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Abstract

This paper presents a novel prediction method of the yield stress and fracture toughness for ductile metal materials through the metal cutting process based on Williams' Model [38]. The fracture toughness of the separation between the segments in serrated chips in high speed machining is then deduced. In addition, an energy conservation equation for high speed machining process, which considers the energy of new created workpiece surfaces, is established. The fracture energy of serrated chips is taken into the developed energy conservation equation. Five groups experiments are carried out under the cutting speeds of 100, 200, 400, 800 and 1,500m/min respectively. The cutting forces are measured using three-dimensional dynamometer and the relevant geometrical parameters of chips are measured