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SOIL WASHING FOR THE TREATMENT OF ONSHORE SYNTHETIC-BASED MUD DRILL CUTTINGS

T Poyai[1, 2], P Painmanakul[1, 2], N Chawaloesphonsiya[1], P Dhanasin[3], C Getwech[3] and P Wattana[3]

[1]Chulalongkorn University, Thailand
[2]Center of Excellence on Hazardous Substance Management (HSM), Thailand
[3]PTT Exploration and Production Public Company Limited, Thailand

According to Thailand's government regulations, synthetic-based mud (SBM) cuttings generated from petroleum drilling is regarded as a hazardous waste due to the presence of dangerous substances, particularly hydrocarbons. The onshore SBM cuttings are currently disposed of as an alternative fuel and raw material in cement kiln plants. Instead of incineration, this work aims to propose soil washing as an alternative treatment technology for lessening hazardous waste volume, and making use of the treated cuttings. The physiochemical properties of cuttings were analyzed, such as electrical conductivity (EC), particle size, pH, and moisture content. Oil present in cuttings was quantified in terms of total petroleum hydrocarbons (TPH) through gas chromatography equipped with flame ionization detector (GC-FID). Effects of washing-reagent type, liquid-to-solid (L/S) ratio, washing time, mixing speed, rinse-to-solid (R/S) ratio, and rinsing time were evaluated via Taguchi method. It was found that drill cuttings held the EC of 3.84 dS/m, pH of 9.1, and moisture content of 13.2%. The TPH in cuttings existed in the diesel range with the concentration ranging from 25,000 to 35,000 mg/kg dry cuttings. A majority of cuttings particles held a mean diameter of 50 µm, which represented the silt fraction. The results also suggested that a green solvent, ethyl lactate, was considered most promising for cuttings treatment regarding its efficiency and benefits on occupational health, safety, and environment. The optimal washing conditions were obtained at L/S ratio of 5:1, washing time of 15 min, mixing speed of 60 rpm, R/S ratio of 10:1, and rinsing time of 1 min, corresponding to the TPH removal of more than 80%. After treatment, cuttings particles had a smaller mean diameter (13 µm), indicating the removal of hydrocarbons from the cuttings surface. Additionally, the clean cuttings were considered non-hazardous and potentially recycled as the construction materials.

mookthaksina@gmail.com