

MATHEMATICAL MODELING OF DYNAMIC PROCESSES OF CONTROL SYSTEM OF HYDRAULIC DRIVE OF BELT CONVEYOR WITH VARIABLE LOAD

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Abstract: For built-in hydraulic drive of belt conveyor which is equipped with two hydraulic motors mounted in parallel a control system is proposed in order to activate the second hydraulic motor when the load exceeds the rated load by a given value. The control system duty cycle diagram and computational scheme are developed, differential equations are composed, which describe a movements of its movable masses as well as fluid balance equations for phases of forward and backward strokes of shut-off-and-regulating element and unambiguity condition.

Keywords: built-in hydraulic drive, belt conveyor, control device, mathematical model.

1. Introduction

The conveyor used in agricultural machinery, deep mining, open mining, food industry processing, etc. is characterized by variable loading modes, which implies that under certain conditions of increased pressure, the conveyor's urgent stoppage is necessitated to avoid breakage.

Freight traffic coming onto the conveyor belt is characterized by great irregularity, interruptions in the receipt and are usually arbitrary in nature and described as stochastic processes. In addition, receipt and distribution of the freight on the belt may vary according to different laws [1]. Uneven ratio of freight traffic can be within 1.97...2.02 [2].

2. Results

Executive links of the control system (CS) of hydraulic drive of conveyor with variable load (Fig. 1) are two hydraulic motors HM1 and HM2 to which the working fluid flow Q_{M1} and Q_{M2} is supplied from the pumping station, which has expenses Q_H and the plunger of half-coupling of friction clutch that switch-on transmission mechanism of the second hydraulic motor HM2 with reduced mass m_3 .

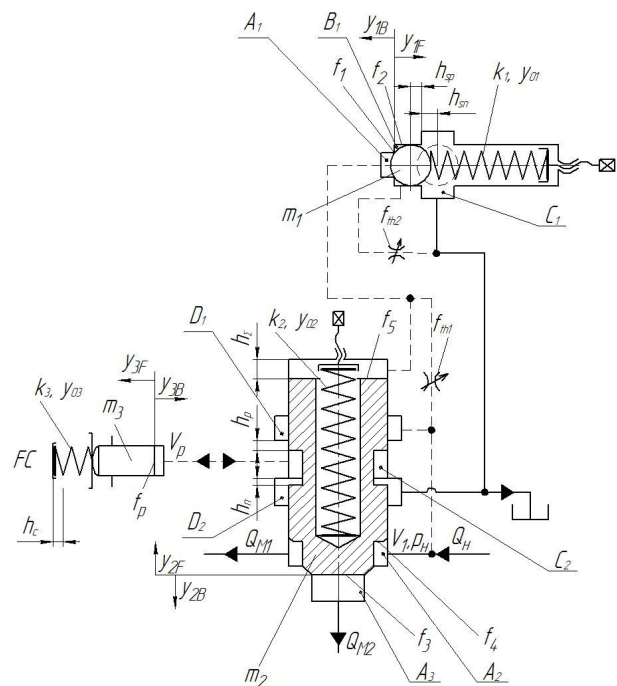


Figure 1: The computational scheme of control system of hydraulic drive of conveyor with variable load

Plunger interacts with the pressure device of disks of half-coupling that is loaded by a spring with stiffness k_3 . At this stage of the research, we assume the axial force F_a of compression of discs takes to be a constant that corresponds to the final stage of switching coupling.