18. Modeling of pneumonozzle system work

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Introduction. The purpose of the study is to develop a formalized approach to the simulation of kinematic and dynamic analysis of a pneumatic blower unit of the ejection type in the environment of PP FluidSim with CFD modeling.

Materials and methods of research. Outgoing long-time simulations are selected: conical pneumatic hook with different sections of the confuser; restriction of the input pressure in the range from 3 to 6 bars; conditions for the arrangement of the nozzle - a variable angle of the confuser in the range from 30 to 60 degrees, the length of the nozzle from 5 to 25 mm. The mathematical model is constructed taking into account the laws of ultraviolet body transference, the motion of Newtonian fluid and gas through a nozzle; the law of continuity of the work flow. Adiabatic leakage velocity was determined as:

$$C_{ад} = \sqrt{\frac{2k}{k-1} RT`_0 \left[1 - \left(\frac{P_c}{P`_0}\right)^{\frac{k}{k-1}}\right]},$$

where T'_0– absolute temperature in the nozzle, K; Pc/P'_0– relation of pressure at the entrance and at the experimental section of the nozzle, Pa; k – coefficient of adiabatic, R – gas constant.

Result and discussion. Changing the velocity flux across the pneumatic nozzle, assuming assumptions about the working environment, is depicted in Fig. 1.

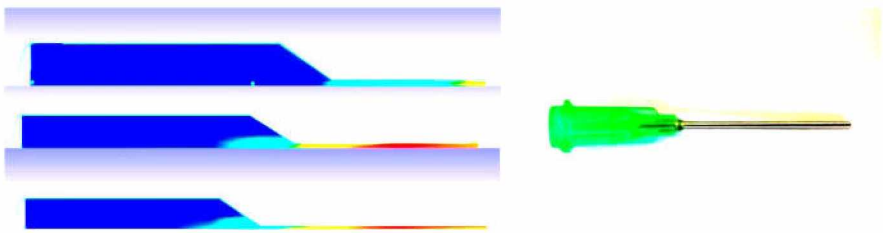

Fig. 1. a – Distribution of the flow rate of the stream in the flow of the experimental working environment at an angle of confusion 60°; b – real nozzle.

Conclusions. The research was carried out to determine the sufficient number of nodes of the design grid of the experimental pneumatic tube. The value of maximum and minimum possible pressure change inside the confuser section when using different working media is obtained. During the irregularization of the data of the physical and simulation experiment, the error of the pressure change at the outlet of the nozzle was within 1.5%. The obtained results allowed to choose the design of a pneumatic molding with minimum destructive properties under pressure at the exit for a length of 15 mm.