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COST MINIMIZATION OF AUTOMATIC WATER FIRE EXTINGUISHING UNIT DURING DESIGN

Marchuk R., NUCDU
SD - M. Murin., PhD., chair associate professo.r, NUCDU

In modern conditions, when carrying out design development of systems for automatic water fire extinguishing installations (AUVPT), the task is to reduce the cost. The cost of the AUVPT system can be represented as

$$C_{AUVPT} = C_u + C_p + C_f + C_{ea}, \quad (1)$$

where C_u – the cost of AUVPT elements and assemblies (sprinklers, control units, shut-off valves, automatic water feeder, elements of the automation system);

C_p – system piping cost;

C_f – cost of the main water feeder unit,

C_{ea} – cost of extinguishing agent.

If C_u depends on the manufacturer chosen by the system designer, then C_p, C_f, C_{ea} depend on the design parameters of the system. At the same time, the task of determining the design parameters is multifactorial.

The cost of the pipeline for a given topology depends on the diameter. However, a decrease in the diameter of the pipeline leads to an increase in hydraulic losses, which leads to an increase in the required head and flow rate in the system and, as a consequence, to an increase in the cost of the main water feeder unit.

For sprinkler AUVPT, the consumption of extinguishing agent depends on the estimated area, which, in turn, is a function of the room group.

The cost of the pump of the main water feeder depends on its parameters - pressure and flow. At the same time, for sprinkler installations with a given topology, in the first approximation, the pressure and flow rate at the main water feeder can be considered constant. Therefore, the cost of the system will depend on the number of branches in the distribution pipeline network and the diameter of the branch.

Thus, the constructed nomogram makes it possible to find the optimal ratio between the given topology, the cost of the main water supply pump and the cost of pipelines, and, consequently, the diameter of the branch.

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