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Measuring Wear-resistance of AISI 1.7225 Steel under Various Heat Treatments: Hydraulic spool valve

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Abstract

Producing mechanical components with long time functioning is a vital issue in the advanced industries. Wear is one of serious difficulties which prevents from achieving desires. The objective of present study is how wear-resistance of a spool valve, which is an important part of hydraulic valves, can be improved. Hence, different heat treatment methods were implemented to harden the surface layer of this component which is an AISI 1.7225 steel. Wear-resistance measurement test coupled with roughness and distortion tests have been performed to run this analysis. Furthermore, a vision measuring microscope was used to investigate the quality of surfaces that impaired by the wear test. As a result of this work, it was revealed that surface hardening methods generally outperformed the bulk hardening process. In particular, carburizing surface hardening method generates the surfaces with ability of high wear-resistance and better surface quality compared to the other heat treatment processes used in this study. Moreover, highest distortion occurred in the spool valve when gas carburizing heat treatment method has been carried out.

Keywords: Wear-resistance; measuring; spool valve; heat treatment; roughness; distortion.

1. Introduction

Applying hydraulic systems to control the functioning of different types of mechanical devices is a widespread method in the advanced industries. A spool valve is a controlling component of a hydraulic system. It is placed inside the valve body in order to moves between relief, opened, and modulating positions for directing the fluid flow [1-3]. By improving in the accuracy of hydraulic systems, spool valves with the qualities such as high accuracy and high wear-resistance are needed. Thus, the wear of this component can produce some difficulties inside of valve body like a large gap between the spool and valve body which results in the greater internal leakage. Based on statistics,

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