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The definition of the integral characteristics of the process of formation of cavitation bubbles when operating the control valve

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Statement of the Problem: The efficiency of the control equipment for the transportation of fluid flows depends on the degree of protection of the valve from the undesirable effects of cavitation phenomenon. The study of the formation of cavitation bubbles at the initial stage of hydrodynamic cavitation in a flowing part of the control valve allows identify from a set of its constructive-regime parameters to identify the main factors influencing the evolution of bubbles. Despite the existence of various deterministic and stochastic descriptions of this process, the modeling problem is relevant. The purpose of this study is to determine the integral characteristics of the process of formation of cavitation bubbles when operating the control valve.

Methodology & Theoretical Orientation: On the basis of the stochastic approach, the model of formation of cavitation bubbles proposed by the authors is used. The application of the formalism of process Ornstein-Uhlenbeck with the description of stochastic energy of a spherical bubble depending on its radius and the velocity of the center of mass allows using the differential distribution function of the cavitation bubbles according to their sizes for the estimation of the integral characteristics of the process.

Findings: The simulation results allow to evaluate average values for the radius of the cavitation bubble, surface area of bubble and to estimate the volume of a cavity in the initial stage of hydrodynamic cavitation, depending on constructive-regime parameters of flow area control valve.

Conclusion & Significance: Modeling the initial stage hydrodynamic cavitation can be performed from the positions of the stationary and homogeneous Markov process. The results obtained here can be used in the formation of methods of engineering calculations of control valves.

Biography

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