Natural oil adsorbent for produced water treatment

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Instead of being just landscaping waste, the dried leaves can help environmental agencies and oil and gas companies treat waste water from petroleum extraction

The extraction process of petroleum from the ocean floor contributes to the increase in liquid waste.

Produced water contributes to about 80% of liquid waste being generated. Produced water consists mainly of heavy metals, radionuclides, oil and grease, processed chemicals, numerous types of dissolved gases, salts, solids, microorganisms, and dissolved oxygen. Oil and grease content in produced water can be divided into two types, which are dissolved oil and dispersed oil. Dissolved oils consist of benzene, etylbenzene, and xylene which are the main organic compounds in produced water.

However, dispersed oils are small droplets of oil suspended in liquid and contain fewer suntans of hydrocarbons. Untreated produced water contains numerous substances such as dispersed and dissolved oil, heavy metals, and chemicals produced can cause harm to the environment.

Dispersed oil content in produced water may vary in different oil wells. Dispersed oil in water is classified as toxicants to human beings and marine life. The dispersed oil can cause physiological damage and cause cancer in living creatures.

Over the years, numerous technologies have been established to treat dispersed oil in produced water treatment. Current treatment that is being used is by using physical method and also chemical treatment that may have a negative effect on the ecosystem.

In this research, the use of dried Khaya Senegelansis leaves was established as a natural oil adsorbent capable of absorbing dispersed oil. Khaya Senegelansis dried leaves were chosen due to its abundant availability in Malaysia. These types of trees are planted to enhance the landscape with plants and are planted all over most major urban cities. These trees play a significant role in developing a greener environment in urban areas. However, the leaves shed by the trees may be considered as waste. The leaves can be utilised by the local authorities to turn the waste into a useful product.

In this study the collected dried Khaya Senegelansis leaves were washed, dried and grounded before being mixed with synthetic produced water for 24hr. The mixed solution was than stirred by using a magnetic stirrer.

The engine oil used to be mixed in the produced water solution was SAE40 Petromas Mach 5 Mineral Engine Oil with distilled water. The results from Partition Gravimetric Method shows that the dried Khaya Senegelansis leaves are good oil sorbents due to the ability to remove 73% of oil from the solution in ambient temperature.

Images obtained from the Scanning Electron Microscope (SEM), Gemini models also proved that patches of oil appeared on the surface of the leaves after 24 hours of contact time.

This is because Khaya Senegelansis rich in phytochemical constituent which is lipophilic in nature. The constituents include flavonoids, carbohydrates, glycosides, saponins, tannins and anthraquinones. Saponins and flavonoids are the main components that contribute to oil

absorption due to their lipophilic properties. A series of experiments were conducted to gauge the effects of various temperatures and oil concentration to investigate it's capability in adsorbing more oil and grease especially in produced water treatment.

The results strongly indicated that Khaya Senegelansis dried a leaf which is a naturally occurring product can be used as an environment friendly oil adsorbent.

The findings also helps the local authorities to manage landscaping waste such as the dried leaves as well as to help the oil and gas companies to have more choices in treating Produced Water.

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