

SCREENING OF NON-IONIC SURFACTANTS FOR BUNKER-C CONTAMINATED SOIL WASHING

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For decades, soils contaminated with Bunker C fuel oil have been recalcitrant to traditional remediation technologies. In spite of the enormous amount of research on the remediation of hydrocarbons from contaminated soil, there has been no reported use of surfactant-enhanced soil washing (SESW) for the remediation of Bunker C contaminated soil in the literature. This paper presents the evaluation of non-ionic surfactants for Bunker C contaminated soil washing. The study utilized two patented non-ionic surfactants (Iveysol 106 and Iveysol 108) and a well known non-ionic surfactant (Triton X-100). The surfactants were used at concentrations below their critical micelle concentrations (CMC) to investigate the occurrence of roll-up mechanism with bunker C contaminated weathered soil that had been contaminated for almost three decades at an old mine site. The experiments were statistically designed and analyzed. The washing parameters varied included: surfactant concentrations (50 % and 90 % below the CMC), temperature (5 oC and 40 oC), washing speed (89.70 rpm and 181.70 rpm), salinity of the washing water (deionized water and seawater); and washing time (1 minute and 5 minutes) respectively. The results showed that the roll-up mechanism (washing below the CMC) can efficiently remove at least 92 % of Bunker C oil from the soil with all the surfactants tested. Experimental parameters affected the results of each surfactant differently. For example, the Triton X-100 surfactant was ineffective at concentrations of 50 % below its CMC and at low temperatures (5oC). The study concluded that SESW has considerable potential in removing Bunker C oil from the soil, and further testing is recommended for the optimization of the significant parameters for each surfactant.

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