Optimization of drilling tool by changing various point angle

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Abstract: Drilling operation is widely used in the aerospace, aircraft and automotive industries, although modern metal cutting methods have improved in the manufacturing industries, but conventional drilling still remains one of the most common machining. In this study, focuses on the optimization of drilling parameters using the Taguchi technique to obtain minimum surface roughness (Ra) and hole diameter, cylindricity & MRR. A number of drilling experiments were conducted using the L9 orthogonal array on conventional drilling machine. The experiments were performed on D3 using HSS twist drills under dry cutting conditions with various end point angle speed and feed. The measured results were collected and analyzed with the help of the commercial software package MINITAB17. As a result of the Taguchi experimental trials, it was found that the type of speed were the most significant factor improving the surface roughness with contribution percentage of 38%. The optimum control factor for surface roughness A\textsuperscript{3} (spindle speed, 600rpm), B\textsuperscript{1} (feed rate 0.06 mm/rev) and C\textsuperscript{3}(Point angle--115º). The optimum control factor for Diameter accuracy and Roundness were A\textsuperscript{3} (spindle speed, 1000rpm), B\textsuperscript{2} (feed rate 0.04 mm/rev) and C\textsuperscript{1}(Point angle--110º) and End point angle were the most significant factor improving the diameter accuracy and roundness with contribution percentage of 28% & 25%. The optimum control factor for MRR were A\textsuperscript{2} (spindle speed, 800rpm), B\textsuperscript{1} (feed rate 0.06 mm/rev) and C\textsuperscript{1}(Point angle--110º) and End point angle were the most significant factor improving the MRR with contribution percentage of 33%.

Keywords— Dry drilling, Taguchi method, Analysis of Variance, D3

1. Introduction

The important goal in the modern industries is to manufacture the products with lower cost and with high quality in short span of time. There are two main practical problems that engineers face in a manufacturing process. The first is to determine the values of process parameters that will yield the desired product quality (meet technical specifications) and the second is to maximize manufacturing system performance using the available resources. Drilling operation is widely used in the aerospace, aircraft and automotive industries, although modern metal cutting methods have improved in the manufacturing industries, but conventional drilling still remains one of the most common machining.
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