

Experimental Evaluation and Optimization of Machining Parameters of EN31 Alloy Steel in Cylindrical Grinding

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Abstract: *The current study focuses on analysing how certain process parameters affect performance outputs. The parameters examined include feed rate (mm/min), workpiece speed (rpm), and depth of cut (mm), while the key response variables are surface roughness (Ra) and material removal rate (MRR). The experiments utilize EN31, a high-strength alloy steel commonly used in the manufacture of components such as crankshafts, gear shafts, and connecting rods in the aerospace and heavy vehicle sectors. To determine the optimal combination of process settings, the Taguchi Design of Experiments (DOE) method with an L16 orthogonal array was employed, followed by optimization using Grey Relational Analysis (GRA). The optimal results obtained were: surface roughness (Ra) of 0.615 μm and MRR of 1.13984 grams/second, achieved at a work speed of 620 rpm, feed rate of 32.4 mm/min, and depth of cut of 0.04 mm.*

Keywords: Cylindrical grinding, Workpiece speed, Feed rate, Depth of cut, Material removal rate (MRR), Surface roughness (Ra), Taguchi method, Grey relational analysis (GRA).

