УДК 691:699.86

Lyalyuk Elena[1]
Zhang Haibiao[1]
Lyalyuk Andriy[1]

THE USE OF MODERN MATERIALS IN THE CONSTRUCTION OF EXTERNAL WALLS OF ENERGY-EFFICIENT BUILDINGS

[1]Vinnytsia National Technical University

Abstract

The article deals with the problem of energy saving in the buildings. The article considers the use of a wall heat-insulating block. The heat-sound insulation block is made of compressed treated with an antiseptic and fire retardant of straw. The transition to less safe materials will lead to the promotion of environmentally friendly energy-efficient buildings.

Key words: energy-saving renovation, natural materials, energy conservation, heat-sound insulation block, frame technology.

INTRODUCTION

Commercial and residential buildings account for about a third of the total global energy consumption, while industry and transportation each account for about a third. Energy conservation in the construction field has become one of the common concerns of the world. In the field of construction, the proportion of energy consumption varies in different types of countries, with 52% in industrialized countries, 25% in Eastern Europe , and in developing countries for 23%. However, building energy consumption in developing countries grew the fastest: 6.1% / year in developing countries, 3.4% / year in Eastern European countries, and 0.6% / year in industrialized countries. [1-3].

Japan has established a sound residential energy conservation system, promoted the industrialization development of energy conservation and environmental protection, and attaches importance to raising the awareness of energy conservation and environmental protection in the whole society. For example, the "residential performance" is based on the "Product assurance method (residential quality assurance promotion method)", which began its implementation in 2000. In the representation system ", the residential thermal environment, energy conservation and other projects have been set an evaluation benchmark. As a model of efficient building operation and management, Japan implemented the Revised Energy Conservation Law, which was implemented in 2003, incorporated energy conservation in building operation process into daily management to maximize the benefits of various measures of building energy conservation.[4-6]

To support those living in old houses to renovate and modernize their living conditions through energy-saving renovation. After energy-saving renovation, the energy consumption of old houses has been generally reduced from 130kW/m^2.a to within 30kW/m^2.a, and some houses can even be controlled within 9kW/m^2.a. in Poland.

The American Green Building Association has actively promoted the Green Building Assessment System with the theme of energy conservation. Lawrence Berkeley Laboratory has focused on the research of residential energy conservation technology, and cooperated with some state governments to build "energy conservation model houses", playing an exemplary role in the energy conservation of large public buildings.

MAIN PART

The guarantee of energy saving is correctly calculated and built enclosing structures: carefully insulated walls, floor, roof, windows and doors. Western Europe is a pioneer in the invention of construction materials. A lot of them have been developed, which allow to ensure effective energy saving with minimal wall thickness. In particular, in European houses, a multi-layer wall structure consisting of a load-bearing frame filled with various heat-insulating materials with an emphasis on environmental friendliness is popular. At the same time, if funds allow, Europeans choose natural materials — moss, cellulose, sheep's wool, wood shavings treated with milk whey, etc. And among artificial materials, one of the latest developments of the URSA company — PureOne — is enjoying success. The white color and

very delicate texture distinguish the novelty from most artificial heat insulators. Other advantages include "external" similarity with natural material and not the highest price.

In practice, it is possible to use a wall heat and sound insulation block as insulation. The external wall heat-sound insulation block contains a rigid base of connecting elements, a block of heat-insulating material protected by a layer of composite material. The heat-sound insulation block is made of compressed treated with an antiseptic and fire retardant of straw, which is reinforced along the perimeter with a polymer mesh, and the outer one the plate surface is protected by a heat-reflecting and waterproofing film and covered with a decorative finishing waterproof layer of a complex cement-clay-sand solution, a the inner surface is plastered with an air-permeable clay-sand mixture [7,8].

In Ukraine, stone wool is mainly used as wall insulation. This material is light, "breathes" and allows water vapor to pass through, preventing moisture from accumulating in the house (provided the multilayer "sandwich" is properly constructed). But, of course, it is inferior in quality to the natural materials favored by Europeans.

As for construction technologies, the most common option in the West is a combined structure: a basement floor made of monolithic reinforced concrete and the ground part, which is a wooden frame with multi-layered external walls and ceilings. The thickness of the external walls and floor coverings is 45 cm, the internal partitions are 15 cm.

In Ukraine today, too, quite a lot is built using frame technology, but at the same time, wanting to save money, they use not the most harmless materials. The transition to less hazardous materials can be considered a breakthrough in the promotion of green energy-efficient buildings, but the driving force remains the cost of construction [9].

Conclusion

The first stage of building an energy-efficient house is the choice of environmentally sound materials. The most suitable in this regard are wood, stone, brick. In some European countries, it is even more appropriate from an ecological point of view: houses are built from recycled inorganic materials - glass, metal and concrete.

REFERENCES

1. Tu Fengxiang. Energy Saving Form in Residential Buildings. Residential Technology,2005（9）: 20~26.
2. Naki'cenovi'c N, Grübler A, Mc Donald A. Global Energy Perspectives. Cambridge: Cambridge University Press, 1998.
3. Lu Qiu. Germany 2006 Building Energy Conservation Code and Energy Certificate System. The Journal of Architecture, 2006（11）: 26~28
4. Willow poplar. A Brief Analysis on Japanese Research and Achievements in the Field of Building Energy Conservation [J]. Shanghai Energy Saving,2010（11）: 17~20.
5. Li Day. Laws and regulations on building energy conservation and environmental protection in Japan . Residential industry, 2008（12）: 23~25.
6. Tian Chunfu, Wang Shihui. Japan "Zero Emission Residence". The Journal of Architecture,2010（1）: 52~55.
7. Utility model patent No. 121651. EXTERNAL WALL HEAT AND SOUND INSULATION UNIT. Georgiy Ratushniak, Yuriy Biks, Andriy Lyalyuk, 11.12.2017. (in Ukrain)
8. Georgiy Ratushniak, Yuriy Biks, Andriy Lyalyuk. Modeling heat transfer through an external multi-layer thatched wall block. /Modern technologies, materials and structures in construction". - Vinnytsia: Universam - Vinnytsia, №. 1, 2018. – P.50-55 (in Ukrain)5
9. Olena Lyalyuk, Olga Ratushnyak, Andriy Lyalyuk Management of factors that influence the choice of financial mechanism. /Modern technologies, materials and structures in construction". - Vinnytsia: Universam - Vinnytsia, №. 1, 2018. – P.94-100 (in Ukrain)

Lyalyuk Elena - Ph. D., assistant professor of construction of urban economy and architecture Vinnitsa National Technical University. e-mail: Lyalyuk74@gmail.com.

Lyalyuk Andriy – master Vinnitsa National Technical University. e-mail: 1b16b.lyalyuk@gmail.com .

Zhang Haibiao - master Vinnitsa National Technical University. e-mail:35787844@qq.com