

Abstract

An experimental and theoretical simulation study has been carried out in the present work, in order to study the effect of adding a hydraulic accumulator to the hydraulic system.

Theoretical modeling for the main parts of the hydraulic system was studied, to determine the transfer function for a short and long pipe line.

Simulation analysis for the hydraulic system using **MATLAB. R2010b** to study the stability of the system, by drawing the (Bode diagram) depending on the transfer function (TF). Also a physical simulation test was made to show the effect of the accumulator when it's connected to the system for the different parameters.

Simulation analysis of hydraulic system using **Automation Studio (AS) package V5.2** for the same system which is exist in the experimental test. The system have been built and tested by computer to measure different data, such as the rotational speed of hydraulic motor and the linear speed of hydraulic cylinder and to study the effect of connecting the accumulator with the system.

The hydraulic system test bench existing at the Fluid Mechanic Laboratory/University of Technology has been developed to meet the requirements of the experimental work.

The experimental work includes using measuring devices with interface to measure the pressure of the system and the vibration of the system directly by computer so as to show the effect of accumulator graphically and for real conditions.

The effects of hydraulic accumulator for different applications have been tested, such as the effect of using the hydraulic accumulator as; (energy storage for linear and rotational actuator, leakage compensating for a short and long pipeline, to cushion the vibration of the system, emergency unit and as shock absorber). All these tests have been done, and the results showed that the hydraulic accumulator has a great benefits and a large enhancement to the hydraulic system. Also, the comparison between the experimental results and simulation results showed that the result is so closely and acceptable, and a comparison with the previous works also showed a convergent results.