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Analysis of Hard Turning Process of AISI D3-Thermal Aspects

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Abstract : In the manufacturing sector, hard turning has emerged as vital machining process for cutting hardened steels. Besides many advantages of hard turning operation, one has to implement to achieve close tolerances in terms of surface finish, high product quality, reduced machining time, low operating cost and environmentally friendly characteristics. In the present study, three-dimensional CAE (Computer Aided Engineering) based simulation of hard turning by using commercial software DEFORM 3D has been compared to experimental results of stresses, temperatures and tool forces in machining of AISI D3 steel using mixed Ceramic inserts (CC6050). In the present analysis, orthogonal cutting models are proposed, considering several processing parameters such as cutting speed, feed, and depth of cut. An exhaustive friction modeling at the tool-work interfaces is carried out. Work material flow around the cutting edge is carefully modeled with adaptive re-meshing simulation capability. In process simulations, feed rate and cutting speed are constant (i.e.,. 0.075 mm/rev and 155 m/min), and analysis is focused on stresses, forces, and temperatures during machining. Close agreement is observed between CAE simulation and experimental values.

Keywords : hard turning, computer aided engineering, computational machining, finite element method
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