Introduction: Drilling tools are multipoint cutting tools. Tool wear in drilling occurs because of two factors. The former being the contact friction between the work-tool interface; the latter is because of the heat generated. Heat generated weakens tool’s composition matrix, continuous friction thus applied on the weaker matrix is sufficiently enough to erode cutting tool’s surface. The effect of this generated heat decreases tool life, increases surface roughness and decreases the dimensional sensitiveness of work material. This case is more important when machining of difficult to cut materials, when more heat would be observed.

Cutting fluids are used to carry away the heat generated during machining process, which at the same time reduces the friction between the tool and chip and between tool and work and facilitates the chip formation. Cutting fluids are usually in the form of liquid at the formation zone to improve the cutting condition. It was found that MQL reduces the friction coefficient and the cutting temperature compared with dry and flood coolant.

Vegetable oil offers properties desirable for lubricants, such as a high viscosity index, high lubricity, low volatility, and advanced properties including low toxicity and high biodegradability. Vegetable oils primarily consist of triglycerides; the triacylglycerol structure of vegetable oil makes it a strong competitor as a base stock for lubricants and functional fluids. Long, polar fatty acid chains provide high strength lubricant films that interact strongly with metallic surfaces, reducing both friction and wear. The raw versions of vegetable oils lack sufficient thermal and oxidative stability for lubricant use and other tribocellular limitations restrict their use as lube base stocks in its natural form.

Scope and Objective: Amongst all the machining processes, drilling acquires 18% of world’s manufacturing. Conventional studies on the metal working fluids are widely employed to increase the machining productivity and quality of metal cutting. Vegetable oils have become identified world over as a potential source of environmentally favourable metal working fluids due to a combination of biodegradability, renewability and excellent lubrication performance.

Objective:
- Determine the influence of Neem and Mahua based cutting fluids on surface roughness during drilling of AISI 304L.
- Compare the performance of different vegetable based cutting fluids among themselves and with commercial cutting fluids.

Methodology: AISI 304L is tested in this study for tool wear behavior in drilling using vegetable oils based cutting fluids. AISI 304L has lower carbon content as compared with AISI 304 to increase weldability; making it slightly weaker than AISI 304. The purpose of this research is to evaluate the Surface Roughness of inner surface of Drilled Holes of AISI 304L under the influence of Neem and Mahua as the cutting lubricants through the use of minimum quantity lubrication (MQL). It involves,
  - Formulation of raw oils. (Available at Bio-Fuel park, Madenur, Hassan.)
  - The drilling operation is carried out with Minimum Quantity Lubrication, considering the parameters - cutting fluid, spindle speed, feed rate and depth of cut.
  - Surface Roughness ($R_a$) is measured.
  - The results obtained with respect to vegetable based cutting fluids (Neem and Mahua) are compared to that of mineral oil (MO), graphs are plotted.

Experimental setup:
Results and Conclusions:
The analysis of results suggest that esterified neem oil showed minimum surface roughness (Ra=4.911µm) at speed of 750 rpm, followed by esterified mahua (Ra=5.041µm) and mineral oil (Ra=5.086µm). Esterified neem and mahua oils showed better surface finish than mineral oil. Hence these oils can be used as potential alternative cutting fluid for drilling process.

Scope for Future work:
- Vegetable oils with additives can be tested for better machining performance.
- Apart from drilling, other machining operations like Grinding, Milling etc. can also be considered for the future study.

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