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SIMULATION OF RESPONSE IN DYNAMIC LOAD OF HYDRAULIC ACTUATOR SYSTEMS WITH CARTRIDGES LOGIC ELEMENTS

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ABSTRACT

This study presents a system for dynamic modeling of linear hydraulic motors. The example presented in this paper demonstrates the use of SimHydraulics ® analysis medium for simulating a complex hydraulic system equipped with cartridges logic elements, which enables flow distribution in the system. Modeling actuating system allows obtaining information on the response of the system even in its design phase.

Keywords: hydraulic, cartridges logic elements, modeling SimHydraulics ®, dynamic analysis medium

1. INTRODUCTION

Logic elements are being used more and more frequently in press control, often grouped together into control modules. In this sense, a module is either a closed or opened loop control circuit incorporated into a manifold block. This can be extended or modified by the addition of a further module or extra hydraulic components.

A complete hydraulic control is produced by a number of modules. The functions of a basic module can be extended by addition of other modules.

The study presented in the paper approaches the issue of modeling the response under dynamic load in a hydraulic actuating system with linear motor and distribution made with cartridges logic elements used in fixed drives especially presses.

Modeling the system uses SimHydraulics ® analysis medium. This involves modeling working conditions of hydraulic linear engine, movement of the piston and viewing pressure variation in the system.

Sizing the components of the model is realized by default since it follows the response of the hydraulic system.

The proposed model for the analysis applies best when shareholder power and large volumes of fluid pumped, large presses that are specific cadence.

In this case, the use of distribution blocks reduces the overall size of the entire hydraulic circuit, respectively, of losses of any nature and increases the overall equipment efficiency.

2. ANALYZED MODEL

For simulating the functional response using SimHydraulics ® analysis medium, in Fig.1 is presented the proposed scheme for the study. It contains structural components necessary for the operation and visualization response under dynamic load.

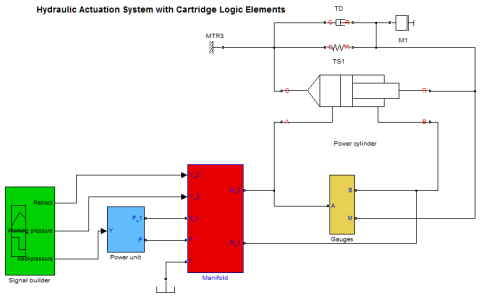


Fig.1. Block diagram of the hydraulic system

3. OPERATING SYSTEM STRUCTURE-BLOCKS

The main element of functional simulation are cartridges logic elements integrated in the distribution block assembly.

This includes all elements flow routing, the most important being cartridges logic elements, representing components of command and direction for the flow and thus linear motor functional program. In the following schemes (Fig.1) are specified the operational blocks.

The main component of the hydraulic system, the distribution block with cartridges logic elements is shown in (Fig.2), with corresponding connections for installation.

Other blocks, power block, block control signals, gauge block do not require a detailed presentation.

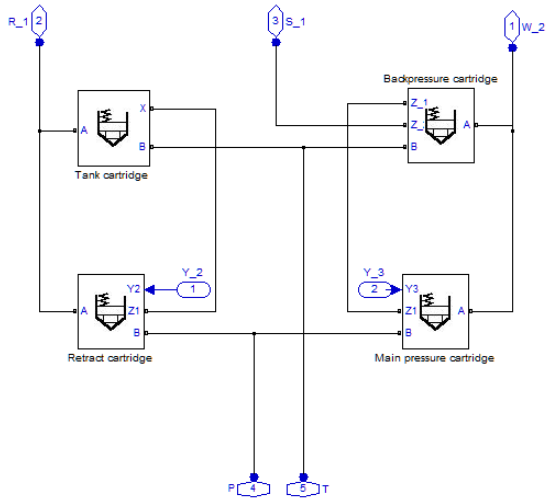


Fig.2. Distribution block diagram

4. DEFINING THE SIMULATION FUNCTIONS.

Fig.3 presents Simulink scheme for descent function (pressing), which is the base for motion simulation phase in the dynamic load of the linear engine piston.

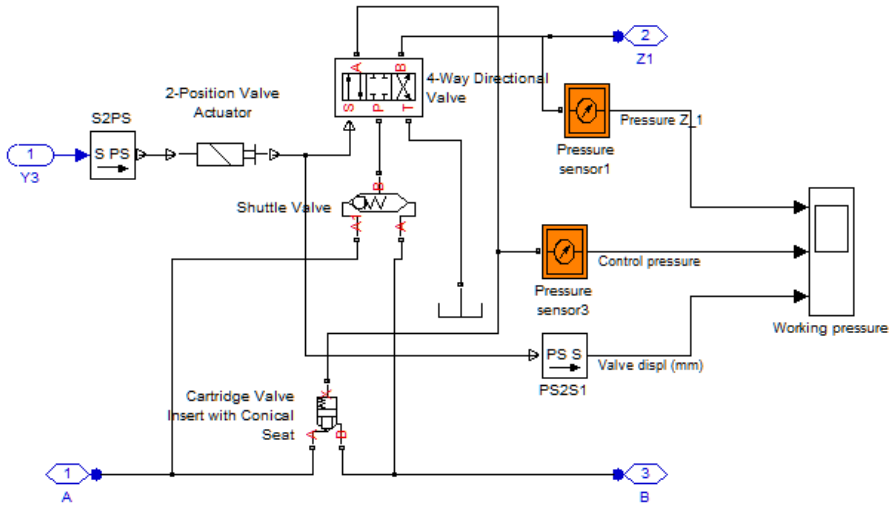


Fig.3. Lowering Phase of piston

Fig.4 presents Simulink scheme for withdrawal function (lift), based on which is realized motion simulation phase without dynamic load of linear engine piston.

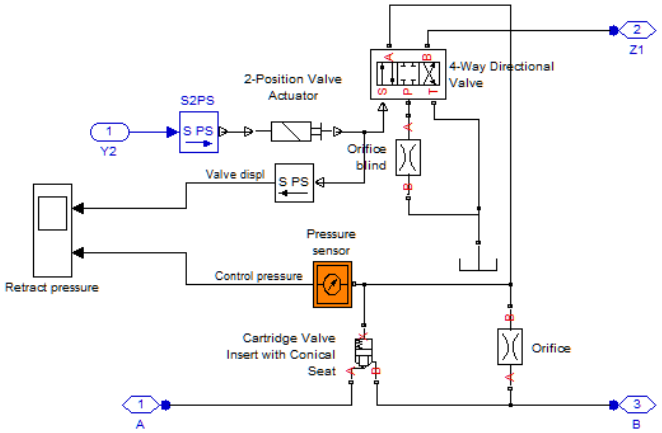


Fig.4. Phase of piston lifting

In Fig.5 are reported linear motor construction data necessary for modeling and functional simulation

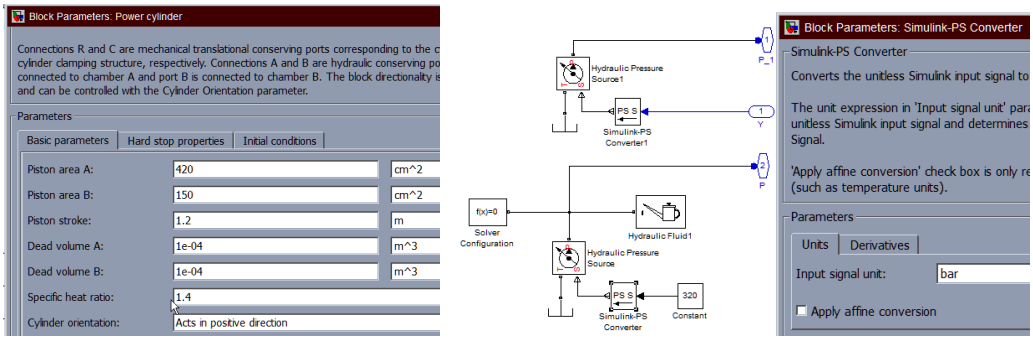
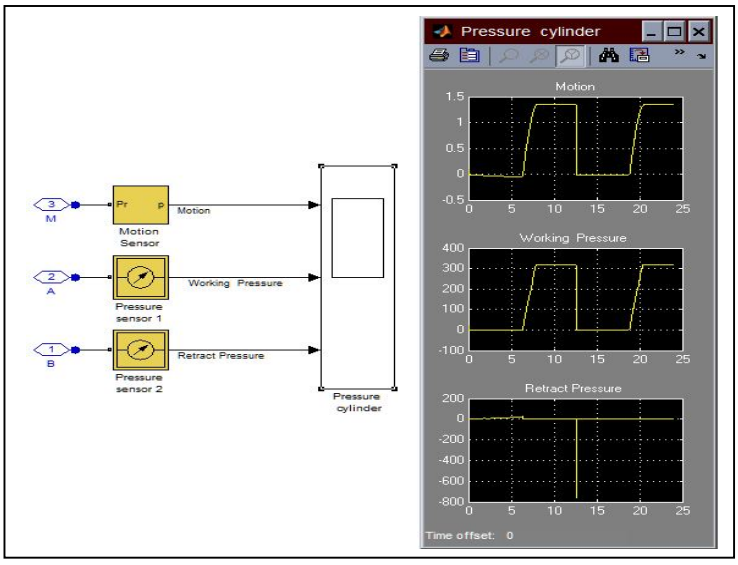


Fig.5. Constructive data of the installation

5. MODELLING RESULTS

Simulink scheme for measuring function



Graph function shows the result of modeling the dynamic response in charging of hydraulic actuator systems with cartridges logic elements.

Characteristics of pressure and displacement are in phase and show a continuous increase, without blockages or functional disorders of cartridges logic elements in the final actuating stage (closed or open).

6. CONCLUSIONS

As a result of simulation of response in dynamic load of hydraulic actuator systems with cartridges logic elements we can state the following:

- MATLAB analysis environment / SimHydraulics ® allows functional simulation actuating facilities with medium and large complexity and obtaining useful information since the scheme design phase and sizing of components;
- Cant make different types of action in order to optimize the operating system and avoid high power consumption;
- The evolution actuating system analyzed in the study shows that the operation is stable and accurate.

Logic elements covering directional and pressure functions built into modular units offer the following advantages and conventional piped system:

- compactness
- individual elements may be matched to the flows required
- piping is very much reduced
- a number of circuits funtions can be achieved with one arrangement of valves.

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