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CRITERIA FOR SELECTING THE OPTION TO RESTORE THE WATER NETWORK PIPELINES

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Abstract. This article discusses the issues of choosing the most legitimate service life of equipment that meets the required level of reliability of water supply, payback period, which is determined on the basis of statistics on accidents and damage to sections of pipes in operation, averaged for any operating conditions of pipeline systems.

Keywords: network, water supply, pipeline systems, residual value, operating conditions.

Of particular importance in the implementation of the program for the modernization of the city's water supply network is the task of timely identification of such sections of pipelines that in the near future will be unsuitable for further normal functioning and their restoration will be required. The functioning of the database (DB) for the operation of pipelines makes it possible to reasonably select the priority objects of repair.And then there is the problem of choosing the type (option) of restoration - to replace the pipe section, or to carry out its sanitation, or to continue its operation by carrying out repair, restoration and preventive maintenance to ensure the maintenance of the pipeline section in working condition.

Currently, replacement or rehabilitation of pipeline sections is carried out on the basis of operating experience and, in some cases, expert assessment. At the same time, the amount of necessary costs for carrying out certain works is estimated promptly as accidents occur, without taking into account specific operating and construction conditions and assessing the level of their reliability, as well as the actual service life of the pipeline.

The basis for making one or another decision to ensure the reliability of pipelines, along with ahigh accident rate of pipeline sections in certain places of the network, an expert assessment of their condition and the end of the standard service life, is the estimated useful life.To assess the useful life of the pipeline, corresponding to agiven level of reliability, an economic-statistical model is used, which reads the actual data on the failure rate of pipelines with different laying periods and various operating conditions. Studies have shown that this service life can be either longer or shorter than the standard service life, which is determined by the impact on pipelines of various external and internal factors, as well as the conditions of construction and operation in a particular case. The share of each factor in the total impact can be different, which is practically very difficult to establish in real operating conditions. However, the sum of the generalized impact allows us to give a reasonable picture of the need to modernize the urban water supply network from both technical and economic positions. In addition, it is obvious that when the pipeline is operated beyond its useful life, the reliability of water supply through it decreases and does not correspond to the specified one. At the same time, the technical feasibility of operating the pipeline in its current state is determined by the correspondence of the actual level of its reliability to that adopted as a standard [1].

Economic feasibility at a given level of reliability is determined by the new (actual) service life and the corresponding depreciation rates, as well as the cost of capital and

current repairs. Taking into account the specifics of the specific operating conditions of pipelines and, if necessary, compliance with the required (specified) level of reliability of water supply, the actual costs of capital, current repairs and depreciation will also not correspond to the normative ones established for average operating conditions.

In specific conditions, they can be either more or less than the normative ones. After assessing the useful life, (at a given level of reliability), there are two options for making adecision on the further operation of the pipeline:

- the first one provides for the investment of additional funds (with the old values of deductions for all types of repairs) to maintain the pipeline's operability at reduced values of the reliability level;

- the second one provides for the possibility of re-laying the pipeline, the operation of which in its previous form has become economically unfeasible, or carrying out special work to restore it (rehabilitation) in order to ensure its working condition with the required level of reliability. In accordance with regulatory documents [1,2], the indicator of the best option is the minimum of the reduced costs. Reduced costs Ppr. for each option, they represent the sum of current costs (operating costs Pek) and one-time costs (capital investments Ps), reduced to the same dimension in accordance with the standard efficiency of capital investments E, or the standard payback period of capital investments current.

That is, we have the following expressions for determining the values of the reduced costs:

$$P_{pr.} = P_s + EP_{ek} \quad \text{minimum}$$
$$P_{pr.} = P_s / \text{Current} + P_{ek} \quad \text{minimum}$$

Thus, the main dictating components of the reduced costs when choosing options for restoring the efficiency of pipelines will be:

- capital costs for the construction of anew pipeline, the residual value of the laid (operated) pipeline by the year of the end of its optimal service life, the year the decision is made, capital costs for repairs, the annual cost of electricity.

According to the existing (not yet canceled) methodology for determining the effectiveness of capital investments, the payback period for capital investments (directive) is 8.3 years. According to this methodology, this meant that the option with the highest capital cost would be more economical if the additional capital cost will pay off by saving operating costs in up to 8.3 years. This deadline was the result of the planned management of the national economy and reflected the level of development of the country's economy.

In modern conditions, there is no centralized management of the economy. Each industry, depending on the level of its economic situation, can invest capital investments in the development of the industry in completely different ways. Therefore, in modern conditions, it is impossible to focus on this period. Some researchers believe that, by analogy with developed foreign countries, it is now necessary to take this period of 4-6 years. But this value of the economic payback period does not correspond to the level of development of the economy of Uzbekistan [2].

Therefore, in our opinion, in relation to water supply and distribution systems, it is most legitimate to consider the issue of the so-called useful life corresponding to the required level of reliability of water supply. It has those advantages over the payback period, which is determined on the basis of statistical data on accidents and damage to sections of pipes in operation, that is, it is not directive, averaged for any operating conditions of pipeline systems.Then, when performing optimization calculations according

to the above two main options, if during the calculation it turns out that the economic service life of the pipeline section will be less than the service life corresponding to the required level of reliability, then this will indicate that the replacement of this section with a new one both technically and the economic side is fully justified.

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