Determination of the law of control pressure change over the valves of a pneumatically operated micropump

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The purpose of this research was to carry out mathematical simulation of a membrane pneumatically operated micropump. Such pumps are widely used to circulate the medium in microfluidic devices applied in various fields of science and technology. A micropump consists of three thin-walled membranes: two valves and one membrane of the working chamber. The pump is operated according to a special algorithm by alternating supply of compressed and vacuum air to the membranes of the valves and the working chamber from the control unit. Definition of a new pressure value over the valves and the working chamber is not instantaneous, so a limitation is imposed on the switching frequency of the valves and the working chamber. The purpose of the work is to determine the law of pressure change over the membranes and to find a limitation on the frequency of their switching. Dependences describing the increase and decrease in the pressure value above the working chamber are obtained and tested experimentally on a specially designed stand. The results of mathematical modeling are in good agreement with the experimental data.

Keywords: *micropump, membrane, microfluidic device, pneumatic drive, transient process*

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