Studies on Minimum Quantity Lubrication (MQL) and Air Cooling at Drilling

by: B. Tasdelen, T. Wikblom, S. Ekered
Journal of Materials Processing Technology

Summary:

This paper deals with the results obtained at cutting with MQL at different oil amounts, dry compressed air and emulsion. The results are discussed in terms of wear, chip contact, forces/torques and surface finish. Link to ordering information...

Effect of Minimum Quantity Lubrication (MQL) on Tool Wear and Surface Roughness in Turning AISI-4340 Steel

by: N. R. Dhar, M. Kamruzzaman, Mahiuddin Ahmed
Journal of Materials Processing Technology

Summary:

This paper deals with experimental investigation on the role of MQL on tool wear and surface roughness in turning AISI-4340 steel at industrial speed-feed combinations by an uncoated carbide insert. The encouraging results include significant reduction in tool wear rate and surface roughness by MQL, mainly through the reduction in the cutting zone temperature and a favorable change in the chip–tool and work–tool interaction. Link to ordering information...

Dry Turning of Tempered Martensitic Stainless Tool Steel Using Coated Cermet and Coated Carbide Tools

by: M. Y. Noordin, V. C. Venkatesh, S. Sharif
Journal of Materials Processing Technology

Summary:

Turning trials were performed under dry cutting conditions with constant depth of cut in order to investigate the usability of coated TiCN based cermet and coated carbide cutting tools to turn tempered martensitic stainless tool steel. Regardless of the cutting tool material, cutting speed and feed expectedly have an effect on tool wear and tool life. The results suggest that dry turning of hardened, stainless tool steel could be performed using coated TiCN based cermet and coated carbide cutting tools with −5° SCEA at suitably selected cutting speed and feed combination. Link to ordering information...

Mechanism of Minimum Quantity Lubrication in High-Speed Milling of Hardened Steel

by: Y. S. Liao, H. M. Lin
International Journal of Machine Tools & Manufacture Design, Research, and Application

Summary:
The rapid wear rate of cutting tools due to high cutting temperature is a critical problem to be solved in high-speed machining (HSM) of hardened steels. Near-dry machining, such as minimum quantity lubrication (MQL), is regarded as one of the solutions to this difficulty. In this paper, the mechanism of MQL in HSM of hardened steel is investigated. Based on this study, it is concluded that the tool life can be effectively improved by MQL in HSM hardened steels when cutting parameters are chosen properly. Link to ordering information...

An Experimental Investigation on Effect of Minimum Quantity Lubrication in Machining AISI 1040 Steel

by: N. R. Dhar, M. T. Ahmed, S. Islam
International Journal of Machine Tools & Manufacture Design, Research, and Application

Summary:
This study compares the mechanical performance of MQL to completely dry lubrication for the turning of AISI-1040 steel based on experimental measurement of cutting temperature, chip reduction coefficient, cutting forces, tool wears, surface finish, and dimensional deviation. Results indicated that the use of near dry lubrication leads to lower cutting temperature and cutting force, favorable chip–tool interaction, reduced tool wears, surface roughness, and dimensional deviation. Link to ordering information...

A Review of Developments Towards Dry and High Speed Machining of Inconel 718 Alloy

by: D. Dudzinski, A. Devillez, A. Moufki, D. Larrouque`re, V. Zerrouki, J. Vigneau
International Journal of Machine Tools & Manufacture Design, Research, and Application

Summary:
The combination of high speed cutting and dry cutting for difficult-to-cut aerospace materials is the growing challenge to deal with the economic, environmental and health aspects of machining. In this paper, attention is focused on Inconel 718 and recent work and advances concerning machining of this material are presented. In addition, some solutions to reduce the use of coolants are explored, and different coating techniques to enable a move towards dry machining are examined. Link to ordering information...

Performance of Coated Tools During Hard Turning Under Minimum Fluid Application

by: CH R. Vikram Kumar, B. Ramamoorthy
Journal of Materials Processing Technology

Summary:
This paper deals with the comparative performance of different coated tools in conventional dry turning and wet turning processes with the minimal fluid application method by varying speed and feed keeping depth of cut constant. The relative influence of the different types of coatings and different operating parameters on cutting performance in machining hardened steel with minimum fluid application was analyzed using statistical design of experiments. Link to ordering information...

Analysis of Temperature During Drilling of Ti6Al4V With Minimal Quantity of Lubricant

by: Rodrigo Panosso Zeilmann, Walter Lindolfo Weingaertner
Journal of Materials Processing Technology

Summary:
This paper presents a study of the temperature reached during drilling of the titanium alloy Ti6Al4V, employing class K10 carbide drills with and without hard coating (TiAlN, CrCN or TiCN). The main objective of this study was to evaluate the temperature for different coated tools under the condition of application of minimal quantity of lubricant (MQL). Link to ordering information...

Temperature Determination at the Chip–Tool Interface Using an Inverse Thermal Model Considering the Tool and Tool Holder

by: S. R. Carvalho, S. M. M. Lima e Silva, A. R. Machado, G. Guimar˜aes
International Journal of Machine Tools & Manufacture Design, Research, and Application

Summary:
The studies of thermal fields in machining are very important for the development of new technologies aiming to increase tool life and to reduce production costs. This thermal model is obtained by a numerical solution of the transient three-dimensional heat diffusion equation that considers both the tool and the tool holder assembly. Link to ordering information...

Mean Flank Temperature Measurement in High Speed Dry Cutting of Magnesium Alloy

by: F. Z. Fang, L. C. Lee, X. D. Liu
Journal of Materials Processing Technology

Summary:
High speed dry cutting is preferable in cutting magnesium alloys due to there being no extra part cleaning work required, the environmental benefits and the ecological concerns. However, fire ignition could happen when the cutting temperature is close to the melting point of magnesium during high speed cutting. An experimental study of the mean temperature on the flank face is presented in this paper. This indicates that the mean flank temperature can reasonably be used to predict the occurrence of fire in high speed cutting of magnesium alloys.