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Effect of drill point angle on surface integrity when drilling titanium alloy

Abstract

Surface integrity of machined component is of major importance for the reliability and safety requirements during in service especially for the aerospace applications. This paper presents an investigation on the effect of drill geometry on the surface integrity of drilled hole of Ti-6AL-4V during drilling operation. Drilling experiments were conducted under the MQL using a special vegetable oil known as Jatropha oil. Experimental results revealed that drill point angle and coolant-lubricant conditions significantly influence the surface integrity which include surface roughness, micorhardness and microstructure defects. The surface roughness decreased with greater drill point angle. The subsurface deformation layer thickness was approximately 9 - 15 μm from the top of the machined surface. Microhardness profiles of the last hole indicated that the subsurface deformation extend up to a 150 to 200 μm until it reaches to the average hardness.

Keywords; Drilling, MQL, Point Angle, Surface Integrity, Ti-6Al-4V