

Development of a hybrid technique of solvent extraction and freeze-thaw for oil recovery from petroleum sludge

M. Abdulqawi^a, A. Ibrahim^a, R. Embong^b, N. Ismail^a

^a Faculty of Chemical and Process Engineering Technology, Universiti Malaysia Pahang, Lebuhr Persiaran Tun Khalil Yaakob, 26300 Gambang, Pahang, Malaysia

^b Faculty of Civil Engineering Technology, Universiti Malaysia Pahang, Lebuhr Persiaran Tun Khalil Yaakob, 26300 Gambang, Pahang, Malaysia

ABSTRACT

The petroleum industry produces around 60 million tons of petroleum sludge annually, posing a considerable danger of environmental contamination. Crude oil recycling or recovery is critical to addressing this issue. While solvent extraction is a cost-effective and efficient technology, its low efficiency and unpredictability make it inadequate for crude oil extraction. Combining this method with the freeze-thaw process may boost oil extraction efficiency. With a 4:1 solvent-to-sludge ratio and a 30-minute extraction time, this study produced the maximum oil recovery rate of 50.98 % using cyclohexane. These findings show that the hybrid cyclohexane approach can recover up to 60.98 % of crude oil.

KEYWORDS

Petroleum sludge; Freeze-thaw; Solvent extraction; Oil recovery; Sludge treatment

ACKNOWLEDGEMENT

The authors wish to express their gratitude to the Ministry of Higher Education for their financial support under the IIUM-UMP-UiTM Sustainable Research Collaboration Grant 2020 (RDU200732).