Bilichko A.V., Dem`yanenko O.Y., Kozir T.G., Maksimenko A.S.

INFLUENCE OF PUMPING UNITS ON RELIABILITY AND ECONOMY INDICATORS

Pumping units of thermal power plants to nuclear power plants are very energy-intensive elements (at large power units their power consumption can be 13-18 MW) and have a significant impact on the technical and economic characteristics of power units, in particular - on the share of energy costs intended for the own needs of power plants. The energy capacity of pumping units is determined by the hydraulic characteristics of the network for which they work.

In turn, the network characteristics are determined by the required flow rate of the working environment, as well as the geometric parameters of the network, and the coefficients of local and linear losses.

As a rule, the flow rate of the working medium through the pipeline is determined by the capacity of the consumer (steam generator unit, condenser) or the need to maintain the flow of technological processes (condensate pipelines, oil pipelines, drainage pipelines). The linear dimensions of the pipelines are limited by the layout of the main and auxiliary equipment in the main building or on the general plan of the power plant.

Thus, the variables can be the geometric dimensions of the pipelines, the main one being their internal diameter, as well as the coefficients of local and linear resistances.

The next value that influences the drive power is the total coefficient of local resistance. This value depends on the type and quantity of shut-off, control, safety and measuring valves installed on pipelines, as well as on the profile of the pipeline route (number of bends, tees, etc.).

The most important indicator of the operation of pumping unit pipelines is their reliability, which can be assessed by the readiness factor.

One of the main reasons for failures in pipeline operation is ruptures of pipes and fittings due to an unacceptable excess of equivalent stress in pipelines over the nominal permissible value. Equivalent stresses in pipelines must satisfy the following conditions:

$$\left.\begin{array}{l} \sigma_e^{\text{в}} \leq 1.1[\sigma] \\ \sigma_e^{\text{в.ск}} \leq 1.5[\sigma] \end{array}\right\}$$, Where $[\sigma]$ – nominal allowable stress, MPa.

Relationship between nominal permissible stress $[\sigma]$, the pressure of the transported medium and the geometric dimensions of the pipeline can be analyzed based on the formula for determining the nominal wall thickness of the pipeline.

That is, to increase the reliability of pipelines, it is necessary to carry out strength calculations in order to determine equivalent stresses and compare them with the permissible ones $[\sigma]$ or, asking $[\sigma]$, determine the nominal wall thickness of the pipe.

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