

THE RESEARCH OF COLD VOLUME STAMPING PROCESSES OF BILLETS FOR PUMP PISTONS AND DEVELOPING TECHNOLOGY FOR THEIR MANUFACTURING

Tarasov M.M., Laktionov E.V.

Scientific advisor – Ph. D., Senior researcher Levchenko V.M.

National Technical University «Kharkiv polytechnic institute»

(Ukraine, 61002, Kharkiv, Kyrpychova str., 2, chair of treatment of metals by pressure, phone (057)707-60-40)

E-mail: omd.kpi.kharkov@ukr.net

The plunger (piston) pumps are widely used in water supply systems, in food and agriculture industry as well as in everyday life. The pistons (Fig. 1) are important parts of the pumps. Currently, the pistons of pumps are made by cutting from a rod. This technology is characterized by high labor inputs and low (less than 0.5) coefficient of material using. The material for the pistons is steel 18XГТ.



Fig. 1 – Piston with pivot of axial hydraulic pump

One of the most effective processes for manufacturing parts of this type is cold extrusion. The main advantages of cold extrusion are: it is a high-performance process, there are practically no metal losses and the manufacturing accuracy is such that only finishing operations (grinding and polishing) are required. In addition, cold extrusion leads to significant hardening of the metal, which in many cases makes it possible to abandon the very labor-intensive heat treatment operations.

The several variants of the technology have been considered for the manufacturing of pistons: extrusion of the piston billet for two operations, extrusion of the piston billet for three operations and extrusion of the piston is performed together with the aluminum core for three operations. Using finite element modeling, strain forces were obtained, the stress-strain state of the billet was researched and the degree of utilization of the plasticity resource of the material was determined for all three variants of the technology. It is shown that for the first technology of piston billet extrusion, due to the features of the punch construction, considerable loads take place at the first operation, that reduces the tool durability, and using extrusion for three operations (the second variant of technology) allows to reduce load on the tool. Separate producing of the piston body and aluminum core requires using of certain methods of their assembling. One of the most common ways of assembling these elements is rolling, but this method is not very reliable and requires very precise control. It was determined, that the quite promising technology is the extrusion of piston together with aluminum core.