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Optimization of machining parameters in plane surface grinding process by response surface methodology

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ABSTRACT

This paper aims to predict the optimal solution of surface roughness using Response Surface Methodology in surface grinding machining process. Response surface Methodology extracted for input parameters preparation to surface grinding process. EN 24 steel machining with various speed, depth of cut and feed rate timing. The surface roughness of the machined workpiece measured by the conventional stylus probe. Then input and output parameters feed into the RSM and developed ANOVA and regression equation to produce the optimal solution.

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1. Introduction

The product quality decides by the machining process. Especially which component used in bearing shaft and other automobile parts which the surface quality plays the main role. The surface grinding process is one of the high-quality surface roughness production process. The process parameters such as depth of cut feed rate speed and material removal rate used to achieve the high accuracy rate of surface roughness. Madam surface roughness screening process has consisted of a cylindrical wheel magnetic check for holding the workpiece and feed rod for smooth surface produce. Compare with CNC machining process the surface grinding is suitable for the mild steel other Steel grades. Artificial neural network model used to predict the surface roughness in aluminium 6063, In this paper single workpiece carried out for the whole experiment. Speed, feed rate, depth of cut and frequency mean values are the input parameter and the surface roughness is the output parameter [1]. Random forest and ANFIS classification used to predict the accuracy level, higher accuracy percentage predicted by comparing the random forest and ANFIS classification [2]. IS2062 E250 Steel machined by carbide coated cutting tool, the statistical solution was generated by L9 orthogonal array. The final regression equation used to predict the surface roughness of E250 machined steel [3].

AISI 4140 Steel machined by cylindrical grinding with different speed and feed rate. The response surface methodology used to produce the optimal solution for achieving the high-quality surface of machined steel [4].

2. En24 steel

En24 Steel mainly used in the high load-carrying application. It has high strength and a combination of nickel and chromium-molybdenum. This type of steel used for gears, high strength shaft, die and pushes and retaining rings. Tables 1 and 2 shows the physical and chemical properties of EN24 steel.

The table shows the EN24 has good tensile strength and yield stress, and also it contains more nickel and low silicon content. Fig. 1 shows the machined Figs. 2 and 3

3. Surface grinding

The grinding wheel abrasive particle and silicon carbide etc.. The speed of the grinding wheel is 800 RPM 2500 RPM. The feed rate time was calculated by using a stopwatch. Depth of cut is one of the major influence factors of surface roughness. Fig. 1 shows the surface grinding machine. This grinding machine only

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