Experimental Investigation of Minimum Quantity Lubrication in Meso-scale Milling with Varying Tool Diameter

By: Yusof, MQM (Yusof, M. Q. M.)[1]; Harun, HNSB (Harun, H. N. S. B.)[1]; Bahar, R (Bahar, R.)[1]

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Abstract

Minimum quantity lubrication (MQL) is a method that uses a very small amount of liquid to reduce friction between cutting tool and work piece during machining. The implementation of MQL machining has become a viable alternative to flood cooling machining and dry machining. The overall performance has been evaluated during meso-scale milling of mild steel using different diameter milling cutters. Experiments have been conducted under two different lubrication condition: dry and MQL with variable cutting parameters. The tool wear and its surface roughness, machined surfaces microstructure and surface roughness were observed for both conditions. It was found from the results that MQL produced better results compared to dry machining. The 0.5 mm tool has been selected as the most optimum tool diameter to be used with the lowest surface roughness as well as the least flank wear generation. For the workpiece, it was observed that the cutting temperature possesses crucial effect on the microstructure and the surface roughness of the machined surface and bigger diameter tool actually resulted in higher surface roughness. The poor conductivity of the cutting tool may be one of reasons behind.

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Author Information

Reprint Address: Bahar, R (reprint author)

+ IIUM, Dept Mfg & Mat Engn, Jalan Gombak, Kuala Lumpur 53100, Malaysia.

Addresses:

+ [1] IIUM, Dept Mfg & Mat Engn, Jalan Gombak, Kuala Lumpur 53100, Malaysia

E-mail Addresses: rbahar@iium.edu.my

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