

# **Numerical Analysis of the Peculiarities of Flow Rate Adjustment in Armature Vibrating Pump in Hydraulic Systems Applications**

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## **Abstract**

The paper refers to the equipment for the espresso production process and the peculiarities of hydraulic systems and pump functioning. It presents a new approach in modelling and simulation of the armature vibrating pump by using Space-State modelling for describing the spool displacement and the differential twin-cylinder functioning. The objective of this paper is to investigate the level of the adjustability of the solenoid pump in various hydraulic pressure conditions. The tank- or reservoir type of coffee machine uses this type of pumps, and they are calculated and chosen for a specific flow rate and, as a result, these machines can deliver just one product at a time, thus reducing the productivity of the production process. The objective of the present research was to analyze the adjustability of a solenoid pump and offer a solution for the flow rate control for the hydraulic systems with this type of pump. The simulation results based on the State-Space model of the pump show that the adjustability of the hydraulic systems which use this type of pumps have some limitations. The type of designed system should consider these limitations, however, at the same time the dependence of the current through the inductor coil is linear and directly proportional to the pump functioning, and the output flow rate can be precisely controlled.