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ENERGY-EFFICIENT MATERIALS: APPLICATION IN DIFFERENT FIELDS AND THEIR IMPROVEMENT

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Abstract
This article describes modern technologies in the use of energy-saving materials, the identification of materials with low thermal conductivity and the results of research conducted on them. Preparation of liquid heat-retaining materials and flawless coating on any surfaces, use of heat is covered

Keywords: Energy-saving materials, thermal conductivity analysis, requirements for energy-saving coatings, their advantages.

Introduction

Saving energy, saving it, building and using it is one of the biggest problems in the world today. This is due to limited energy sources, high energy prices and negative impact on the environment as a result of production [1-3].

Thermal conductivity is the phenomenon of the occurrence of heat flow as a result of the deviation of the temperature in its various parts from the equilibrium value in an environment, or the property of the material. This property is considered the most important indicator of construction and thermal insulation coatings. Thermal conductivity depends on the structure of the material, its chemical composition, porosity and the nature of the pores and moisture content. Currently, there are several heat-retaining materials: cellulose, eco-cotton, gypsum-fiber sheet, expanded polystyrene, basalt cotton etc. These materials also have good heat preservation properties, especially the heat preservation property of cellulose is well known in advance [4-6]. At the end of the 19th century, large-scale research was carried out on the study of cellulose material. In 1928, the first production of heat-retaining material from cellulose was launched in Germany. These heat-retaining materials are distinguished by their bio-stability, sound insulation, and ease of use. However, it is considered to be a disadvantage when it becomes thick, becomes dusty during installation, and causes inconvenience when filling complex areas [7-10].

We know that nowadays there is a great demand for heat-retaining materials. To maintain the temperature inside buildings and structures at the required level when the weather is low, first of all, it is necessary to reduce the level of thermal conductivity of the building walls (internal and external barriers).

In winter, uninsulated (coated) heating pipes lose up to 55-65% of heat, and cold, hot water and sewage systems are less able to maintain their previous state due to freezing. These losses are mainly noticeable when using non-standard heat-retaining coatings, in wet weather in the cold part of the air. (Figure 1).

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Figure 1. Heat loss

Covering pipes with high-quality thermal insulation prevents their rapid failure, doubles the service life of engineering networks and saves significant money every year. Taking this into account, we can safely say that the demand for materials with the ability to preserve heat is high. So, the research on heat-retaining materials is not in vain [11-14].

Coatings are made based on specific compositions. First of all, they should have the ability to retain heat, not be heavy, not be harmful to human health, not occupy a large volume, have permeability, be able to keep sound and noise as much as possible, be resistant to fire, water and it does not lose its properties when used in steamy places, against decay (corrosion) when applied to iron products, reduces heat loss when used in buildings and structures, and protects against mould.

Saving heat and reducing energy consumption in production and large industrial enterprises is an urgent and important issue. Therefore, the liquid heat-retaining coating, which we are conducting scientific research on, is suitable for the insulation of all types of heating and cooling systems, capacity in chemical industry enterprises, and special rooms designed for the storage of fruit and vegetable crops [15-18].

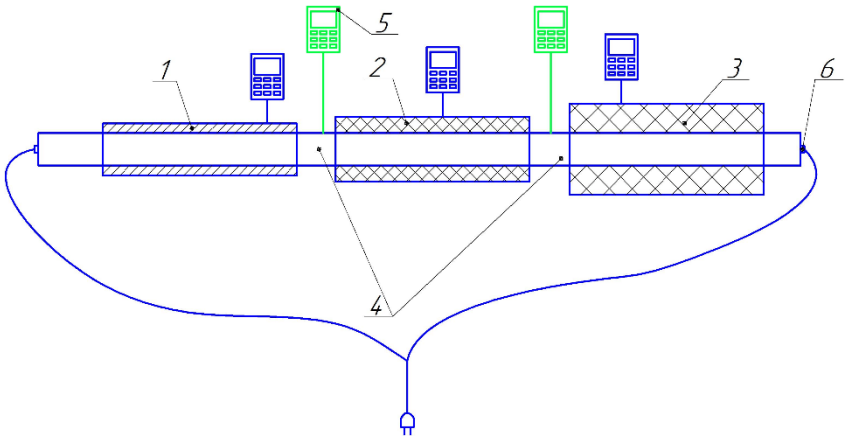

Figure 2. Scheme of the equipment for determining the coefficient of thermal conductivity of liquid thermal insulation coating.

1 - coating with a thickness of 1 mm, 2 - coating with a thickness of 2 mm,
3 - a coating with a thickness of 3 mm, 4 - a stainless steel pipe with a thickness of 0.8 mm,
5- Thermocouple (2 pieces), 6- Electric tent (220V (1 kW)).

Our experiment is conducted using dry air. A 1.6-meter-long, 0.8-mm-thick, 80-mm-diameter stainless steel pipe is covered with 1.2- and 3-mm coating in 3 places from 40 cm. A 1 kW electric tent is placed inside the pipe. Before connecting the tent to the electrical network, the temperature in the stainless steel tube is measured. (Of course, the experiment was conducted in normal room conditions). Then the tent is connected to the electrical network and waits until it heats up. When the temperature in the pipe reaches around 100-110 °C, the temperature of the coatings is measured. The temperature of 1.2 and 3 mm coatings is recorded and analysed. If we pay attention to the obtained results and analysis, the thicker the coating, the higher the ability to retain heat [19-21].

This heat-saving material not only has thermal insulation properties but also reduces energy costs by accelerating the heating process and reducing heat loss;

Correct application of coating also has a positive effect on productivity and efficiency. It is wrong to use them on a wet, icy surface. Because we know that in wet and icy places, the property of viscosity is lost. The coating is applied in several layers. The number of layers is determined depending on the tasks. Several layers can be applied, and the interval between the layers is related to drying, that is, it is necessary to wait for some time to dry after applying each layer.

After drying, our research coating forms a durable, polymer coating that prevents heat loss and, due to its unique properties, the material has a clear energy-saving effect even at a thickness of 1 mm.

It is flexible and has good viscosity at low and high temperatures. The base material does not leave residue and does not crack during its long service life.

Good protection against fire.

Coating (adheres to sand plaster, cement building materials, brick, metal, plastic, wood and other materials), prevents corrosion and condensation on cold surfaces, and does not require additional protection from mechanical and atmospheric influences. The combination of such components has flexibility, lightness, elasticity and excellent adhesion to surfaces of any shape and almost any chemical composition.

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