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# INCREASING THE CONDUCTIVITY CAPACITY OF PIPES

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**Annotation**
This article provides information on the fundamentally new possibilities of reducing hydraulic resistance in pipes, i.e. increasing the permeability of pipes. A fundamentally new method known as the Toms effect results in the reduction of hydraulic resistance in pipe walls as a result of the addition of a small amount (per thousandth) of a high molecular weight polymer to the liquid.

**Keywords:** Hydraulic resistance in pipes,. Toms effect, polymers, engineering structures, polymers surfactant content.

One way to increase the permeability of pipes is to reduce their hydraulic resistance. Recently, fundamentally new opportunities have emerged to reduce the hydraulic resistance of pipes. We are talking about the Thoms effect or the Thoms phenomenon.

The Toms effect is due to the small amount of high molecular weight in the liquid

The addition of a linear polymer reduces the hydraulic resistance of the pipe walls. The practical effect of this method, discovered by Toms in 1948, is obvious, but only

By the mid-1960s, the use of one-millionth of a million water-soluble polymers by a number of authors began to be widely used only after proving that they could halve the loss of pressure in hydraulic resistance.

The mechanism of the Thoms effect has not yet been fully elucidated. However, it has been found that the addition of high molecular weight polymers changes the structure of the turbulent flow, especially near hard surfaces. Here, it suppresses a certain amount of turbulent pulsations (alternating current flow) and reduces turbulent displacement in the flow, thus reducing the energy dissipation of the flow. Research at the Department of Water Supply of the Moscow Institute of Civil Engineering aimed at solving this problem. The research was conducted on steel pipes with a diameter of 15 mm to 100 mm. The effect of Reynolds number, solid particles, polymer concentration, pipe wall roughness and pipe diameter on the reduction of hydraulic resistance was studied. The main studies were performed with a solution of water-soluble polyacrylamide (PAA) at a concentration of 0.004% to 0.012% by weight, with Reynolds numbers ranging from 20 to 500,000.

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The results show that the effect of reducing the hydraulic resistance is as pronounced in pipes with technical roughness as in hydraulic smooth pipes.

Experiments with closed circulating equipment have led to some conclusions that the effect of reducing the hydraulic resistance of a polymer solution in a closed pump-pipe system is reduced. For example, the addition of 0.02% polyacrylamide to water after pumping reduces the hydraulic resistance in the pipe by 75%, while adding it before the pump reduces it by 50%.

The above-mentioned research was also conducted on firefighting equipment. The large flow rate, small diameter, single use of the polymer in the system and the availability of technical equipment (tanks, tanks, mixers, etc.) for the application of polymers in the hoses and nozzles allow to significantly reduce the hydraulic resistance. The experiments were performed on a system consisting of 51 mm diameter rubber hoses, 100 m long fire hoses and a 28 mm diameter nozzle. The results showed that due to the reduction of friction loss in the friction in the sleeves, an increase in the flow rate was achieved at a concentration of 0.05% PAA.

Due to the fact that PAA polymers added to water are surfactants, their aqueous solution can improve the fire-retardant properties of the stream and increase the length of the stream as a whole. It should be noted that the addition of polymers to the water not only reduces the hydraulic resistance, but also increases the efficiency of the pumps, as well as reduces the erosion of the inner surface of the pipes.

Thus, the addition of small amounts (0.004% to 0.012%) of high molecular weight linear polymers (PAAs) to the water content not only reduces the hydraulic resistance in the pipe and fire hoses, but also the p.i.c. This increases the length of the entire section of the flow and reduces the erosion of the inner surface of the pipes.

Adding polyacrylamide (S = 0.02%) to the water stream reduces the resistance in sprinkler and drain fire extinguisher pipes by 67.5%, which increases their permeability by 1.77 times. The addition of polyoxyethylene (S = 0.0002%) to the water reduces the loss of pressure in fire hoses by 40%.

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