Punch force behavior during micro v-bending process of the copper foil

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Abstrak

Sheet metal bending is defined as a straining process of flat strip material around a linear axis. The micro V-bending process was conducted to investigate its punch force behavior with 0.1 mm thick copper foil. The V-shaped configuration of the punch and die provides a simplicity of tools and an ability to produce different bending angles with a single tool. During the straining of material, a unique force profile, which is related to punch trajectory, occurs. The process was performed with the punch speeds 0.5 mm/s, 1.0 mm/s, 5.0 mm/s and 10.0 mm/s. The results showed that the punch force profile consists of the free-bending stage and the coin-bending stage. In the free-bending stage, the force magnitude was not influenced by the punch speed for the same geometrical and mechanical properties of the sheet material. Furthermore, during the coin-bending stage, the force magnitude increased significantly since the material needed to be bottomed.