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Chapter 4

Machinability Aspects in Heat Assisted Machining of Hardened Steel AISI H13 using Coated Carbide Tool

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1.0 INTRODUCTION

AISI H13 tool steel is one of the major hardened materials used extensively for making hot working moulds and dies, because of favourable combination of their mechanical and thermal properties. However, these enhanced properties, especially high hardness make them very difficult to machine using conventional techniques. In the current project a technique of workpiece heat assisted machining was adopted as a possible means of improving machinability of the material. Machining was conducted on a vertical machining centre using TiAlN coated carbide inserts and heating of the workpiece was carried out using an induction heater. An online vibration monitoring system was used to record the vibration signals during machining. Comparison between room temperature and heat assisted machining was then made in terms of tool wear and life, surface finish and chatter/vibration. It was found that tool life was higher under heat assisted machining condition. Heat assisted machining also yielded lower surface roughness and lower amplitudes of chatter during machining. AISI H13 tool steel is a widely used material in mould and die making industry, because of its high hardness and ability to sustain severe operating condition. The other properties that make H13, as an inevitable material for mould and die are high resistance to deformation and breaking under high loads, high hardness at elevated temperature and high wear resistant. However, these properties of H13 do possess some of unfavourable effect in terms of machining process. For this, enhancement of machinability of H13 tool steel drew the attention of many researchers and metal cutting scientist. Despite the importance of end milling operation for the manufacturing of mould and die, most of the research work concentrated mainly on the turning operation of H13 tool. In this perspective, the current study adopted preheating as a technique to enhance machinability of H13.

The industrial adoption of hard machining was made during the last decade with the improvement of cutting tool material, coating technologies and advanced machining techniques. Generally, hard machining involves the machining of material with a hardness value over 45 HRC. Hard machining has provides a significant cost or lead-time reduction in comparison to traditional route processes. Moreover, adoption of hard machining technique