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 31

Elimination of Burr Formation during End Milling of Polymethyl Methacrylate (PMMA) Through High Speed Machining

A.K.M. Nurul Amin[1], Syaban[2], Md. Asif Mahmud[3]
1.2.3 Faculty of Engineering - International Islamic University Malaysia (IIUM)
e-mail address of corresponding author: akamin@iiu.edu.my

1.0 INTRODUCTION

A burr is a raised edge or small pieces of material remaining attached to a workpiece after it has undergone machining. The Burr, Edge and Surface Technology (BEST) Division, the Society of Manufacturing Engineers defines a burr as "an undesirable projection of material that results from cutting, forming, blanking or shearing operation [1].

The first stage, chip formed in front of the cutting tool with a positive shear angle, φ. The plastic zone around the primary shear zone is extended towards the work edge when cutting tool advance toward the work edge.There are four basic types of burr that have been defined by researchers which are: poisson, roll-over, tear burr and cut-off burr [2-3]. The four specific types of burr are:

Roughness refer to the small, finely spaced deviations from the nominal surface, which is determined by the material characteristics and the process that formed the surface [4]. The theoretical surface roughness, R_a can be estimated using the following equation [5]

$$R_a = f_t^2 / 32(\mathrm{R} \pm f_t n_t / \pi) \quad (1)$$

Where R_a is the surface roughness, n_t is the number of teeth on the cutter, R is the radius of the cutter, f_t is the feed per revolution and the (+) sign refers to up-milling and the (-) sign refers to down milling.The above equation does not consider many factors that in reality can affect the surface roughness. For this reason the surface roughness will generally be higher than that predicted by Eq. (1). Statistical models that include such factors as depth of cut and spindle speed in addition to feed rate have been developed [6].

2.0 ANALYSIS OF SURFACE ROUGHNESS AND MODEL DEVELOPMENT

Table 1 shows the cutting conditions and the measured surface roughness results using Wyko NT 1100. It calculates the effect for all model terms. It produces statistics such as F- values, lack of fit and R-squared values for comparing the models. The fit summary test output is given in Table 2. The test detects linear model as a statistically significant model and it underlines and note the "Suggested" on the linear model.