

Chapter
8

**INVESTIGATION OF THE RELATIONSHIP
BETWEEN TEMPERATURE, SOUND
INTENSITY AND SURFACE ROUGHNESS
RELATED TO TOOL WEAR DURING TURNING
OF HARDENED AISI 4340 MATERIAL**

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Introduction

The AISI 4340 material has a wide range of applications. This material gains different hardness values through heat treatment. Turning operations that are performed above 45 HRC hardness are called hard turning. As the hardness value of the material increases, the strength and abrasion resistance of the material increases, hence the service life of the machine extends. Hard turning can create as good surface quality as the grinding process. However, it is much more economical than grinding and the processing time is much shorter than it. In addition, energy consumption in hard turning is lower than the grinding process. Therefore, many types of researches have been done on hard turning⁽¹⁻⁵⁾.

Good surface quality is one of the advantages of hard turning over conventional turning. Surface quality is of great importance in the machining industry. There are many studies on this subject⁽⁵⁻⁹⁾.

Smooth surface finish ensures low friction between machine parts hence, a low frictional force created that causes low temperature. Thus, expansion and contraction related to temperature are reduced. The expansion causes machine parts to work more difficult, while contraction increases the gaps between the machine parts, resulting in vibration. These two cases prevent the machines to operate properly. Therefore, it is desired that the surface roughness value and friction are low. The low frictional force also reduces the loss of temperature and energy during machine operation. Nowadays, minimizing energy losses is of great impor-

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chine current value to rise too much and results in high power consumption. Increased vibration causes damage to machine tools. The increased temperature value causes deterioration of the chemical structure of the workpiece material. For all these reasons, it is necessary to use coolant in hard turning operations with carbide tools.

It is aimed to obtain a good surface quality in hard turning operations. In this experimental study, the surface roughness value is between 0.39 and 0.48 (μm). This value is near the range of grinding operation quality. At this point, very good results are obtained with carbide tools. However, increasing temperature, friction amount, energy consumption and increasing sound intensity are undesirable in terms of manufacturing. Therefore, the use of coolant from hard turning with carbide tools will contribute to better cutting. As a result, the carbide cutting inserts, which have a very low cost, can be a very good alternative to high cost CBN cutting inserts during hard turning process.

Keywords: AISI 4340, Hard turning, Surface roughness, Sound intensity, Temperature

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