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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Chapter 10

Influence of Chatter on Tool Life During End Milling of Aluminium and Aluminium Alloy on Vertical Machining Centre (VMC)

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1.0 INTRODUCTION

Cutting tools are subjected to severe stress-strain conditions due to cutting forces, heat generated and vibrations caused during machining. These conditions affect the overall performance of the tool. Wear is the major concern in metal cutting and since it affects the productivity and dimensional accuracy of the machined part. Intensive chatter vibrations are a major concern during metal cutting in most of the cases at high cutting speeds. It leads to lower life of machine tools elements, lower machining accuracy and surface finish, and higher rate of tool wear are caused by chatter. Apart from that high noise level, associated with chatter, is generally uncomfortable for the operator. There are various theories on the formative mechanism of chatter. However Talantov and Amin established quite convincingly that, during turning chatter occurs when the frequency of the cyclic or the serrated chip elements coincides with the natural frequency of the individual components of the machine-tool system, like tool holder, spindle, etc. [1,2]. During resonance the frequency of the vibration remains practically constant and the amplitude increases to a maximum value and then gradually decreases when the component gets out of the resonance. Trent has also concluded that the formation of serrated chips during metal cutting leads to chatter of machine tools [3]. Increasing cutting force contributes to intensification of chatter. Chatter can be reduced by changing cutting parameters [4]. This work aims at studing the influence of cutting parameters on chatter to minimize chatter effects on tool wear and at developing a chart of recommended cutting conditions for the given materials to facilitate almost chatter free machining with satisfactory surface finish and tool life.