

Performance Evaluation of Different Types of Cutting Fluids in The Machining of Hardened Steel – A Review

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Abstract- This paper presents a review on performance evaluation of different types of cutting fluids in the Machining of various hardened Steel Materials. Knowledge over the performance of vegetable oil based cutting fluids when applied to different work materials and operations is of vital importance in order to improve the efficiency of various conventional machining processes. This Efficiency can be measured, among other parameters, through cutting tool life and surface finish of work piece. In this Review, performances of various vegetable oil based cutting fluids are compared in terms of tool wear, force and surface roughness during various operations of various Hardened steel Material with various cutting tools

Keywords- Cutting Fluids, Machining, Work Piece material, Tool Material.

I. INTRODUCTION

Cutting fluids are employed in machining to reduce friction, cool the work piece, and wash away the chips. With the application of cutting fluid, the tool wear reduces and machined surface quality improves. Often the cutting fluids also protect the machined surface from corrosion. They also minimize the cutting forces thus saving the energy. These advantages of using cutting fluids in machining are accompanied by a number of drawbacks. Sometimes the cutting fluid costs are more than twice the tool related costs. Most of the cutting fluids possess the health hazard to the operator. Disposal of the used cutting fluid is also a major challenge. In the recent past, there has been a general liking for dry machining. On the other hand, several researchers started exploring the application of minimal cutting fluid.

In this Paper, a review on performance evaluation of different types of cutting fluids in the machining of hardened steel material is presented. Cutting fluid (coolant) is any liquid or gas that is applied to the chip and/or cutting tool to improve cutting performance. A very few cutting operations are performed dry, i.e., without the application of cutting fluids. Generally, it is essential that cutting fluids be applied to all machining operations.

Cutting fluids have traditionally been used in machining operations to lubricate the chip-tool and tool-work piece interfaces, remove heat from the work piece and cutting zone, flush away chips from the cutting area, and inhibit corrosion. While each of these four functions can be employed as justification for cutting fluid usage, it is widely believed that the primary functions of a cutting fluid are lubrication and cooling. Seminal contributions to the technical literature in support of this belief are provided below.

II. LITERATURE REVIEW

M. Anthony Xavier, M. Adithan (2008) they determined the influence of cutting fluids on tool wear and surface roughness during turning of AISI 304 austenitic stainless steel. They performed turning operation by using AISI 304 work piece material. They used three different vegetable oil based cutting fluids: 1. Coconut Oil 2. Soluble Oil 3. Straight Cutting Oil. They concluded that feed rate affects surface roughness & cutting speed affects tool wear. Coconut oil is better cutting fluid than the conventional mineral oils in reducing the toolwear and surface roughness.

Patrick Adebisi Olusegun Adegbuyi, Ganiyu Lawal; Oluwatoyin Oluseye; Ganiyu Odunaiya (2010) they Analysed the effect of cutting fluids on the mechanical properties of mild steel in a turning operation. Turning was done under dry condition and also using 3 coolants. They found that Palm kernel oil performed very well the specific functions of soluble oil as cutting fluid which includes good chip formation, reduction of heat generated and realization of a good surface finish.

R.F. Avila, A.M. abrao (2001) in their work, the performance of three types of cutting fluids were compared to dry cutting when continuous turning hardened AISI 4340 steel using mixed alumina inserts. The parameters they gone through are tool life, surface finish, and chip form. They found that when finish cutting at high cutting speeds, the use of cutting fluid is responsible for reducing the scatter in the surface roughness value.

III. LITERATURE OUTCOME

- 1) From the literature review, it is observed that less research work has been conducted with the use of ‘castor oil’ as vegetable based cutting oil in machining process.
- 2) Also less work has been reported for optimization of various turning parameters on Hardened steel material with Castor Oil as a Cutting Fluid.
- 3) It has been also found that very few work carried out on 904L Stainless Steel as a work piece material.

IV. CONCLUSION

1. From the review, it is concluded that various vegetable based cutting fluids can be used to optimize cutting parameters and to create healthy environment for machining operators.
2. Also from the review of different journal papers it is observed that, research has not been done on ‘castor oil’ as vegetable based cutting fluid.
3. The various review papers concludes that, the vegetable based cutting fluids are better than the conventional cutting oils.

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