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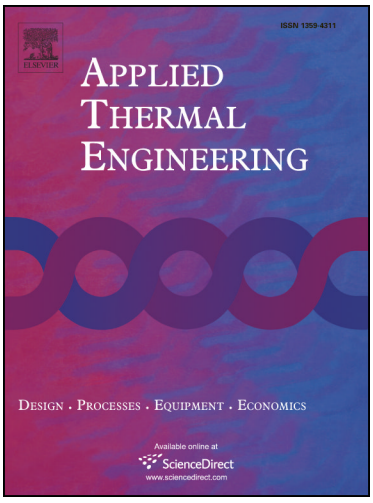

TEMPERATURE ASSESSMENT WHEN MILLING AISI D2 COLD WORK DIE STEEL USING TOOL-CHIP THERMOCOUPLE, IMPLANTED THERMOCOUPLE AND FINITE ELEMENT SIMULATION

Hugo V. Lima, Augusto F.V. Campidelli, Antônio A.T. Maia, Alexandre M. Abrão

PII: S1359-4311(18)32107-0
DOI: https://doi.org/10.1016/j.applthermaleng.2018.07.107
Reference: ATE 12465

To appear in: *Applied Thermal Engineering*

Received Date: 4 April 2018
Revised Date: 10 July 2018
Accepted Date: 20 July 2018

Please cite this article as: H.V. Lima, A.F.V. Campidelli, A.A.T. Maia, A.M. Abrão, TEMPERATURE ASSESSMENT WHEN MILLING AISI D2 COLD WORK DIE STEEL USING TOOL-CHIP THERMOCOUPLE, IMPLANTED THERMOCOUPLE AND FINITE ELEMENT SIMULATION, *Applied Thermal Engineering* (2018), doi: https://doi.org/10.1016/j.applthermaleng.2018.07.107

TEMPERATURE ASSESSMENT WHEN MILLING AISI D2 COLD WORK DIE STEEL USING TOOL-CHIP THERMOCOUPLE, IMPLANTED THERMOCOUPLE AND FINITE ELEMENT SIMULATION

Hugo V. Lima, Augusto F.V. Campidelli, Antônio A.T. Maia, Alexandre M. Abrão*

Department of Mechanical Engineering, Universidade Federal de Minas Gerais, Av. Antônio Carlos, 6627, Pampulha, Belo Horizonte, MG, CEP 31270-901, Brazil.
Phone: 55 31 3409 5138. E-mail: abrao@ufmg.br

* Corresponding author

Abstract: Due to the cyclic mechanical and thermal loads imposed to the cutting tool during milling, the study of the process temperature is of utmost importance for the better understanding of various associated phenomena, such as tool life and wear mechanisms, cutting forces behaviour and workpiece subsurface metallurgical alterations. Nevertheless, temperature measurement during milling operations imposes a number of restraints to experimental methods, mostly related to the cutter rotational speed, variable chip thickness and intermittent action of the cutting edges. The principal goal of this work is to perform a comparative study of the cutting temperature during in end milling using implanted and tool-chip thermocouple methods under distinct operating parameters. Additionally, finite element simulation is employed to correlate the results provided by the experimental techniques. Tool-chip thermocouple and implanted thermocouple experimental methods were used in addition to three dimensional finite element simulation. The findings indicated that the developed system is capable to cope with the drawbacks associated with intermittent machining operations and to provide reliable temperature values for both experimental methods. Milling temperature increased with cutting speed, feed per tooth and both axial and radial depths of cut, however, the relevance of each factor varied in accordance with the measurement method. The average cutting temperature was not statistically affected by cutting direction and the experimental determination of the friction coefficient between tool and