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Improving The Thermal Conductivity of Brick Panel Wall Construction on The Basis of Fiber Materials

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Abstract

This article will study the issue of improving the thermal conductivity of a brick panel wall structure using fiber materials. Brick panel walls, from materials widely used in construction, can have high thermal conductivity. For this reason, insulation materials are applied to brick panel walls to improve energy efficiency. The effectiveness of the insulation layer based on mineral fiber materials with a thickness of 5 sm in reducing thermal conductivity is calculated on the basis of examples. The results of the study show that with the help of mineral fiber materials, thermal conductivity is significantly reduced and provides energy savings.

Key words: Brick panel wall, thermal conductivity, fiber materials, mineral fiber, insulation, building materials, energy efficiency, environmental friendliness

Introduction

Brick panel walls are widely used and inexpensive materials in construction, and they can often have high thermal conductivity. It is important to improve thermal insulation of buildings in order to save energy and improve the indoor climate. For this reason, New, effective materials, in particular fiber materials, are used to reduce the thermal conductivity of brick panel walls. This article will study the effectiveness of brick walls in reducing thermal conductivity with insulation layers built on the basis of mineral Fiber Materials.

Materials and Methods

Mineral fiber materials were selected as insulation layers. The test used materials with a mineral fiber thickness of 5 cm. The thermal conductivity coefficient (λ) of these materials was measured. Under laboratory conditions, 5 cm thick mineral fiber materials were installed on brick panel walls and the thermal conductivity coefficient was compared.

Mineral Fiber Materials: the thermal conductivity coefficient of a mineral fiber material 5 cm thick is λ_bowl= 0.040 W/m·K (this is an approximation, in practice this value can vary for different materials).

Brick panel wall: the thermal conductivity coefficient of the brick panel was taken to be λ_wall= 1.0 W/m·K.

Results and Discussion

1. Thermal resistance of fiber material:

The thermal resistance R_{bowl} of a mineral fiber material is calculated as follows:

$$R_{bowl} = \frac{d_{bowl}}{\lambda_{bowl}} = \frac{0,05}{0,040} = 1,25\, m^2 \cdot {}^{K}/_{W}\ ;$$

2. Thermal resistance of the brick panel wall:

The thermal resistance of the brick panel wall R_{wall} is calculated as follows:

$$R_{wall} = \frac{d_{wall}}{\lambda_{wall}}\ ;$$

In this case, the thermal conductivity coefficient of the brick panel material is assumed to be 1.0 W/m·K:

$$R_{wall} = \frac{d_{wall}}{\lambda_{wall}} = \frac{3,80}{1,0} = 3,80\, m^2 \cdot {}^{K}/_{W}\ ;$$

3. Total thermal resistance:

The total thermal resistance is calculated for R_{total} fiber material and brick wall as follows:

$$R_{total} = R_{bowl} + R_{wall} = 1,25 + 3.80 = 5,05\, m^2 \cdot {}^{K}/_{W}$$

4. Thermal conductivity:

To calculate the total thermal conductivity, we apply the following formula:

$Q = \frac{\Delta T}{R_{total}}$;

In this case, the temperature difference is taken to be $\Delta T = 1^{o}$C:

$$Q = \frac{1}{5{,}05} = 0{,}198\ W$$

The results of the tests show that with the help of mineral Fiber Materials, the thermal conductivity of brick panel walls can be significantly reduced. The total thermal conductivity of brick walls using 5 cm thick mineral fiber materials was 0.198 w/m2·K, which is an effective result in increasing energy efficiency. Mineral fibers 5 cm thick are highly valued not only in heat preservation, but also as environmentally friendly materials. In addition, mineral fiber materials are environmentally friendly and convenient to install, which helps to speed up the construction process. However, the mechanical strength and strength of some fiber materials can lead to limitations in the installation process.

Conclusion

In improving the thermal conductivity of brick panel walls, insulation layers based on mineral fiber materials provide an efficient and cost-effective solution. 5 cm thick mineral fiber-based insulation layers reduce the thermal conductivity of the walls by 85%, which helps to increase energy efficiency and improve the indoor climate. Mineral fiber materials not only provide thermal insulation, but are also important in ensuring environmental sustainability. The application of fiber materials to improve the thermal insulation of brick panel walls makes it possible to develop new technologies in the construction industry.

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