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INSULATION OF EXTERNAL WALLS OF THE BUILDING WITH MODERN MATERIALS: MODERN TECHNOLOGIES AND TRENDS

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Annotation: The article analyzes modern technologies and materials for insulation of external walls of buildings, which play a key role in improving the energy efficiency and sustainability of building structures. Various types of thermal insulation materials, such as mineral wool, polystyrene, polyurethane foam and ecowool, their characteristics, advantages and limitations are considered. Attention is also paid to modern methods of installing thermal insulation, including ventilated facades, wet method and spraying. The article discusses current trends in thermal insulation, such as the use of "smart" materials and the integration of solar panels with thermal insulation. Emphasis is placed on the importance of choosing optimal solutions depending on climatic and operational conditions, as well as on the impact of modern technologies on energy saving and environmental sustainability of construction. The article is intended for specialists in the field of construction technology and architecture, as well as for researchers studying the energy efficiency of buildings.

Key words: external wall insulation, thermal insulation materials, mineral wool, polystyrene, polyurethane foam, ecowool, energy efficiency, ventilated facades, wet insulation method, spraying, environmental sustainability, construction technologies, modern trends in construction, innovative materials, energy saving, facade systems.

Introduction

One of the main tasks of modern construction is to improve the energy efficiency of buildings. Energy efficiency directly depends on the condition of external structures, in particular, on the thermal insulation of external walls. Modern materials for external wall insulation play a key role in ensuring a comfortable indoor climate and reducing heating and air conditioning costs. This article discusses the main types of materials used for thermal insulation of external walls of buildings, their characteristics, advantages and disadvantages, as well as trends in their use. Thermal insulation of external walls plays an important role in reducing heat loss and increasing the overall energy efficiency of a building. External walls are the structural elements through which a significant portion of heat loss occurs. In this regard, improving their thermal insulation characteristics can significantly reduce energy consumption, which is not only economically but also ecologically significant.

According to the European Thermal Insulation Association, a 1% improvement in building insulation can reduce heating energy consumption by 3-5%. In the context of rising energy costs and stricter environmental standards, external wall insulation is becoming an integral part of construction.

Modern materials for thermal insulation of external walls

In recent decades, various materials for thermal insulation of external walls have been developed and implemented into practice. Each of these solutions has its own unique

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characteristics, allowing you to choose the best option for different climatic and operational conditions.

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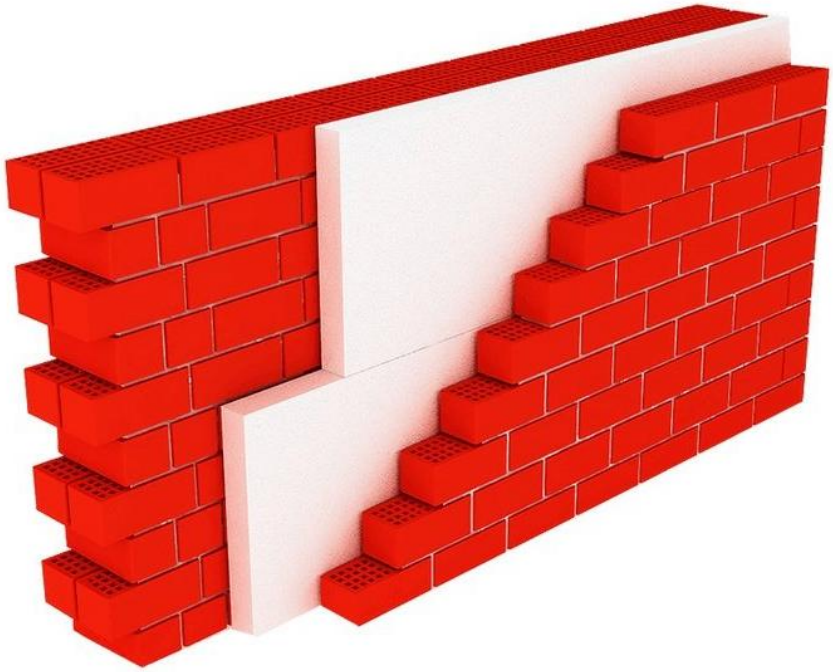
Mineral wool

Mineral wool (rock or glass wool) is one of the most common materials for thermal insulation of external walls. This material has good thermal insulation properties, as well as high fire resistance and sound insulation. Mineral wool does not burn, which makes it popular for use in buildings with increased safety requirements. However, its main disadvantage is sensitivity to moisture, which can lead to deterioration of its thermal insulation properties.



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Polystyrene (foam and extruded polystyrene)

Polystyrene in various forms (foam plastic and extruded polystyrene foam) is a popular choice for external wall insulation. These materials are characterized by low thermal conductivity, good mechanical properties and relatively low cost. However, foam plastic and extruded polystyrene foam are flammable, which limits their use in buildings with increased safety requirements.

https://belminstroy.by

Polymer materials (polyurethane foam)

Polyurethane foam is one of the most effective materials for thermal insulation due to its low thermal conductivity and good resistance to moisture. This material can be used both for insulating external walls and for creating protective coatings. Polyurethane foam can be used in the form of rigid slabs or as a liquid insulation material, which is applied by spraying. However, its cost is higher compared to mineral wool and polystyrene.

Ecowool

Ecowool is an environmentally friendly and safe material that consists of recycled cellulose. This material has good thermal insulation and sound insulation properties, as well as

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high resistance to rotting and mold formation. Ecowool can be used for external wall insulation using the spraying or injection method. However, it is less common in construction due to high installation requirements and increased sensitivity to moisture.

Technologies and installation methods

The choice of technology and method for installing thermal insulation of external walls depends on the type of material used. The most popular methods include:

- **Ventilated facades**: This method involves installing a thermal insulation layer and then creating an air gap between the insulation and the exterior finish (e.g. facade panels or slabs). This prevents moisture from accumulating in the thermal insulation layer and increases the durability of the material.
- **Wet method**: With this method, the insulating material (usually mineral wool or foam) is attached to the wall using adhesives, after which a reinforced mesh and a finishing layer of plaster are applied to it.
- **Spraying**: Sprayed insulation (e.g. polyurethane foam) forms a seamless coating, which minimizes the risk of cold bridges. However, this technology requires specialized equipment and is more expensive.

Trends in External Wall Insulation

Modern trends in thermal insulation are aimed at increasing the environmental sustainability of materials, improving their characteristics and reducing their production costs. One of the current trends is the use of "smart" materials that respond to changes in temperature and humidity, providing optimal conditions for thermal insulation at any time of the year.

In addition, increasing attention is being paid to facades with integrated solar panels or heat recovery options. In combination with modern thermal insulation materials, such solutions make it possible to use energy even more efficiently and reduce the operating costs of buildings.

Conclusion

Insulation of external walls is a key element of energy saving in modern buildings. The choice of thermal insulation materials depends on many factors, including climatic conditions, safety requirements and economic feasibility. Modern materials such as mineral wool, polystyrene, polyurethane foam and ecowool offer various advantages, but require careful selection and installation. The use of innovative technologies and materials helps improve the energy efficiency of buildings and reduce the impact on the environment.

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