

Effect on the Performance of the Nano-Particulate Graphite Lubricant in the Turning of AISI 1040 Steel under Variable Machining Conditions

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Abstract : Technological advancements in the development of cutting tools and coolant/lubricant chemistry have enhanced the machining capabilities of hard materials under higher machining conditions. Generation of high temperatures at the cutting zone during machining is one of the most important and pertinent problems which adversely affect the tool life and surface finish of the machined components. Generally, cutting fluids and solid lubricants are used to overcome the problem of heat generation, which is not effectively addressing the problems. With technological advancements in the field of tribology, nano-level particulate solid lubricants are being used nowadays in machining operations, especially in the areas of turning and grinding. The present investigation analyses the effect of using nano-particulate graphite powder as lubricant in the turning of AISI 1040 steel under variable machining conditions and to study its effect on cutting forces, tool temperature and surface roughness of the machined component. Experiments revealed that the increase in cutting forces and tool temperature resulting in the decrease of surface quality with the decrease in the size of nano-particulate graphite powder as lubricant.

Keywords : solid lubricant, graphite, minimum quantity lubrication (MQL), nano-particles

Conference Title : ICMETA 2018 : International Conference on Mechanical Engineering : Theory and Application

Conference Location : Kuala Lumpur, Malaysia

Conference Dates : February 12-13, 2018