ABSTRACT

Titanium and its alloys are attractive materials for different field of industries because of their outstanding properties. Drilling is one of the most important traditional machining processes and it is a primary technique in aerospace industry. Since drilling process commonly be in the final steps of the fabrication, drilling titanium has economic significance. In addition, using coolant is the most harmful pollutant in machining and it is responsible for high percentage of total machining cost. The dimensional tolerance and surface roughness are significant quality characteristics in drilling operation because the poor tolerance and surface roughness will affect at the point of assembly.

The performance of un-coated and TiAlN-coated carbide tools were investigated when dry drilling Ti-6Al-4V alloy. The investigation had been performed in order to find the best tool material performance when dry drilling Ti-6Al-4V. The effect of spindle speed and feed rate on thrust force, torque, dimensional tolerance, and surface roughness were reported. Response surface methodology (RSM) based on central composite design (CCD) is used to perform the investigation. In addition, RSM based on CCD integrated with desirability function is used to determine the optimum input conditions that produce the most desirable quality characteristics (minimum tolerance and surface roughness) with good productivity. Analysis of variance (ANOVA) is used to detect the relative significance of the input factors on each response.