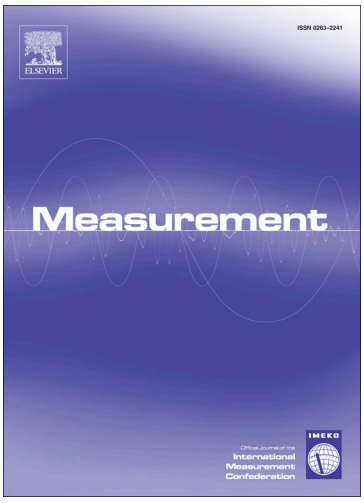

Multi-response optimization of end milling parameters under through-tool cryogenic cooling condition

Mozammel Mia

PII: S0263-2241(17)30468-2
DOI: http://dx.doi.org/10.1016/j.measurement.2017.07.033
Reference: MEASUR 4873

To appear in: *Measurement*

Received Date: 30 November 2016
Revised Date: 13 April 2017
Accepted Date: 18 July 2017

Please cite this article as: M. Mia, Multi-response optimization of end milling parameters under through-tool cryogenic cooling condition, *Measurement* (2017), doi: http://dx.doi.org/10.1016/j.measurement.2017.07.033

Multi-response optimization of end milling parameters under through-tool cryogenic cooling condition

Mozammel Mia

Mechanical and Production Engineering, Ahsanullah University of Science and Technology

141-142 Love road, Tejgaon I/A, Dhaka 1208, Bangladesh.

Email: arif_ipe@yahoo.com; mozammelmiaipe@gmail.com; mozammel.mpe@aust.edu

Abstract

Cryogenic cooling atmosphere in machining is usually accredited as clean cutting condition. Works in literature are mostly focused on external implementation of cryogenic; thereby not many studies are concerned in its internal application (i.e. through-tool). In this regard, present study deals with quality characteristics such as cutting force, surface roughness and specific cutting energy in internal cryogenic cooling assisted milling of hardened steel vis-à-vis mathematical modeling and multiple attributes optimization by using response surface methodology. Full factorial based design of experiment focusing on input variables cutting speed, feed rate and cutting condition divulged 27 experimental runs. Analysis of variance results showed that cutting condition prominently affects all responses which reflect the criticality of choosing appropriate mode of cooling. Experimental outcomes revealed that through-tool cryogenic cooling is better than dry and wet cooling technique. Furthermore, the formulated mathematical relations are usable due to higher prediction accuracies. A cutting speed of 26 m/min, feed rate of 58 mm/min and through-tool cryogenic cooling have been found and verified as optimum levels for concurrent minimization of quality characteristics.

Keywords: End milling; Through-tool cryogenic cooling; Eco-friendly machining; Response surface methodology; Multi-objective optimization.