

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

Edited by:

A.K.M. Nurul Amin (Chief Editor)

Dr. Erry Yulian Triblas Adesta

Dr. Mohammad Yeakub Ali



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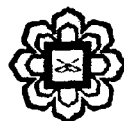
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Chapter 23

MODELLING OF TOOL LIFE BY RESPONSE SURFACE METHODOLOGY IN HARD MILLING OF AISI D2 TOOL STEEL

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1.0 INTRODUCTION

Tool life prediction is an important factor that has profound influence on the higher productivity in industrial activities. High metal removal rate is intended to reduce the manufacturing cost and operation time. The productivity interms of a machining operation and machining cost, as well as quality assurance, and the quality of the workpiece machined surface and its integrity are strongly depend on tool wear and consequently it depends on the life of the tool. Moreover, despite having the target of achieving optimum superficial finishing with the shortest possible time one must take into account the consideration of tool life, so that the complete finishing operation can be carried out with just one tool, avoiding the intermediate stops in order to change the tool due to its wear [1] Eventually, sudden failure of cutting tools lead to loss of productivity, rejection of parts and consequential economic losses [2]

There are various methodologies and strategies that were adopted by researchers in order to predict tool wear or tool life in milling and turning. Response surface methodology (RSM) which is classified into designed experiments approach seems to be the most wide-spread methodology for the surface roughness prediction. RSM is an important methodology used in developing new processes, optimizing their performance, and improving the design and/or formulation of new products. [3] It is a dynamic and foremost important tool of design of experiment (DOE), wherein the relationship between responses of a process with its input decision variables is mapped to achieve the objective of maximization or minimization of the response properties.

Many researchers have used RSM for their experimental design and analysis of the results in end milling, but very few of them were engaged in machining hard material which is commonly known as hard milling. Vivancos [4] presented a model for the prediction of surface roughness in high-speed side milling of hardened die steels. Palanisamy et al. [2] predicted the response variable tool wear based on DOE combined with RSM technique in a universal milling machine on AISI 1020 steel using carbide insert. The development of a surface roughness model for end milling EN32 casehardening carbon steel (160 BHN steel) using design of experiments and RSM was discussed by Mansor & Abdalla [5] As has been