

Prediction of Cutting Tool Life in Drilling of Reinforced Aluminum Alloy Composite Using a Fuzzy Method

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Abstract : Machining of Metal Matrix Composites (MMCs) is very significant process and has been a main problem that draws many researchers to investigate the characteristics of MMCs during different machining process. The poor machining properties of hard particles reinforced MMCs make drilling process a rather interesting task. Unlike drilling of conventional materials, many problems can be seriously encountered during drilling of MMCs, such as tool wear and cutting forces. Cutting tool wear is a very significant concern in industries. Cutting tool wear not only influences the quality of the drilled hole, but also affects the cutting tool life. Prediction the cutting tool life during drilling is essential for optimizing the cutting conditions. However, the relationship between tool life and cutting conditions, tool geometrical factors and workpiece material properties has not yet been established by any machining theory. In this research work, fuzzy subtractive clustering system has been used to model the cutting tool life in drilling of Al₂O₃ particle reinforced aluminum alloy composite to investigate of the effect of cutting conditions on cutting tool life. This investigation can help in controlling and optimizing of cutting conditions when the process parameters are adjusted. The built model for prediction the tool life is identified by using drill diameter, cutting speed, and cutting feed rate as input data. The validity of the model was confirmed by the examinations under various cutting conditions. Experimental results have shown the efficiency of the model to predict cutting tool life.

Keywords : composite, fuzzy, tool life, wear

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