World Academy of Science, Engineering and Technology
International Journal of Industrial and Manufacturing Engineering
Vol:10, No:04, 2016

Chip Morphology and Cutting Forces Investigation in Dry High Speed Orthogonal Turning of Titanium Alloy

Authors : M. Benghersallah, L. Boulanouar, G. List, G. Sutter

Abstract : The present work is an experimental study on the dry high speed turning of Ti-6Al-4V titanium alloy. The objective of this study is to see for high cutting speeds, how wear occurs on the face of insert and how to evolve cutting forces and chip formation. Cutting speeds tested is 600, 800, 1000 and 1200 m / min in orthogonal turning with a carbide insert tool H13A uncoated on a cylindrical titanium alloy part. Investigation on the wear inserts with 3D scanning microscope revered the crater formation is instantaneous and a chip adhesion (welded chip) causes detachment of carbide particles. In these experiments, the chip shape was systematically investigated at each cutting conditions using optical microscopy. The chips produced were collected and polished to measure the thicknesses t2max and t2min, dch the distance between each segments and ϕseg the inclination angle As described in the introduction part, the shear angle f and the inclination angle of a segment ϕseg are differentiated. The angle ϕseg is actually measured on the collected chips while the shear angle f cannot be. The angle ϕ represents the initial shear similar to the one that describes the formation of a continuous chip in the primary shear zone. Cutting forces increase and stabilize before removing the tool. The chip reaches a very high temperature.

Keywords : dry high speed, orthogonal turning, chip formation, cutting speed, cutting forces
Conference Title : ICMET 2016 : International Conference on Manufacturing Engineering and Technology
Conference Location : Istanbul, Türkiye
Conference Dates : April 19-20, 2016