Influence of elastic deformation of tool on sheared part quality in axisymmetric shearing process

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ABSTRACT

Shearing is one of the most important processes as cutting, because of its high productivity and high yield rate. To get high quality parts, all related process parameters have to be understood and optimized for any applications. However the influence of the tooling parameters on shearing quality is complex. For example, the clearance between punch surface and die hole surface is an important process parameter on sharing. It is optimised for shearing surface length and burr height from the viewpoint of workers' experience. It will change in shearing process because of elastic deformation of punch and die. Therefore the change in the clearance affects on the quality of sheared part.

In this study, first of all, the amount of elastic deformation on an axisymmetric shearing die was measured. The change in clearance was evaluated and sheared part quality, sheared surface length and burr height, was investigated. As the results, the influence of the elastic deformation of tool on sheared part quality in axisymmetric shearing process was showed.

Deformation analyses of axisymmetric shearing were performed using FE analysis. Damage progress in carbon steel plates in the processes was investigated and influence of shearing type on initiation timing and progress speed of shearing crack. Shear droop height, shearing surface and fractured surface length and burr height obtained by the analysis were coincided to the results of shearing experiment. The effect of the clearance increment on shearing quality was clarified. In addition, influence of stress state of tool edge on damage progress and shearing behaviour was showed.

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