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LIBRO DE RESÚMENES

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SESIÓN DE PÓSTERS

Mitigación y Remediación

P212. Bench-Scale Tests with different surfactants aiming Tar Oil Removal

Gonçalves, C., Oliveira, L., Crepaldi, S., Pacoal, D.A., Menezes, M.P., Masutti, M.B., Silvério, P.F.

CPEA – Consultoria, Planejamento e Estudos Ambientais Ltda. – Rua Henrique Monteiro, 90. São Paulo - SP -
Brazil
mariana.masutti@cpeanet.com

Surfactant-enhanced soil washing is being considered with increasing frequency to actually achieve soil-contaminant separation. In this work three types of surfactants at different concentrations and combinations were evaluated for the enhanced soil washing of soils contaminated with heavy petroleum hydrocarbons.

Tests were performed with (i) nonylphenol ethoxylate, (ii) alkyl sulfonic acid, (iii) pure d-limonene and (iv) a combination of d-limonene with ethoxylate sorbitan monooleate, which acts as a emulsifier.

Surfactant selection was based on the amount of reagent necessary for tar oil surface tension and viscosity reduction, costs and byproducts.

Bench tests were carried out with NAPL (non-aqueous phase liquid) samples collected from monitoring wells installed at a contaminated site located in Sao Paulo State, Brazil. The tests showed that 80% of nonylphenol ethoxylate as well as alkyl sulfonic (160mL surfactant: 40 mL tar oil) were not enough to promote a visible change of viscosity after 24hours of contact. Comparing these two surfactants to pure d-limonene, the last one was preferred once concentration of 20% was efficient to obtain tar oil surface tension and viscosity reduction besides of being a biodegradable product, not generating byproducts; on the other hand, the relationship between cost and effectiveness was still high. A mixture of d-limonene and ethoxylate sorbitan monooleate was also evaluated in this survey; a commercial solution with 8-15% of d-limonene and 10-15% of monooleate was diluted 10 times allowing similar results to 20% of pure d-limonene.

Among the surfactants tested, the best results were obtained with d-limonene combined with emulsifier, demonstrating that the mixture of d-limonene with ethoxylate sorbitan monooleate enhanced remediation of tar oil is a viable technology. It was observed that at a low concentration and in less than 24 hours, satisfactory results were obtained; no significant changes were observed with increasing product concentration or contact time.

Keywords: surfactant, soil washing, hydrocarbons, D-limonene.