

Tool Condition Monitoring of Ceramic Inserted Tools in High Speed Machining through Image Processing

Authors : Javier A. Dominguez Caballero, Graeme A. Manson, Matthew B. Marshall

Abstract : Cutting tools with ceramic inserts are often used in the process of machining many types of superalloy, mainly due to their high strength and thermal resistance. Nevertheless, during the cutting process, the plastic flow wear generated in these inserts enhances and propagates cracks due to high temperature and high mechanical stress. This leads to a very variable failure of the cutting tool. This article explores the relationship between the continuous wear that ceramic SiAlON (solid solutions based on the Si₃N₄ structure) inserts experience during a high-speed machining process and the evolution of sparks created during the same process. These sparks were analysed through pictures of the cutting process recorded using an SLR camera. Features relating to the intensity and area of the cutting sparks were extracted from the individual pictures using image processing techniques. These features were then related to the ceramic insert's crater wear area.

Keywords : ceramic cutting tools, high speed machining, image processing, tool condition monitoring, tool wear

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