ABSTRACT

An axisymmetric extrusion-forging problem is theoretically analysed. Solutions can be used to predict the extrusion-forging force and the average pressure developing on the container-wall. The dependence of the average pressure of extrusion-forging and the average container-wall pressure on friction and on the geometric parameters viz. extrusion ratio, position of the extrusion-hole and the length (thickness) of the workpiece is analysed. The analysis is made for both steady state and non-steady state conditions.

The theoretical analysis is done by using the upper-bound method and the slab method (stress-equilibrium method). For the upper-bound analysis Kudo's parallel and triangular velocity fields and Kobayashi's velocity fields with curved surfaces of velocity discontinuity are used. The relative merits of these velocity fields in finding the average pressure are studied from the theoretical results. Besides being convenient to use, parallel velocity field gives the lowest value of average pressure for a wide range of billet dimensions. The solutions of average pressure obtained from the upper-bound method using parallel velocity field and from slab method analysis are closely similar. The slab method of analysis gives expression for finding the container-wall pressure.

Experiments are conducted and the results are compared with the theoretical ones. The theoretical results are also compared with the experimental results of previous workers.