

Performance Evaluation and Economic Analysis of Minimum Quantity Lubrication with Pressurized/Non-Pressurized Air and Nanofluid Mixture

Authors : M. Amrita, R. R. Srikant, A. V. Sita Rama Raju

Abstract : Water miscible cutting fluids are conventionally used to lubricate and cool the machining zone. But issues related to health hazards, maintenance and disposal costs have limited their usage, leading to application of Minimum Quantity Lubrication (MQL). To increase the effectiveness of MQL, nanocutting fluids are proposed. In the present work, water miscible nanographite cutting fluids of varying concentration are applied at cutting zone by two systems A and B. System A utilizes high pressure air and supplies cutting fluid at a flow rate of 1ml/min. System B uses low pressure air and supplies cutting fluid at a flow rate of 5ml/min. Their performance in machining is evaluated by measuring cutting temperatures, tool wear, cutting forces and surface roughness and compared with dry machining and flood machining. Application of nano cutting fluid using both systems showed better performance than dry machining. Cutting temperatures and cutting forces obtained by both techniques are more than flood machining. But tool wear and surface roughness showed improvement compared to flood machining. Economic analysis has been carried out in all the cases to decide the applicability of the techniques.

Keywords : economic analysis, machining, minimum quantity lubrication, nanofluid

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