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MODELLING OF NON-STATIONARY REGIMES ALONG MULTI-LINE LINEAR SECTIONS OF THE PIPELINE

The **aim** is to model the gas transportation regimes on a multiline linear section of a gas pipeline. This issue should be considered from the perspective of gas transportation in non-stationary modes under conditions of rapid changes in gas flow parameters. This is the task of high priority in the gas industry and energy sector because we can solve such problems as ensuring the safety and reliability of gas pipeline operation modes, operating efficiency, reducing gas losses, planning maintenance and repairs. These issues become especially critical, when the gas flow parameters at the inlet or outlet of a multiline linear section of a gas pipeline change rapidly, that is, in emergency or abnormal situations.

Results. The paper considers a mathematical model of non-stationary gas flow regimes on a multiline linear section of a gas pipeline. It consists of several parallel pipes of a given diameter with a common input and output.

The structure of multiline linear section of gas pipeline we will model using a directed graph that has two vertices, which we denote as 1 and 2, where 1 and 2 are the input and output of the pipeline section, respectively, and specified number of arcs corresponding to their sections of the pipeline with certain lengths and diameters, going from node 1 to node 2.

Mathematical model of a non-stationary non-isothermal regime of gas flow along multiline linear section of given structure will look like as interconnected system of quasi-linear partial differential equations of the first order, corresponding to the graph arcs. The matching conditions at graph vertices 1, 2 are given by linear algebraic equations. Mass flow rate, pressure and temperature in corresponding pipeline section are significant parameters. The boundary conditions and initial distribution are assumed to be given. Pressure and temperature are specified as functions that depend on time in node 1, mass flow is set as a function of time in node 2. The stationary gas flow regime is taken as the initial distribution.

As a numerical method for solving the system of equations of the mathematical model, at the initial stage it is proposed to choose the finite difference method using an implicit finite difference grid.

Conclusions. The proposed mathematical model can be used for modelling and analysis of non-stationary non-isothermal gas flow regimes on multiline linear sections of a gas pipeline in emergency or abnormal situations and making appropriate decisions to prevent unforeseen consequences of such situations.