

MODELING AND SIMULATION OF A PUMP CONTROLLED MOTOR WITH LONG TRANSMISSION LINES

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Abstract: In this paper are given different mathematical models of the pump controlled hydro-motor with long transmission flow lines and the flow lines effects analysis on it's stability and response. The simulation results are obtained by using the Matlab-Simulink.

Keywords: hydrostatic power transmission systems, dynamic behavior, long transmission line

1. INTRODUCTION

The pump is connected to the motor via line (pipe, tube) that could in some applications, such as mining, construction machines, heavy machines and remote control systems, be very long. In accordance with their strong behavior demands, for example, a motor is commanded to change to a different speed (from very low speed to very high speed and vice-versa) for short time. In such case the dynamics of the system must be considered, that is, the dynamics of the all elements coupled in the system (pump, line, motor etc.) must to be considered. Moreover, having servo control of that system, the dynamics of the coupled system becomes more important. Authors of this paper assumed usual type of a servo hydrostatic power transmission system with a variable- displacement pump and a fixed-displacement motor as shown in Fig.1. The coupled subsystem pump-line-motor is shown in Fig.2.

The modeling of fluid transmission line has received a great deal of attention over the past few decades (from

about 1950) [1-3] and there are several hundreds publication that could be quoted relating to different theories and applications for air, water and oil hydraulic systems [4-6]. The effect of transmission line dynamics on the dynamic behavior of fluid power systems was studied by J. Watton [7]. Simulation and experimental analysis of dynamics and control of pump controlled motor are presented in [8-10]. Some results in regard to dynamics of pump controlled motor with long transmission line were presented in [11-13]. This paper presents analysis on dynamic behavior of pump controlled motor with long transmission line based on different mathematical line models in frequency and time domain.

Previous analyses did not include the analysis of stability and response of the automatic regulation system of a pump controlled motor from the aspect of the length change of a transmission line. Therefore the results of such analysis are presented in this paper.

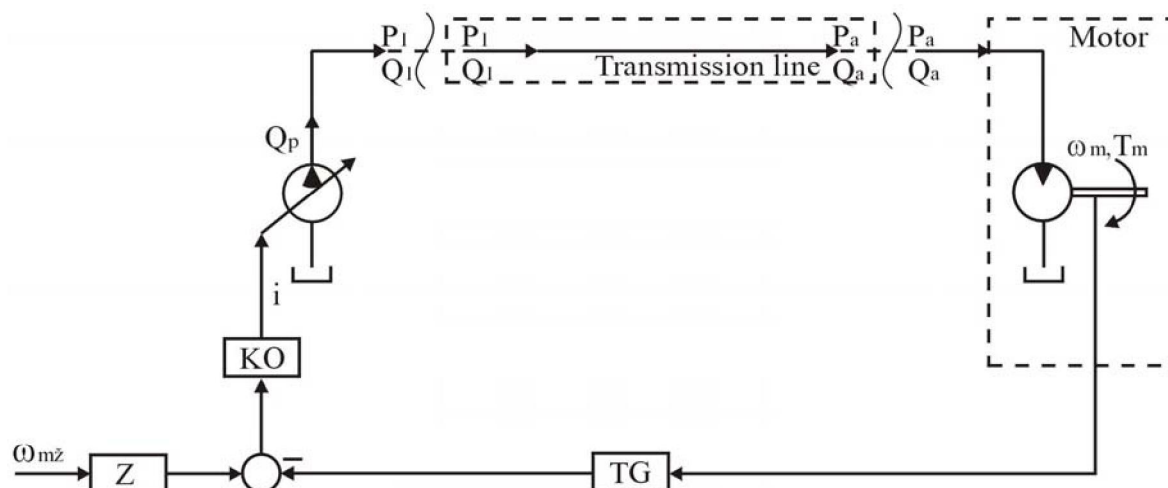


Fig.1. Symbolic diagram of the servo pump controlled motor

