

**FORMULATION OF HYDRAULIC BRAKE FLUID USING CASTOR OIL AS A BASE STOCK: Physicochemical Properties of Castor oil and the hydraulic brake fluid**

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**Abstract**

Indirect leaching was used to extract castor oil from the castor beans. A hydraulic brake fluid was formulated by mixing the castor oil, solvents and other additives at various proportions using unifactor design approach. Both the castor oil and brake fluid was analysed to determine their physicochemical properties. Results show that the castor oil has high viscosities of 25.29Cst and 19.54Cst at 40°C and 100°C, respectively, specific gravity of 0.927 at 30°C/30°C, acid and saponification values of 3.5 and 186.0 respectively. On the other hand, the best fitted formulation (Castor oil, solvent and additives) of hydraulic brake fluid has reduced viscosities of 19.54Cst and 2.33 Cst at 40°C and 100°C respectively. The flash and boiling points were found to be 124.25 and 220.05 respectively.

**Key words:** Castor beans, Castor oil, Hydraulic brake fluid, physicochemical properties, formulation, unifactor design.

**Introduction**

Hydraulic fluid whether synthetic or natural in origin is any substance in form of grease or oil capable of reducing friction when applied between any metallic moving parts. Hydraulic brake according to SAE J1703 (1985) has three important functions in the life of every metallic moving parts; these include to establish a film to prevent metal - to - metal contact, to reduce friction as well as to act as a coolant to remove heat generated by the moving parts. According to Halton, (1962), petroleum fluids are the most commonly used but they do not have high boiling point as would be desired, which is due to the physicochemical properties of the fluids. These necessitated the search for a potential substitute for the more petrochemical dependent hydraulic brake fluid.

Castor seed, which is often referred to as castor bean has it's oil content to be 40 to 60% in most commercial varieties; Weiss (1983). Castor oil, a triglyceride is unique in that its major fatty acid is the unsaturated hydroxylated 12-hydroxy, 9- Octadecanoic acid, known as ricinoleic acid; Perry and Green (1987). The addition of additives modifies the physical properties of the oil and makes it suitable for use as hydraulic brake fluid, Marter (1971). The castor bean samples were collected from Minna (Niger State) in Nigeria.

**Experimental**

**Pre-Treatment of the Castor Beans**

The castor beans were hulled and sun dried for seven days to reduce the moisture content. These were later dried in the oven 65°C to reduce the moisture content to minimal. This was followed by particle size reduction using mortar and pestle.

**Extraction**

Indirect leaching was used to extract the oil from the castor beans using normal hexane as the solvent.

**Characterisation of Castor Oil**

The castor oil was characterised by determining the various physical and chemical properties.

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