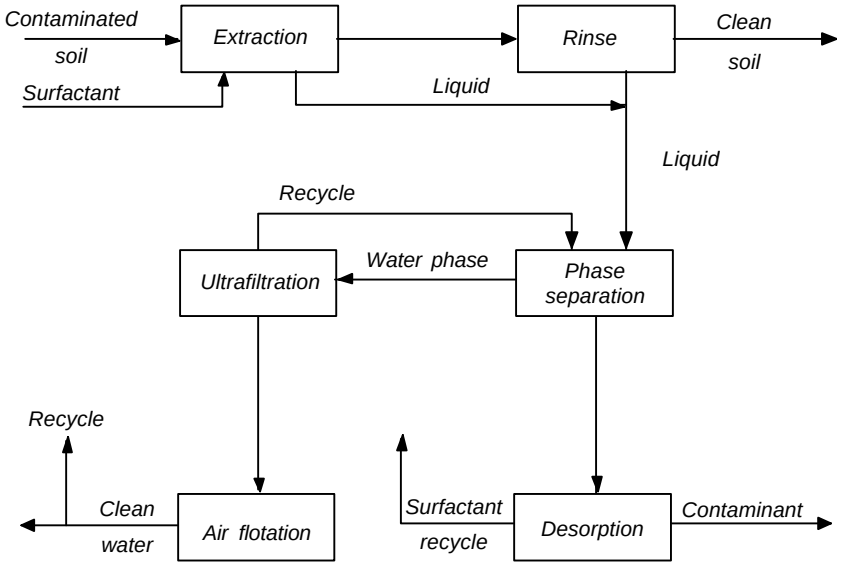

Figure 1. *GHEA Process.*

aromatic compounds, PCBs, coal tar, heavy metals, and oily sludges. The soil samples typically contain fine silt and clay in the 25-50% range.

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Table 1. *Summary of Treatability Test Results*

Matrix	*Untreated Sample*	*Treated Sample*	*Percent Removal*
Volatile Organic Compounds (VOC):			
TCE; 1,2 DCE; Benzene; Toluene			
Soil, ppm	*20.13*	*0.05*	*99.7%*
Water, ppb	*109.0*	*2.5*	*97.8%*
Total Petroleum Hydrocarbons (TPH):			
Soil, ppm	*13,600*	*80*	*99.4%*
Polychlorinated Biphenyls (PCBs):			
Soil, ppm	*380.00*	*0.57*	*99.8%*
Water, ppb	*6000.0*	*<0.1*	*>99.9%*
Trinitrotoluene in Water (ppm)	*180.0*	*<0.08*	*>99.5%*
Coal Tar Contaminated Soil (ppm)			
Benzo[a]pyrene	*28.8*	*<0.1*	*>99.7%*
Benzo[k]flouranthene	*24.1*	*4.4*	*81.2%*
Chrysene	*48.6*	*<0.1*	*>99.8%*
Benzanthracene	*37.6*	*<0.1*	*>99.7%*
Pyrene	*124.2*	*<0.1*	*>99.9%*
Anthracene	*83.6*	*<0.1*	*>99.8%*
Phenanthrene	*207.8*	*<0.1*	*>99.9%*
Flourene	*92.7*	*<0.1*	*>99.9%*
Dibenzofuran	*58.3*	*<0.1*	*>99.8%*
1-Methylnaphthalene	*88.3*	*1.3*	*98.5%*
2-Methylnaphthalene	*147.3*	*<0.1*	*>99.9%*
Heavy Metals in Soil:			
Chromium (ppm)	*21,000*	*640*	*96.8%*
Iron (III) in Water (ppm)	*30.8*	*0.3*	*99.0%*

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