ASPECTS OF DETERMINATION OF HYDRAULIC RESISTANCE OF POWER FLUIDS

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Flows of power fluids, the construction of expressions for determining local resistance in the stepped channel or tube and in rotation on the base of similar values of hydraulic resistance under the flow of Newtonian fluid are considered in the research paper. The basis of the modelling is the use of the principle of Newtonian fluids hydraulic analogy.

The values of local resistances for constrictions and extensions under Newtonian fluid flow are well known, therefore, the authors sought to identify the main trends in the dependence of the local resistance coefficients on the Reynolds number under the circulation of power fluids as heat carrier in pipes, channels of heat-generating devices.

During carrying out of the work it is shown that the fraction of specific kinetic energy is spent on the local resistance overcoming. This fraction can be represented as the sum of the energy fraction which is associated with the acceleration of the flow, if the constriction exists, or with the inhibition of the flow, if the expansion exists, and turn of the flow at certain angle.

The rotational length is proportional to the Reynolds number and the diameter of the pipe for laminar flow. However, this length is the length of the stabilization and includes both the rotation of the flow line and the acceleration (deceleration) of the flow on the straight line which is located behind the local resistance.

The flow of Newtonian fluid during rotation is determined by the action of centrifugal force, which causes secondary eddy flows and fluid rotation in the channel. The flow in rotary can be presented as a flow with constrictions and extensions for the main flow, which separates from it secondary flows.

However, the size and location of the secondary flows, depending on the Reynolds number, are not known enough. Therefore, another way should be followed on the base of expressions for determining the local resistance and the friction resistance under Newtonian fluid flow. The friction resistance can be neglected for bends with small radius of curvature, since the full resistance is practically equal to the local one.

The obtained in the research paper equations can be used in the calculation of hydraulic pressure losses under the power fluid flow as heat carrier in pipelines and shells of technological apparatuses of chemical and food industries.

Keywords: fluid, Newtonian, power, flow, hydraulic, resistance, friction, local, Reynolds number.