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Re-refining of semi synthetic used engine oil 20W-50 and improvement of its tribological behaviour using carbon nanotube

Kabamba, Gabriel Mwendenda

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ABSTRACT

Machines and Automobiles usage decrease the capability of lubricants, and favor water contamination, variation of heat and damage of solid surfaces. The impurities generated during the lubricant's degradation are unsaturated, phenolic, aldehyde, acidic compounds, metals, gums, and other asphaltic compounds. Poisonous metals waste such as zinc, chromium, copper, Tin, arsenic, lead, barium, cadmium and magnesium are found in some used lubricants and unfortunately disposed into environments and freshwater sources such as rivers, lakes, dams, and streams.

In this project, re-refining of SAE 20W-50 through solvent extraction followed by precipitation and modification of lubricant tribological behaviour using CNT's was investigated. Multistage filtration (with screen filtration varied from 100 to 200 micrometers, followed by soil filtration) was employed to remove solid impurities at atmospheric pressure. The filtrate was dissolved in various solvent (n-butanol, butan-2-ol, and t-butanol) at various temperatures (from 30 to 65^0C). The mixture was cooled to different temperatures from 10 to 30^0C, and then ethanolamine was added as precipitant. The oil-solvent ratios and ethanolamine were also investigated.

The filtration system was able to remove solid and suspension particles and the color of the filtrate changed from dark black to brown. The high viscosity index of 124 was observed with oil extracted using butan-2-ol, which indicates better resistance of oil to change in temperature. Better dissolution and primary precipitation were observed at temperature of 50^0C. The use of Butan-2-ol favors the refining of the used lubricant. The sludge removal by addition of ethanolamine increased with the increasing in oil-solvent ratio to an optimum of 1:4. The sludge removal was better with a ratio of 1:5 (ethanolamine: oil-solvent).