

THE EFFECT OF COMPRESSION AIDED BY SHEAR STRESS ON MATERIAL VOID CLOSURE

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Consolidation of material voids is one of the most important goals of the primary metal forming processes. The paper describes a metal forming method where compression is accompanied with transverse, reciprocating motion of a die. It causes additional shear stresses in a workpiece which change in an oscillatory manner. In consequence, a severe plastic deformation can be obtained. A series of experiments and corresponding simulations has been conducted in order to evaluate the effect of additional shear stresses generated during upsetting on material void closure behaviour. The usual upsetting tests have also been performed for comparison. Drilled workpieces have been used in both cases, with voids located in several specific areas on their cross-sections. Two different void orientations towards the transverse punch motion and three variants of the compression process have been analysed. The most important benefits that can be achieved by incorporating additional, oscillatory-changing shear stresses in primary metal forming processes have been presented in a summary.

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