

**Sustainable Alternative for The Cutting Fluid in Lathe Machines**

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Metalworking Fluids (MWFs) are synthetic and mineral oil-based fluids used in nearly all Sri Lankan machining sectors. However, using them may pollute the environment over time and endanger the health of workers. The great deal of work has gone into creating safe and risk-free substitutes for mineral oil-based MWFs, using non-edible vegetable oils is one such substitute. The research involved two stages, selecting suitable oil for machining and preparing a new cutting fluid through a combination of aloe vera gel. Experimental conditions included lathe machine use, mild steel work pieces, and high carbon steel cutting tools. The variation of the tool temperature and work piece temperature was measured respective to the variable control parameters feed rate and cutting speed. Machining with dry cutting condition the temperature is high (69.5°C). The average cutting tool temperature is 31.1 °C and work piece temperature is 31.6 °C, when machining with non-edible vegetable oil. Machining with developed cutting fluid, the cutting tool temperature is 30.3°C and work piece temperature is 30.7°C. The developed cutting fluid viscosity is 40 gm/cm<sup>3</sup> and the pH value is 6. The research concludes that the utilization of non-edible vegetable oil as an alternative in the formulated cutting fluid leads to a notable reduction in the temperatures of both the work piece and cutting tool. The application of the developed cutting fluid results in a significant decrease in surface roughness compared to conventional cutting fluids.

**Keywords:** *Cutting fluid; Aloe vera; non-edible vegetable oil; Lathe operations; Temperature*