Influence of ultrasonically assisted cutting on burr formation

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Abstract

Ultrasonically assisted cutting (UAC) is a machining technique where high-frequency vibration is superimposed on the movement of the cutting tool.
Compared to conventional cutting, UAC leads to a higher cutting performance, decrease in cutting forces, superior surface finish and enables machining of intractable materials, such as aerospace alloys, composites and ceramics.
Since machining processes lead to unintentional burring, subsequent deburring is required, resulting in the increase in the overall manufacturing time and component's total cost. UAC has been reported to reduce this burr-formation process as compared to the conventional technology. This paper studies the influence of UAC on the burr formation for various applications by means of numerical simulations. Different FE-models, based on the FE codes MSC.MARC and AdvantEdgeTM, have been developed to compare the burr formation for UAC and conventional cutting. The paper also deals with the effect of UAC on different burr parameters, such as the burr foot width and burr height. The influence of UAC on a region of highly negative hydrostatic pressure in the workpiece below the cutting edge, known as a hydrostatic bowl, and on a burr shear zone, between the pivot point and tool tip, is studied.