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Recovery of Spent Engine Oil via the Glacial Acetic Acid Treatment Method

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Spent engine oil is considered hazardous waste and as such improper disposal can be harmful to the environment. Hence, proper management is required. This true experimental design research attempted to explore the process of regenerating base oil from waste lubricating oil via the acid-clay treatment process using 10, 15, and 20% acid-oil and 10, 15, and 20% clay-oil ratios. The rationale for choosing a true experimental design methodology was because the re-refining process required manipulation of the independent variables (acetic acid and bentonite clay) to determine the best acid-to-oil ratio as well as the optimum clay-oil ratio to draw credible results so that the investigation can be replicated and put into practice in Guyana. The advantage of using acetic acid as a reagent is that it does not react or only reacts slightly with base oil and its additives, while bentonite clay was used as an absorbent. Additionally, when using this method, the recycling process takes place at room temperature and atmospheric pressure and requires little technical skill. The re-refined oil test results obtained from Machinery Corporation of Guyana (MACORP) indicated that a combination of acetic acid and bentonite clay was able to remove most of the contaminants in spent engine oil and the optimum operational parameters were 15% acid and 15% adsorbent which gave a 57% yield with an average kinematic viscosity at 100 °C of 10.65 cSt. The re-refined oil was dark brown in colour and free of soot and water, while wear elements and oil contaminants were significantly reduced. Approximately 2% of water and volatile substances were removed from the samples during the dewatering process since there was a reduction in volume from 500ml at the beginning of the process to 490ml at the end of the dewatering stage. The major stages in the reclamation process were sampling, dewatering, desludging, absorption, and filtration. Knowledge gained from this research can be used by large or small industries, governments, organisations, or investors who wish to be involved in a project that can benefit both current and future generations.

Keywords: Waste oil, Base oil, Recovery of base oil, Re-refining