ADVANCED MACHINING TOWARDS IMPROVED MACHINABILITY OF DIFFICULT-TO-CUT MATERIALS

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Chapter 16

Application of Response Surface Methodology Coupled with Genetic Algorithm in the Optimization of Cutting Conditions for Surface Roughness in End-Milling of Inconel 718 Using Coated WC-Co Inserts

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1.0 INTRODUCTION

Process modeling and optimization are two important issues in today's manufacturing. It is important, in metal cutting, to select the machining parameters to ensure high quality of machining products, reduce machining costs and increase machining efficiency. Nowadays surface roughness and accuracy of product is getting greater attention in the industry. Surface roughness and dimensional accuracy have important bearing on performances of any machined part. Therefore, there is a need for predictions of these values. However number of surface roughness prediction models available in the literature is limited [1-5]. B. Ozcelik et al [2] generated 81 experimental data to develop a model by using Artificial Neural Networking (ANN) for predicting the surface finish of Inconel 718 in End Milling and then used the developed ANN model as a fitness function of GA to optimize the surface roughness. But the development of surface roughness prediction model increases the total number of tests and as a result the experimentation cost also increases.

Response Surface Methodology (RSM), as a group of mathematical and statistical techniques, is useful for modeling the relationship between the input parameters (cutting conditions) and the output variables. Many machining researchers have used response surface methodology to design their experiments and assess results. Alauddin et al [3] applied response surface methodology to predict the surface finish in end milling of Inconel 718 considering cutting speed and feed as input parameters. S. Sharif et al [4] developed a predicted model for surface roughness when end milling titanium alloy (Ti-6Al-4V) using uncoated carbide under flooded condition.

In the present work, an effort has been made to estimate the surface roughness values in end milling of Inconel 718 using RSM. It has also been attempted to optimize the surface roughness prediction model using a GA approach.