

Precision Grinding of Titanium (Ti-6Al-4V) Alloy Using Nanolubrication

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Abstract : In this current era of competitive machinery productions, the industries are designed to place more emphasis on the product quality and reduction of cost whilst abiding by the pollution-preventing policy. In attempting to delve into the concerns, the industries are aware that the effectiveness of existing lubrication systems must be improved to achieve power-efficient and pollution-preventing machining processes. As such, this research is targeted to study on a plausible solution to the issue in grinding titanium alloy (Ti-6Al-4V) by using nanolubrication, as an alternative to flood grinding. The aim of this research is to evaluate the optimum condition of grinding force and surface roughness using MQL lubricating system to deliver nano-oil at different level of weight concentration of Silicon Dioxide (SiO₂) mixed normal mineral oil. Taguchi Design of Experiment (DoE) method is carried out using a standard Taguchi orthogonal array of L16(4³) to find the optimized combination of weight concentration mixture of SiO₂, nozzle orientation and pressure of MQL. Surface roughness and grinding force are also analyzed using signal-to-noise(S/N) ratio to determine the best level of each factor that are tested. Consequently, the best combination of parameters is tested for a period of time and the results are compared with conventional grinding method of dry and flood condition. The results show a positive performance of MQL nanolubrication.

Keywords : grinding, MQL, precision grinding, Taguchi optimization, titanium alloy

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