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INCREASING THE EFFICIENCY OF HEAT ENERGY TRANSPORTATION

Struchaiev N. **e-mail:** usun105@gmail.com
Postol Y. **e-mail:** yuliapostol111@gmail.com
Dmytro Motornyi Tavria State Agrotechnological University Melitopol, Ukraine.

Relevance and problem statement.

The annual global losses in the transportation of thermal energy are more than 10–20%, and in some regions up to 40% [1]. Development thermal insulation methods for pipelines vary depending on the type of installation, as operating conditions impose special requirements. A significant part of the heating mains has an air gasket [2,3,4]. Therefore, the search for ways to increase the efficiency of using heat insulation plays an important role, since it allows for a long time to reduce heat loss [5,6].

The main research materials.

The research were carried out on a test bench, on which the following samples were installed: horizontal steel pipeline without thermal insulation; horizontal steel pipe coated with thermal insulation aluminum film; horizontal steel pipeline coated with shell-capsule thermal insulation [7]. The temperature in the pipe was maintained by an electric heat generator and was measured by temperature sensors, the signal of which was transmitted to a digital device.

The scheme of the shell-capsule thermal insulation of the pipeline is shown in Fig. 1.

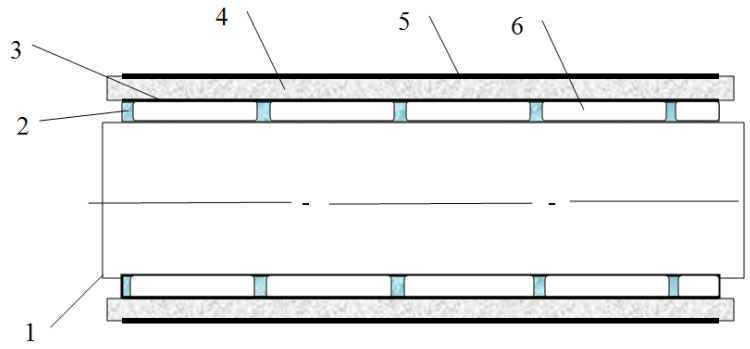

Figure 1. Shell-capsule heat insulation of the pipeline: 1 - pipe, 2 - disk centralizers, 3 - heat-reflecting screen made of aluminum foil, 4 - heat-insulating material, 5 - outer coating, 6 - shell capsules.

The principle of operation of the shell-capsule thermal insulation of pipelines is as follows. Thermal energy enters with the flow of hot coolant to the consumer, while part of it is lost through the wall of the pipe 1. The radiant heat flux is reflected back by a heat-reflecting screen 3 of aluminum foil located with the help of disk centralizers 2 at a distance from the pipe with the formation of shell-capsules 6 between the pipe 1, centralizers 2 and heat-reflecting screen 3 of thermal insulation 4. The shell capsules 6 created by disk centralizers 2 are broken the total air space between the pipe 1 and the heat-reflecting screen 3 into separate cells, which sharply worsens the conditions of convective heat transfer and reduces convective heat loss. The heat energy that has passed through the heat-reflecting screen 3 is delayed by the heat-insulating material 4,

which provides resistance to heat conduction, which also reduces heat loss (Fig. 2). The outer coating 5 protects the insulation from precipitation.

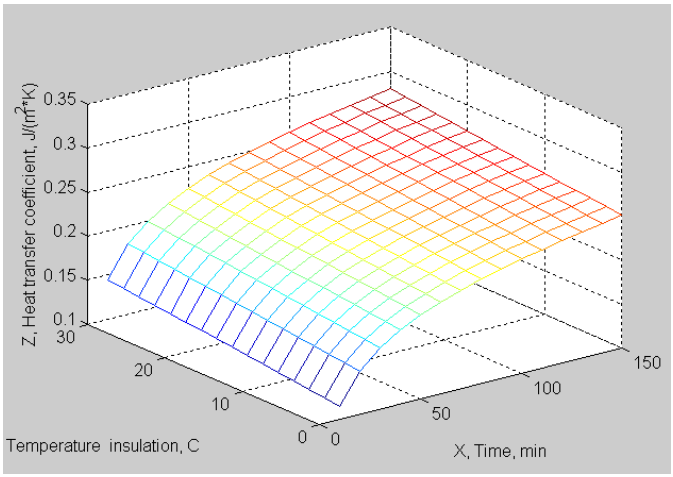

Figure 2. The dependence of the surface temperature of the insulation of the pipeline on the heat transfer coefficient

Conclusions. We proposed: shell-capsule thermal insulation of the pipeline [7]. We determined: that heat losses when using shell-capsule thermal insulation of the pipeline compared to conventional thermal insulation decreased by 18%. The results can be used in the design of thermal insulation of pipelines.

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