

Hydraulic system with the automatic regulator of liquid flow and investigation of its operation

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Abstract

© 2016 Authors. Ensuring functioning of a hydraulic system requires the liquid consumption regulation given to the consumer. In hydraulic actuators by change of the liquid consumption regulation of the movement speed of an output link of the hydraulic engine is carried out: the movement speeds of the hydraulic cylinder piston or rotation frequency of a hydraulic motor shaft. In this work with the purpose of increase in efficiency of a hydraulic system and hydraulic actuators it is offered to use in them the most economical way of the liquid consumption regulation due to change of shaft rotation frequency of the pump engine. Schematic diagrams of a hydraulic system and hydraulic actuators with the automatic regulator of the liquid consumption are developed. For the drive of the pump the electric motor of alternating current is used. Shaft rotation frequency of the electric motor is regulated by the frequency converter. The linearized equations of dynamics of separate links of a hydraulic system from which after an exception of some variables the equations of dynamics of system in general are received are worked out. All equations are written down in a dimensionless form in relative deviations from a nominal operating mode of system. By consideration of hydraulic actuators the equation of dynamics of the hydraulic engine is in addition considered: hydraulic motor or hydraulic cylinder. At the same time the equations of dynamics of the pipeline and the hydraulic engine are replaced with one equation describing dynamics of the integrated link "the pipeline + the hydraulic engine". The research of stability and accuracy of functioning of a hydraulic system and hydraulic actuators is conducted. Accuracy of functioning is understood as the requirement that deviations of a consumption of the given liquid from its calculated value remained in advance set limits. Stability conditions are received on the basis of Rauss - Gurvitz criterion, and for the solution of a problem of accuracy of functioning the method of functions of Lyapunov is used. The results received in article can be used at design of various adjustable hydraulic systems and hydraulic actuators for the rational choice of values of the parameters providing stability and accuracy of their functioning.

Keywords

Dynamics equation, Hydraulic actuator, Hydraulic system, Stability and accuracy of functioning, The liquid consumption regulation

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