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Hydraulic and, in particular, pipeline systems play a rather essential role in the national economy. Thus along with rapid growth of the main pipeline transportation of oil, gas and water at the distance of hundreds and thousands kilometers the basic place is occupied by the municipal and industrial function of pipeline systems.

A hydraulic calculation of the long-distance pipelines transporting hot water or water steam is one of the major engineering problems. Complexity of the problem is connected with the fact that the heat-carrier should cover huge distances before it will get to the consumers.

The mathematical models describing networks with a great number of divisions represent nonlinear equations systems of higher dimension. Because of the great complexity of real objects old methods of their modeling and calculation demand their constant perfection, and also working out of new methods is necessary.

At the same time, different calculation methods are used to determine flow distribution inside the pipeline.

In this work a nodal accounting method has been chosen. A hydraulic network takes the form of an oriented graph and for its calculation a graph's theoretical apparatus is used.

The pipeline has been modeled on the basis of MatLab and Simulinc Software tools in order to optimize and advance efficiency of a hot water transportation system for district heating purposes.

The following problems have been solved:

- the structure and the organization of hydraulic networks have been studied;
- the existing calculation methods of flow distribution in hydraulic networks have been investigated, their advantages and disadvantages have been analyzed;
- the existing applications and the software products applied in calculations of hydraulic networks have been considered;
- the most suitable calculation method of flow distribution has been selected;
- based on this method the algorithm allowing to find hydraulics of a long-distance pipeline has been developed.