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Effect of cutting parameters with Dry and MQL Nano fluids in Turning of EN -36 Steel

[1]MohanaRao.G
Assistant Professor
Department of Mechanical Engineering
Rajiv Gandhi University of Knowledge Technologies (RGUKT), Nuzvid, India.
mohanmech322@rguktn.ac.in

[2]Dilkush, [3]Anil Babu. P, [4]I.Sudhakar
[2]Assistant Professor, [3]Assistant Professor, [4]associate Professor
[2]Department of Metallurgical & Materials Engineering
[2]Rajiv Gandhi University of Knowledge Technologies (RGUKT), Nuzvid, India
[3]Department of Mechanical Engineering
[3]Lendi Engineering College Hyderabad, India
[4]Department of Mechanical engineering
[4] MVGR College of Engineering, Vizianagaram, India

ABSTRACT

Many research works are carried out to minimize the force, temperature and surface roughness and tool wear during turning process, but in dry machining it is very difficult to minimize these parameters directly. For minimizing these parameters, different lubricant have been used so far. The experiments are conducted using Taguchi approach and the results are analyzed using analysis of variance (ANOVA). In the present work Minimum Quantity Lubrication (MQL) with Nano fluids is used during machining EN-36 Steel and measured the parameters without any lubrication and with MQL Nano Fluid lubrication. The experimental values and the result are compared. The results shown, the MQL with Nano fluids are given less cutting force, temperature, surface roughness and tool wear compare to the dry machining. The Nano Fluid Lubricant penetrated into the narrow zones of machining area and reduces the contact between tool and the work piece and it carries the maximum amount of heat generated during machining process, the tool is less contact with work piece compare to the dry machining, due to this the mechanical wear and tear of the tool also decreased. From the experimental result it is observed that the roughness in dry machining is 1.6 μm, with 6% volume nano particle fluid with MQL the roughness is 0.63 μm and with the 8% volume of nano particle fluid with MQL the roughness is 0.1 μm. Similarly the temperatures resulted with dry,

6% and 8% as 55.7^{0}C, 45.92^{0}C and 44.16^{0}C respectively. The force generated in dry, 6% and 8% as 400N, 320.56N and 280.46N respectively. The tool wear in dry, 6% and 8% as 0.005mm, 0.004mm and0.0031mm respectively. Hence it is observed that the Nano fluid with 8% MQL is able to reduce cutting force, temperature and surface roughness and tool wear significantly. The machining processes with MQL Nano fluids values are improved compare to the dry machining. This work mainly contributed to enhance accuracy and efficiency of the machining process and to produce accurate and tolerance machining components while machining high strength alloys.

Keywords: Minimum *Quantity Lubrication (MQL); Nano Fluid; dry machining; ANOVA*