

OPTIMIZATION OF MACHINING PARAMETERS ON THE SURFACE ROUGHNESS OF ST 40 STEEL USING THE TAGUCHI METHOD

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ABSTRACT

The turning process is one of the most commonly used machining methods in the manufacturing industry to produce precision components. Surface roughness is a key parameter that determines the quality of the turning results. This study aims to analyze the optimization of machining parameters on the surface roughness of ST 40 steel using the Taguchi method. The variables used include spindle speed, feed rate, Tool Holder angle, and Coolant concentration. The experiments were carried out with spindle speeds of 260 rpm, 360 rpm, and 1120 rpm; feed rates of 0.18 mm/rev, 0.23 mm/rev, and 0.28 mm/rev; Tool Holder angles of 10°, 15°, and 20°; and Coolant concentrations of 20% Coolant 80% water, 30% Coolant 70% water, and 40% Coolant 60% water. Surface roughness testing was conducted using a Surface Roughness Tester. The results showed that spindle speed was the most significant parameter affecting surface roughness, where higher spindle speeds produced lower roughness values. The optimal parameter combination resulted in the lowest surface roughness value of $Ra = 3.588 \mu m$, thus improving the quality and efficiency of the turning process for ST 40 steel.

Keywords : Turning, ST 40 Steel, Coolant, Surface Roughness, Taguchi Method.