Programming and control of actuators from a hydraulic press for incremental precision forging

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Abstract

One of the methods used for metal forming is forging, a process in which the raw material is plastically deformed in generalized intermittent cycles. The main purpose of this project is the determination of a sequence of movements of hydraulic actuators used in a multidirectional press that allows obtaining forged products with complex geometry and low production of flash. To do this, a programming of logical control for the hydraulic circuit that performs a technique called incremental forging is being developed.

Key words: metal forming, programmable logic controller, hydraulic system.

Introduction

The current search for technological improvements led to new approaches, as the near net shape forming, a technique which can reach the desired size and shape in just one step, reducing the production of flash and avoiding subsequently machining processes [1]. Another significant advance was multidirectional forging, which uses multiple hydraulic actuators with integrated movements, enhancing the part geometry and reducing the time spent in the forming process [2]. In this context, the project's aim is to develop a PLC program to control the hydraulic cylinders of a forging press.

Results and Discussion

Using the CPS-4310 programmable controller and the MasterToll IEC® software, a hybrid code consisting of organization units (POUs) based in ladder, structured text, sequential function chart and instruction list IEC languages was created. It was developed an automatic sequence which allows the placement of the raw material and performs the desired movements, with the assistance of inductive sensors. Moreover, the original manual mode was modified to improve the control over the actuators.

Conclusions

The hydraulic press is still being assembled and a grant extension request was sent to FAPESP in order to add a type-K thermocouple to the system along with an instrumental integrated circuit.

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