

**FORMULATION AND CHARACTERIZATION OF WATER-IN-DIESEL
EMULSION AS ENVIRONMENTAL FRIENDLY FUEL**

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ABSTRACT

Water-in-diesel emulsion (W/D) fuel is an alternative fuel which can be employed in existing diesel engine without any further modification. Apart from retaining the high fuel to power efficiency of diesel engine, W/D fuel is also capable of reducing the amount of hazardous air pollutants in the exhaust emission and usage of diesel fuel. This paper aims to formulate and characterize W/D as environmental friendly fuel with low economic cost and high stability. 36 emulsion fuel samples with different water concentration ranging from 10 to 25%, surfactant concentration of 0.5%, 1.5% and 2.5%, and also varying types of surfactants, namely Span 80, Triton X-100 and polyol based UMP surfactant (NS-16-2). The samples are then undergone gravitational stability test for 1 week duration and rheological characterization using Brookfield rheometer. Triton X-100 was ineffective to produce stable W/D emulsion, whereas Span 80 could be used to produce 10:90 W/D emulsion with 1.5% of surfactant concentration. NS-16-2 was found to be the most optimum surfactant whereby 25:75 W/D emulsion could be formulated using surfactant concentration of 2.5% and managed to remain stable for 1 week duration. The W/D emulsion were tested to exhibit non-Newtonian flow behavior, with its viscosity decreased with shear rate, indicating that it behaved as shear-thinning fluid (pseudo-plastic behavior). The viscosity of emulsions were temperature dependent over the temperature range of 30-70°C as they tended to decrease significantly under temperature.