IMPROVEMENT OF THERMAL INSULATION PROCESSES OF BUILDINGS AND STRUCTURES

Saydakhmedova Zahrokhon Rustam kizi

https://doi.org/10.5281/zenodo.13904372

Abstract. *The relevance of thesis is due to the fact that at present, modern standards for saving thermal energy and thermal protection of buildings are focused on the use of a very limited set of solutions to reduce energy consumption, which do not always meet the specific conditions of construction and are often very expensive. A technique for studying the effective insulation of building envelopes is proposed, taking into account the relationship between structural, heat engineering, regime parameters and economic indicators.*

Keywords: *research, efficiency, costs, thermal energy, enclosing structures.*

СОВЕРШЕНСТВОВАНИЕ ПРОЦЕССОВ ТЕПЛИЗОЛЯЦИИ ЗДАНИЙ И СООРУЖЕНИЙ

Аннотация. *Актуальность диссертаций обусловлена тем, что в настоящее время современные стандарты экономии тепловой энергии и тепловой защиты зданий ориентированы на использование весьма ограниченного набора решений по снижению энергопотребления, которые не всегда соответствуют техническим условиям. условиях строительства и зачастую очень дороги. Предложена методика исследования эффективной изоляции ограждающих конструкций с учетом связи между конструктивными, теплотехническими, режимными параметрами и экономическими показателями.*

Ключевые слова: *исследования, эффективность, затраты, тепловая энергия, ограждающие конструкции.*

INTRODUCTION

The main task is to develop an effective method for calculating the insulation of building walls, which helps to determine the minimum capital investment and operating costs, taking into account the regulation of the released thermal energy. The possibility of solving this problem will reduce the cost of energy resources. It is worth paying attention to new innovative thermal insulation materials and the issue of insulation. One of the most effective ways to save energy is to reduce heat loss through the enclosing structures of buildings and structures when using new designs and technologies, for example, the now widely used curtain wall systems.

MAIN PART

Thermal insulation materials have both advantages and disadvantages. Below we will consider in more detail the characteristics of frequently used materials.

1. Polyurethane foam:

A foam-like liquid substance that is applied to building structures by spraying. It is a mixture of water, polyester, emulsifiers, and diisocyanate. Catalysts are added to the mixture, a chemical reaction occurs, and polyurethane foam is obtained. Thermal conductivity coefficient $\lambda = 0.028$ (W/m·K). Advantages: lightweight, increases the strength of walls, resistant to temperature changes, does not require fasteners. Disadvantages: unstable to ultraviolet radiation, increased flammability. In demand when working with large volumes, rarely used in private construction [2].

2. Polystyrene foam

A lightweight gas-filled product obtained from polystyrene and its copolymers.

Advantages: the material does not absorb moisture, light weight, low cost. Thermal conductivity coefficients $\lambda = 0.031–0.035$ (W/m·K). Disadvantages: low sound insulation, high flammability, low vapor permeability. Today, this material is the most budget-friendly of all high-quality thermal insulation materials and is widely used in construction.

3. Ecowool

It is made from paper and cardboard waste. Most often used to insulate crowns in wooden construction. Thermal conductivity coefficients $\lambda = 0.037–0.042$ (W/m·K). Advantages: high sound insulation, low material consumption for insulation, affordable cost, environmentally friendly. Disadvantages: short service life, high water absorption coefficient [3].

4. Mineral (slag) wool

The raw materials for production are slag, limestone, dolomite and others. The binder is either urea or phenol. Advantages: non-flammability, durability, high sound insulation, ease of installation. Thermal conductivity coefficients $\lambda = 0.046–0.048$ (W/m·K). Disadvantages:

loss of thermal insulation qualities when wet, intensive release of toxic materials in the event of a fire.

5. Glass wool

The same raw materials are used to produce glass fiber as for the production of ordinary glass or waste from the glass industry. Advantages: moisture resistance, fire safety, low price, non-toxic, easy to transport. Thermal conductivity coefficients $\lambda = 0.030–0.052$ (W/m·K).

Disadvantages: short service life, increased fragility of fibers.

6. Basalt wool

It is produced using crushed stone from natural basalt. Advantages: non-flammability, durability, high heat and sound insulation, high resistance to organic substances, wide range of temperature application. Thermal conductivity coefficients λ = 0.032–0.037 (W/m·K). There are almost no disadvantages.

7. PIR insulation is a modern thermal insulation material with one of the lowest thermal conductivity coefficients λ = 0.021 (W/m·K). The material practically does not absorb moisture, does not rot, is not subject to biodeterioration and retains its thermal insulation properties throughout its entire service life - more than 50 years. One of the advantages of PIR is that it can be classified as a reflective thermal insulation. Plus, it does not support combustion, which is also important. There are almost no disadvantages.

Taps are provided at the lowest points of the main lines to drain water from the heating and heat supply systems.

Thermostats are used to regulate the heat output of the radiators.

Balancing valves are installed to balance, shut off, and drain the water. The main pipelines are laid along the technical underground.

Main pipelines, risers, connections to the heating system devices are made of cross-linked polyethylene according to GOST 32415–2013, for the heat supply system of the air handling units, the pipelines are adopted according to GOST 1074–91.

External walls according to the project: above the 0.000 mark - brickwork made of solid brick, 510 mm thick with a thermal conductivity coefficient of 0.7 W/(m °C), also with a ventilated facade and insulation with TechnoNIKOL TECHNOVENT STANDARD mineral wool slabs 120 mm thick. with a thermal conductivity coefficient of 0.038 W/(m °C); windproof membrane – 0.0015 m, 0.4 W/(m °C).

CONCLUSION

The conducted studies demonstrate the feasibility of using the proposed developments, which help to determine the optimal thickness of insulation of the walls of objects with thermal insulation material, find the minimum reduced costs, make an advantageous choice of the method for regulating the released thermal energy, and are aimed at improving the energy efficiency class of buildings.

REFERENCES

1. Rezanov E. M., Petrov P. V., et al. Methodology for efficient calculation of insulation of external enclosing structures of building walls during major repairs, Omsk Scientific Bulletin. Omsk., 2016, 6(150), 109–113.
2. Certificate of state registration of computer program No. 2016616691 Russian Federation. Determination of the optimal thickness of thermal insulation of enclosing structures of building walls, applicant and patent holder P. V. Petrov. – No. 2016614064, published 20.07.2016. [Electronic resource] – Access mode: https://www1.fips.ru/Archive/EVM/2016/2016.07.20/DOC/RUNW/000/002/016/616/691/DOCUMENT.PDF [Petrov R. V. Svidet. o gos. reg. programmy` RU № 2016616691, 20.07.2016. Access: https://www1.fips.ru/Archive/EVM/2016/2016.07.20/DOC/RUNW/000/002/016/616/691/DOCUMENT.PDF]
3. Shilkin N. V. Methods for increasing the thermal efficiency of buildings and their economic assessment, diss… Cand. of Engineering Sciences: 05.23.03. Moscow, 2007. 174.
4. Frolova A. A. Selection of thermal protection of office buildings taking into account energy and economic indicators of air conditioning systems, diss… candidate of technical sciences: 05.23.03, Moscow, 2017, 147