OPTIMIZATION OF TURNING PARAMETERS FOR MINIMUM ENERGY CONSUMPTION

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ABSTRACT

Energy consumption during machining is one of the critical factor to determine a sustainable machining. By minimizing the energy consumption, a green manufacturing can be introduced. This research was about an experimental study to investigate the relationship of turning parameters like depth of cut, feed rate and cutting speed to the energy consumption for turning operation on AISI 1018 Mild Steel by using a conventional lathe machine. The cutting tool used in the experiment was coated tungsten carbide inserts. Design of Experiment (DOE) is used to generate the number of experiments which consists of 20 set of experiments. The result is analysed using Response Surface Methodology (RSM) to determine the interaction between machining parameters to the energy consumption. The results revealed that the most significant parameter in minimizing the energy consumption is feed rate followed by cutting speed and depth of cut. Meanwhile, in two ways interactions between the parameters, it shown that the combination of spindle speed and depth of cut are the most significant to lower the energy consumption during the machining. RSM also generate interaction equation of each parameter with the percentage accuracy about 94%.

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CHAPTER 1

INTRODUCTION

1.1 Project Background

Turning is a standout amongst the most widely recognized strategies for cutting and particularly for the completing segments. Fundamentally, turning is the way toward pivoting or turning a work piece against a cutting tool to create another shape, hence the name. The machine can face, turn, chamfer, neck, knurl, and spaces (cut-off), making it one of the most adaptable machine devices being used today. Turning is one of the earliest technique created by man for granting new shapes to materials.

The turning operation performed on lathe machine involved the primary cutting motion v (rotary) was imparted to the work piece, and the feed motion f (in most cases straight along the axis of work piece) was imparted to a single-point tool. The tool feed rate, f is usually very much smaller than the surface speed, v of the work piece.

Energy consumption is one of the vital goals focused by most company in manufacturing industry. By reducing the energy consumed during machining, firstly, it will reduces the production cost for a product. Secondly, the environmental impact can be lower by reducing the amount of carbon emission that were created in using the electrical energy. According to the article by Qianqian Zhong and Renzhong Tang, the total world energy consumption was predicted to achieve an increase of 56% from the