

Abstract

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Prediction of Abrasive Water Jet Plain Milling Process Parameters Using Artificial Neural Networks

Abstract-Technology of abrasive water jet (AWJ) is one of the most important processes for machining due to its advantages over other technologies. It has proved to be an efficient process for plain milling of various materials. The paper presents a new predictive model of AWJ milling of aluminum alloy. The model is developed to predict some interesting process parameters from process variables. As AWJ is a complicated multi input-output system, its model is developed using artificial neural network (ANN) as one of the artificial intelligent models. A feed forward neural network based on back error propagation is used. The ANN training set is generated by extensive experimental work. The tests considered four process variables, which are traverse speed, water jet pressure, stand-off distance and abrasive flow rate and three process parameters, namely surface roughness, depth of cut and material removal rate. The study of the relation between process variables and parameters yields to eliminate the stand-off distance from the training set. Therefore, the ANN has been designed to have three input neurons for process variables and three output neurons for process parameters. The designed ANN was trained and tested. The ANN succeeded to model the AWJ process by extracting the process parameters from process variables with a regression factor above 90%. This paper is a step towards a better understanding, modeling and controlling of AWJ milling process.