TECHNICAL DIAGNOSTICS OF HYDRAULIC SYSTEMS

Fatyeyev O., Fatieieva N., Poliakov V.
National Technical University
«Kharkiv Polytechnic Institute», Kharkiv

Changes in the technical condition of a particular hydraulic unit have different effects on the reduction of machine productivity. The greatest reduction in machine performance occurs when pump efficiency is reduced. The operating time of individual hydraulic drives (hydraulic motors and hydraulic cylinders) is between 5 % and 25 % of the pump operating time, and that of individual distribution devices is 15–30 %. A study [1] shows that the determination of hydromechanical efficiency according to ISO 4409 can lead to an error of even more than 15 %. Also for digital piston machines and machines that use check valves for switching, the ratio will depend on the valve phases and the valve dynamics of the inlet and outlet valves.

New definitions of total losses, hydromechanical losses, and volumetric losses are considered in this paper. It is shown that it is possible to determine both the general energy efficiency and the hydromechanical efficiency. Although ISO 4409 does not provide any equations for calculating power losses, these equations can be derived from the efficiency definitions in ISO 4409. Thus, it is proposed to correct these loss equations to include the effects of the compressibility of the working fluid, which will reduce the impact on the overall error [2].

A set of tools for diagnosing hydraulic systems has been developed and reviewed, which makes it possible to assess the actual state of hydraulic equipment in real conditions [3]. Testing of pumps and hydraulic motors is proposed to be carried out according to the specified schemes and with the help of the developed set of diagnostic tools [2]. Thus, it is possible to build the real characteristics of the units, taking into account the power loss, which can vary depending on the pressure level, liquid temperature and the amount of air dissolved in the liquid.

References:

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