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

IIUM PRESS

INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA

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

IIUM Press

Published by:
IIUM Press
International Islamic University Malaysia

First Edition, 2011

Perpustakaan Negara Malaysia Cataloguing-in-Publication Data

Advanced Machining Towards Improved Machinability of Difficult-To-Cut Materials: A.K.M. Nurul Amin, Erry Yulian Triblas Adesta & Mohammad Yeakub Ali

ISBN: 978-967-418-175-8

Member of Majlis Penerbitan Ilmiah Malaysia – MAPIM
(Malaysian Scholarly Publishing Council)

Printed by :
IIUM PRINTING SDN.BHD.
No. 1, Jalan Industri Batu Caves 1/3
Taman Perindustrian Batu Caves
Batu Caves Centre Point
68100 Batu Caves
Selangor Darul Ehsan
Tel: +603-6188 1542 / 44 / 45 Fax: +603-6188 1543
EMAIL: iiumprinting@yahoo.com

Chapter 14

Chatter Suppression in End Milling of Titanium Alloy Ti6Al4V Applying Permanent Magnet Clamped Adjacent to the Workpiece

A.K.M. Nurul Amin[1], Ahmad Azhari[2], Md. Asif Mahmud[3]
[1,2,3]Faculty of Engineering, International Islamic University Malaysia (IIUM)

Corresponding author: akamin@iium.edu.my

1.0 INTRODUCTION:

Chatter is an unwanted but sometimes unavoidable phenomenon in machining. The term defines the self-excited violent relative dynamic motion between the cutting tool and workpiece. Nakagawa et al. [1] stated it is meant as a problem has emerged during the end-milling of hardened steels. Campa et al. [2] described chatter as a dynamic problem at high removal rate conditions. Chatter is undesirable due to its adverse effects on the product quality, operation cost, machining accuracy, tool life, machine-tool bearings, and machine-tool life. It is also responsible for reducing output because if chatter cannot be controlled, then metal removal rates have to be lowered to eliminate chatter. Hence chatter must be avoided to improve the dimensional accuracy and surface quality of the product [3]. A system having self-induced vibrations can be said to have a negative damping [4].

In addition, Quintana et al. [5] specified that chatter can be obviously predicted from the loud noise and the poor surface integrity due to the chatter mark.The chatter phenomenon actually can be suppressed by some of methods. Nakagawa [1] showed that an end-mill with different helix angles could prevent generative chatter vibration at lower cutting speeds and was also effective in suppressing chatter vibration at higher cutting speeds.

Chatter conventionally, is determined using Fast Fourier Transformation (FFT), determining whether received voice signals from a sensor are high frequency signals. The analytical and experimental identification of the chatter frequencies in milling processes and the frequency diagram are attached to the stability charts of the mechanical models. Kim et al. [6] also showed the chatter prediction method in this study. With the advancement of a chatter monitoring, the conventional *FFT* (Fast Fourier Transform) method was generally used. But it needs huge number of data for reliable monitoring of end-milling force. In this chapter a new method of chatter control is introduced for suppression of chatter during end milling of titanium alloy Ti6Al4V. The magnet is clamped together with the workpiece using the machine vise. Since titanium alloys are non-magnetic in nature this method could be employed. However, the strength of the magnetic field can't be maintained uniform at all machining locations on the workpiece.