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Treating Drill Cuttings Waste with Oil Contamination by Microwave Treatment then by Earthworms Technique

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Abstract

In this essay, two techniques were used to treat the drill cuttings resulting from oil-based drilling fluid. Whereas amounts of drill cuttings were taken from the southern Rumaila fields, prepared for testing and fixed with 100 g per sample and contaminated with two types of crude oil, one from the southern Rumaila fields and the other from the eastern Baghdad field with concentrations of 10% and 15% w/w in mass. Samples were treated first in the microwave with a power applied of 540 & 180 watt and a time period of 50 minutes. It was found that the results reached below 1% w/w in mass, except for two samples they reached below 1.5% w/w in mass. Then, the sample with the highest treated concentration of 14100 PPM was treated on three groups of earthworms, which are 5, 10 and 15 in numbers. After the appropriate conditions were prepared for testing and for an incubation period of 21 days, the results highlighted the effectiveness of the succession process by reaching concentrations below 5000 PPM.

In this research paper, two techniques were used to treat the drill cuttings resulting from the oil-based drilling fluid. The drill cuttings were taken from the southern Rumaila fields which prepared for testing and fixed with 100 gm per sample and contaminated with two types of crude oil, one from Rumaila oilfields with Sp.gr of 0.882 and the other from the eastern Baghdad oilfield with Sp.gr of 0.924 besides contamination levels of 10% and 15% w/w in mass .Samples were treated first with microwave with a power applied of 540 & 180 watts as well as a time of 50 minutes. It was found that the results reached below 1% w/w in mass, except for two samples they reached below 1.5% w/w in mass .Then, the sample of 1.41% w/w in mass, which has the highest contamination level after microwave treatment, was treated on three groups of earthworms. After the appropriate conditions, samples were prepared for treating by earthworms and for an incubation period of 21 days, the results highlighted the effectiveness of the succession process by reaching concentrations below 0.92%, 0.65%, and 0.42% w/w in mass

Waste disposal operations from the oil and gas industry, unexpected accident leakage, or improperly disposing of drilling waste, have quite serious consequences for human health and the environment in general. When contaminated drill cuttings are removed with the remaining drilling fluids, especially with oil-based mud (OBM), the chemical fractions of liquids begin to seep into the ground, causing the elimination of existing organisms and contaminated groundwater. Normally, the remains of the drilling mud (whether it was oil-based mud or water-based mud) and the drill cuttings are associated with the presence of various hydrocarbon concentrations and heavy materials. The saturated and unsaturated hydrocarbon concentrations are greater in the oil-based mud, these concentrations can reach about 50% and this percentage is more than that in water-based mud (WBM).

Accordingly, it is more toxic than WBM. Since the disposal of drilling waste had become a global problem that causes escalating anxiety, especially for researchers and oil companies, due to the multiple negative impacts on public and environmental health, oil and gas wells drilling in Iraq cannot be an exception in this manner. Drilling waste produced by the exploration and production industry is coming in the second place of international ranking for the largest volume of waste produced. The waste disposal problem has become an important point in achieving a good environmental management system. In general, contamination of drilling fluids with drill cuttings waste is an inevitable result of successful drilling operations; therefore, drill cuttings waste accumulation ought to go through the treatment and disposal option after all. In that situation of the drill cuttings that need to be handled earlier to disposal, there are numerous feasible selections including land-farming, bioremediation, solidification, thermal desorption, stabilization, and cuttings re-injection, etc. Land reclamation is a regularly utilized

bioremediation strategy in which the oil-contaminated drill cuttings are applied to the land where evaporation synchronically with the natural organisms of the soil combines to diminish the pollution of the waste. Among these ways, bioremediation can be considered as a well-proven and environmentally acceptable technology that employs microorganisms (i.e. bacteria, fungi, and or earthworms) to biologically eliminate oil contaminated waste into nontoxic remnant and reduce contaminant concentrations to acceptable levels. Vermiculture or worms farming is a well-steady technique for remediating organic wastes and decompose them into a material eligible for receiving essential nutrients to increase flora growth. Earthworms are an important indicator of soil health, as their presence means the quality of the soil and its absence means the opposite.

Earthworms are also a good predictor of toxicity measurement and have been used to assess environmental risks. However, scientific information remains limited about the sensitivity of earthworms to contaminated soil, as well as their viability and mechanism of treating the soil. Several important studies have highlighted the activity of earthworm use to promote hydrocarbon contaminant loss from soil. On the other hand, microwave drying is one of the modern technologies used industrially and at home, which showed effective results in its practical applications and brought about an ever-increasing change with drying various materials. The treatment levels accomplished by the microwave drying process were significantly greater than those used in the solid control system. The microwave technique is a treatment method for handling waste of many kinds and has multiple advantages. It is also easy to use and fast to accomplish, as well as it can be controlled remotely and with great flexibility. Furthermore, the microwave can reach the required temperature in less than 1% of the time required by traditional heating methods. Besides, the microwave technique is preferred as it considered to be a source of clean energy.