Determination of dispersion predictability on oil spill dispersant using the Warren Spring Laboratory LR 448 test and swirling flask test

ABSTRACT

One of a method used to clean the oil spill is using oil spill dispersant. Availability of dispersant on sea surface reduces the tension and lead to separation of oil and seawater. Early studies showed dispersed oil has a higher rate of degradation than oil in a surface slick, which poses a lesser threat to the environment. However, in recent times with abundant brands of dispersants present, the need to test the effectiveness of oil spill dispersant is increasing. The objective of this study is to determine the relative effectiveness of approved and local dispersants on crude oil and to compare the effectiveness result of two different laboratory tests, which is Warren Spring Laboratory (WSL) LR 448 protocol and Swirling Flask Test (SFT). Five dispersants (A, B, C, D, and E) were tested with Malaysia's benchmark crude oil, Tapis Blend (API Gravity 44°). Experiments were conducted using a UV-VIS spectrophotometer at a Dispersant to Oil Ratio (DOR) of 1:20 for both protocols. Seawater temperature and salinity were set at 29°C and 30 ppt respectively. Results of the WSL protocol showed that dispersants A, C, D, and E marked a relatively lower range of effectiveness between 2.46% to 41.56% index of effectiveness. Only dispersant B (84.31%) did pass the minimum effective range of ≥50%. Contrarily, SFT presents an increasing range of effectiveness with three dispersants (B, D, and E) passed the minimum range of efficiency with 92%, 61.85% and 52.95% respectively. Overall, SFT produces a higher percentage of efficiency compared to WSL. This study could contribute as a baseline to produce a significant test method and a robust data of dispersants supported to be used during oil spill incidents.

Keyword: Dispersant; Index of effectiveness; Oil spill; Swirling Flask Test; Warren Spring Laboratory