

## A Review on Novel Cooling Techniques for Turning Operation

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**ABSTRACT:** This paper focus on machinability of mild steel cutting throughout turning operation. The intention of this paper is to check the result of machining parameter like cutting speed, feed, Depth of cut within the dry and wet machining condition. The experiment was conducted in center lathe for various machining conditions with dry and wet. Flood cooling is mainly used to cool and lubricate the cutting tool and work piece interface during machining process. This paper also focus on reducing cutting fluid cost and investigation of turning operation on mild steel material for optimization the temperature of tool tip-work piece interface, material exclusion rate in dry and flood by considering three convenient input parameters such as cutting speed, feed rate, depth of cut. To analyze the tool tip temperature at different machining condition by using infrared thermometer with dry and wet machining.

**Keywords:** Cutting Condition, Turning Operation

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### 1. Introduction

Today's speedy changing manufacturing background requires the application of optimization techniques in metal cutting processes to with success react to serve aggressiveness and to fulfill up the increasing demand of customizable quality product within the market. The mild steel find large application in manufacturing, like to manufacture nut and bolts, shaft, gears-pinions etc. lathe machine is a usual machine used to generate the shaft, bearing, threading from cylindrical part. The turning operation is most important operation for the machining process. Many difficulties that follow in machining are measure because of heat generated and so that the hot temperature reason by it. Thus proper choice of cutting fluid is very essential, as a result of it may have an impression on the tool life, cutting force, power consumption, machining accuracy, surface end. It is necessary to use the cutting fluids to reduce the friction from it and take away the heat as early as possible. There are two different kinds of machining environments are; 1. Dry machining 2. Wet machining

#### A. NEED OF COOLANT

The function of a coolant is used to cool the work piece and grinding wheel during machining and is to lubricate the ground surface. Cooling of the work piece is important to remove the heat on both the work piece and tool. Lubrication is required to reduce the friction between the tool and work piece and to protect the work piece from corrosion. This cooling protracted tool life primarily by checking tools from more than their critical temperature range while in the cut. The machine coolant's capability to keep the part dimensionally stable during machining is all the more critical. The main function of machine coolant is temperature controller through cooling and lubrication. Application of machine coolant also improves the quality of the work piece by continually removing metal fines and cuttings from the tool and cutting zone. This cooling effect avoids tools from above their critical temperature range outside which the tool softens and wears quickly.

#### Important properties of coolants

- Good cooling and lubrication,
- Prevention of corrosion,
- Physical, chemical and technological stability during use,
- No harmful effects on human health,
- No excessive foaming.

#### B. Available techniques for cooling

1. Wet / flood cooling
2. Near dry machining with oil based lubricants
3. High pressure cooling
4. Cryogenic cooling
5. Chilled air cooling
6. Forced cooling
7. Heat pipe cooling

8. Thermoelectric cooling
9. Compressed air cooling
10. Liquid nitrogen cooling

### C. TURNING OPERATION

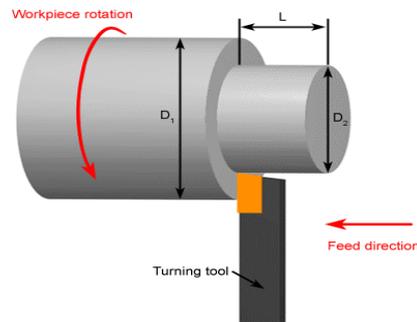


Fig. 01: Turning Operation

Turning is a form of machining process where a single-point cutting tool removes material from outer diameter of a rotating cylindrical work piece. The tool is fed linearly in a direction of parallel to the axis rotation of the work piece. The common research work on the cryogenic machining takes remained completed on turning operation. Unique reasons for that is easy contact of the cryogenic media to enter the cutting zone with an external nozzle in a single-point turning. Turning is used to remove the diameter of the work piece, typically to stated dimension, and to produce a smooth finishing on metal. Regularly the work piece will be turned so that nearby sections have their different diameters.

## 2. Conventional Lathe Machine



Fig.02: Lathe Machine

The development of conventional lathe machine to semi-computerized lathe machine by applying a soft computing method. In the current situation. Lathe machine plays an important role in the engineering division of manufacturing industry. While the physical lathe machines are cost-effective. The accurateness and effectiveness are not equal to the mark. Instead CNC machine provide the desired accurateness and effectiveness, but it need a massive capital.to overcome this condition, semi-computerized method towards the conventional lathe machine is developed by using stepper motors to the horizontal and vertical drive, that can be organized by Arduino UNO-microcontroller. Based on the input parameters of the lathe operation the Arduino coding is stayed created and moved to the UNO board. Thus improvement from physical to semi-computerized lathe machine can considerably increase the accurateness and effectiveness while, at the same time, observance a check on investment cost and successively provide a much necessary growth to the manufacturing industry.

## 3. Traditional Cooling Techniques

### 3.1 Dry Condition

Dry cutting is where the coolant is not require for the metal cutting processes. Dry machining regularly causes extreme temperature rise important to poor tool life and machined surface damage. The benefits of dry machining contain non-pollution of the atmosphere no deposit on the scarf, which is reproduced in decrease

disposal and cleaning cost; no hazard to health; no any harms to the skin and reaction free. So that the dry machining is always the finest technique to sustainability.

### 3.2 Wet Condition

It provide the machining operation by a respectable level of lubrication, cooling and the removal of chips. Generally, at the time of machining soluble oil is used at the interface of tool and work piece or cutting zone by flooding or wet cooling. The functions of the cutting fluids are as follows;

- It increased the tool life
- It improves tolerance
- It improved the surface finish of work piece
- It reduce in the cutting force
- The reduction in the vibrations

### 4. Conclusion

The resulting conclusion can be prepared on the basis of survey -

- This paper provides us the information about the effect on the temperature using various cutting parameter like cutting speed, feed rate, depth of cut.
- This paper provide us the information about the effect on the temperature by dry and wet machining.
- The maximum temperature reduction is obtained with the cutting fluid at all the cutting parameter.
- The choice of the cutting fluids for the machining processes mostly provides many benefits such as higher surface finish quality and well dimensional accuracy and longer tool life and reduce the friction and remove the heat as early as possible and the prevention of corrosion.

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