World Academy of Science, Engineering and Technology
International Journal of Mechanical and Materials Engineering
Vol:12, No:08, 2018

Experimental Chip/Tool Temperature FEM Model Calibration by Infrared Thermography: A Case Study

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Abstract : Temperature knowledge in machining is fundamental to improve the numerical and FEM models used for the study of some critical process aspects, such as the behavior of the worked material and tool. The extreme conditions in which they operate make it impossible to use traditional measuring instruments; infrared thermography can be used as a valid measuring instrument for temperature measurement during metal cutting. In the study, a large experimental program on superduplex steel (ASTM A995 gr. 5A) cutting was carried out, the relevant cutting temperatures were measured by infrared thermography when certain cutting parameters changed, from traditional values to extreme ones. The values identified were used to calibrate a FEM model for the prediction of residual life of the tools. During the study, the problems related to the detection of cutting temperatures by infrared thermography were analyzed, and a dedicated procedure was developed that could be used during similar processing.

Keywords : machining, infrared thermography, FEM, temperature measurement
Conference Title : ICMMM 2018 : International Conference on Machining and Machinability of Materials
Conference Location : Venice, Italy
Conference Dates : August 13-14, 2018