

Ways Of Enhancing Energy Efficiency Within Renovation Of Apartment Houses In The Republic Of Uzbekistan

Sadriddin Sayfiddinov, Ulugbek Akhmadiyrov

Abstract: This article proposes modern ways to improve energy efficiency in the renovation of apartment buildings in the Republic of Uzbekistan. The concept of a passive house is proposed. The basic idea is that the total energy requirement is covered by solar energy or the recovery of heat generated by household appliances and people. In these houses it will be possible to widely use modern building materials and structures, as well as the latest engineering equipment.

Index Terms: Apartment houses, efficiency, energy, enhancing, renovation, thermal energy, ways.

1. INTRODUCTION

Development of civilization has led to problems with the environment, lack of energy resources. The world community has become faced with the need to take serious measures to reduce energy consumption in both industry and housing. The solution to the issue of saving energy resources is relevant for all sectors of the economy, including construction [1,2,3]. Nowadays, have most promising are two directions for increasing energy efficiency of facilities: saving energy resources by minimizing energy consumption and energy losses, incl. utilization of energetically valuable wastes; the use in the operation of residential buildings of renewable energy sources. Concept of a "passive house" is of increasing interest in the world [4,5,6]. In it, the main part of the total energy demand is covered by solar energy or the utilization of heat generated by household appliances and people. The "passive houses" use modern building materials and structures, as well as the latest engineering equipment. Currently, such residential buildings are recognized in Europe as the most perfect in terms of comfort, microclimate of premises and energy consumption.

2 METHODS OF RESEARCH

Main condition for designing an energy-efficient home is to ensure a comfortable internal temperature without the use of heating and ventilation systems by sealing the building and using alternative energy sources. Classification of such houses is based on their energy consumption. With the cost of heating the premises per year less than 90 kWh / m² - the house is energy efficient; up to 45 kWh / m² - passive; up to 15 kWh / m² - zero energy consumption, that is, energy is not consumed for heating, energy is required for heating water. Energy efficiency of a residential building is ensured through the implementation of the following measures: reliable thermal insulation, with the use of enclosing structures with high thermal insulation characteristics, "warm" windows; the use of a ventilation system with heat recovery from ventilation emissions, the use of secondary and renewable sources of

heat energy for heating and hot water supply, such as solar collectors or heat pumps, the use of internal sources of heat and energy of a residential building. Additional saving of thermal energy occurs due to the use of an automated control system for all technical devices in the building. In Uzbekistan, these tasks are being addressed at the state level, legislative and regulatory acts governing this area of activity have been adopted, and the first energy-efficient multi-apartment residential buildings have been built and are being operated. A transition is being made to the mass construction of energy-efficient multi-apartment residential buildings, as well as the implementation of thermal modernization of the existing housing stock.

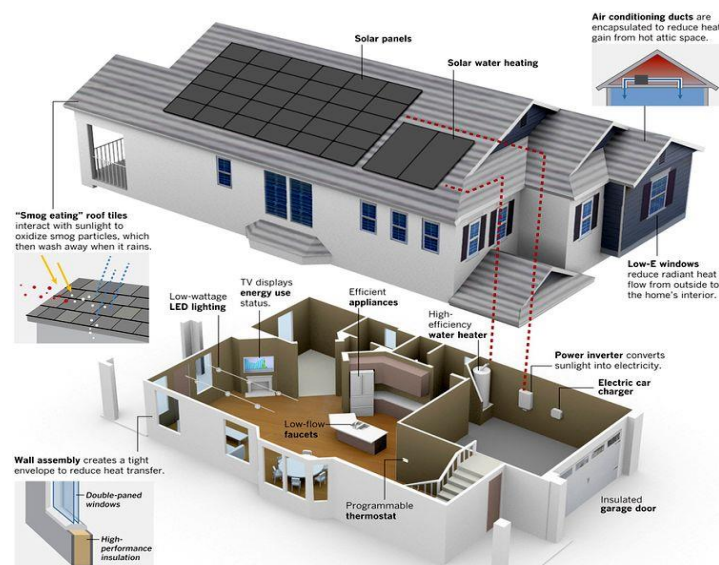


Fig. 1. Process of enhancing by alternative energy sources

New constructive-technological systems of energy-efficient residential buildings of industrial housing construction, typical design solutions for building envelopes with enhanced heat-shielding characteristics have been developed. The industrial zones of the Republic of Uzbekistan have launched the production of engineering equipment used in energy-efficient residential buildings. Payment of utility bills in energy-efficient houses for the consumed thermal energy for residents is 4 times lower than in ordinary houses [7,8,9,10]. However, the problems of the high cost of 1 m² of the total area in

- Sadriddin Sayfiddinov, PhD, Professor of department "Building and structures" at Tashkent Institute of Architecture and Civil Engineering, Tashkent, Uzbekistan.
- Ulugbek Akhmadiyrov, PhD of department "Building and structures" at Tashkent Institute of Architecture and Civil Engineering, Tashkent, Uzbekistan.

apartment buildings with low energy consumption due to the high cost of engineering equipment remain unresolved. Investment costs are on average higher by 25%. The payback period of such systems according to the most optimistic estimates is 7-10 years. In some cases, during this period of time, it becomes necessary to replace components. In addition, in the domestic market there are no required spare parts for repairs. High prices can deter even the convinced "green" from buying apartments in such houses if he does not have an excess of financial resources.

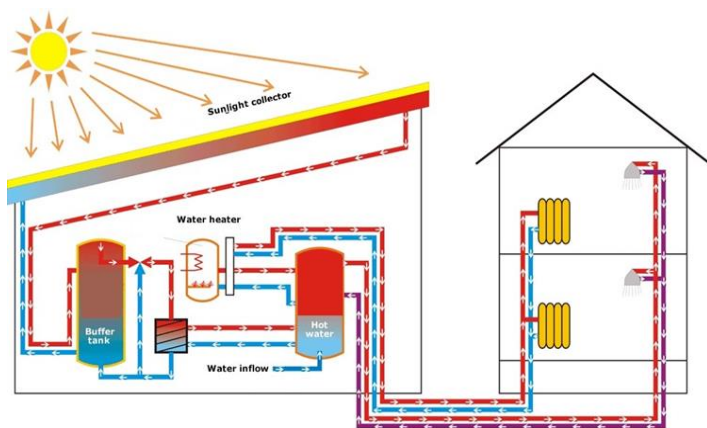


Fig. 2. Automated control system

In addition to the construction of energy-efficient residential buildings in order to reduce the consumption of energy resources, it is important to bring the existing housing stock of the development period of 1960-1990 to the modern requirements of energy consumption through thermal modernization. After it, the energy consumption for heating in panel houses of various series is reduced by 30-40%. The costs of these measures have a relatively short payback period of 3 to 5 years, and if world gas prices are taken into account, then 1-2 years. Another problem that arises in this area is the proper operation of energy-efficient residential buildings. The results of the resulting energy savings largely depend on the residents, their desire to save heat and their literacy in operating matters. The problem of operating energy-efficient residential buildings is the lack of motivation for the proper operation of energy-saving equipment by apartment tenants. According to surveys, temporary residents in most cases do not care if the windows are open, whether the ventilation system works, and whether it saves heat. Only about 11% of residents, regardless of their educational level, understand that it is impossible to open windows in an energy-efficient house with a working ventilation system. The ventilation system with heat recovery makes it possible to ensure a constant flow of fresh air into the apartment without having to open the windows. At an outdoor temperature of +5–5 ° C, a ventilation system with recuperation can reduce the consumption of thermal energy for heating by up to 70%. During the heating season, the amount of savings reaches at least 50%. When ventilating the premises by opening the windows, the energy-saving effect is canceled, since warm air is actively replaced by cold. As a result, heating costs increase significantly and the payback period of engineering equipment increases significantly. This problem can only be solved by the right tariff policy in relation to energy resources with the simultaneous availability of the tenant's ability to regulate the

actual energy consumption for heating and, accordingly, the amount of financial costs for heating the apartment. If we take into account the constant appreciation of energy resources, then the profitability of energy-efficient construction is increasing. In general, the technology of the "passive house" helps to maximize the rational use of the "internal" heat of the house, and seeks to minimize any energy consumption from external sources. The next problem is the lack of highly qualified specialists. A prerequisite for the construction of such houses is the presence of highly qualified designers and workers. This is due to the need for careful observance of construction technology. Even small work flaws reducing all efforts to seal the house, correction of the marriage is very expensive.

3 RESULTS

Nowadays, reduction in energy consumption in housing is supported by the legislative level in Uzbekistan. Analysis of the legislative framework in the field of the efficient use of fuel and energy resources allows us to highlight the following key areas of state regulation in this area:

1. Technical modernization of power generation facilities and transmission infrastructure.
2. Tariff regulation.
3. Energy saving.
4. Improving regulation in the use of fuel and energy resources and a monitoring and evaluation management system.

With regard to the technical modernization of power generation facilities and transmission infrastructure, the Industry Program for the Development of the Electric Power Industry of the Republic of Uzbekistan for 2020-2030 stipulates that replacement or modernization is foreseen for a significant part of the equipment of generating sources over which the standard terms of operation expire. The main measure in the development of generating sources is the commissioning of the capacities of the Uzbek nuclear power plant and their further development with effective integration into the balance and operation mode of the power system. In Uzbekistan, a number of decrees have been adopted on tariffs and prices for energy resources for consumers and producers, the main purpose of which is to improve the payment procedure for energy consumption and to stimulate or deter the development of certain sub-sectors of the energy complex. An important aspect of energy efficiency is the rational use and selection of fuel and energy resources, which is what the entire legislative system of the fuel and energy complex of Uzbekistan is focused on. The rational use of energy will not only reduce economic costs, but also reduce the burden on the environment. An important aspect of the rational use of fuel and energy resources is the increasing involvement of local, including renewable, sources. Currently, interest in decentralized energy based on both traditional and renewable energy sources has also increased. This interest is due to the following reasons: reduction of required investments in network development up to 30-40%; reduction of losses during energy transfer; improving the reliability of energy supply to consumers. The basis of energy conservation activities is the Law of the Republic of Uzbekistan "On Energy Saving" and the State Program "Energy Saving" for 2020-2030, which provide for energy savings through the introduction of modern energy-efficient technologies, energy-saving equipment, devices and materials, the maximum possible involvement in the country's fuel balance own energy resources, including

renewable ones, popularization of energy conservation, stimulation of energy conservation by establishing incentive tariffs for energy. With regard to improving regulation in the use of fuel and energy resources, a monitoring and management evaluation system, work is underway to develop and implement management systems, without which it is impossible to achieve energy-efficient development of the Uzbek economy. Thus, the efficiency of the use of fuel and energy resources in Belarus largely depends on the state policy. In Belarus, at the legislative level, the main aspects of the efficient use of energy resources are fixed. Mandatory today is the availability of an energy passport of a residential building. At the legislative level, there is a requirement for the presentation and transfer of an energy passport when selling and renting a house. When solving the problems of financing the construction of energy-efficient residential buildings, it is possible to use the experience of Western European countries where 2 to 10 thousand such houses have already been built. The leaders here are Denmark, Germany and Finland. In these countries, targeted state programs on energy conservation and the construction of energy-efficient buildings have been adopted and are effectively working, and there is rich experience in stimulating the improvement of energy efficiency in housing construction. Government programs include the provision of soft loans or grants. This support is given to the construction of newest and reconstructed buildings. Moreover, the requirements that apply to them are stricter than those provided by regional building codes. Subsidized buildings comply with the provisions of the Uzbekistan Strategy of Action until 2030. It is also possible to provide grants for special deep thermal modernization; additional grants for the use of renewable energy sources for heating engineering systems. This way encourages the owner to apply the most effective technologies in the field of energy conservation and reduces the initial financial burden on him. Another possible solution to the problem is the construction of residential houses efficient design, but without expensive energy-saving engineering equipment, however, with the possibility of its installation provided for by the project at any time.

4. CONCLUSION

Consequently, building provides for internal or double thermal insulation. Building envelopes in houses to avoid heat loss are constructed as tight as possible, heat and air tight, without "cold bridges". The volumetric structure of a residential building is designed to be more compact with minimal curvature of the facade, to reduce the area of external fences and reduce heat loss through them. The orientation of the building is provided by the windows to the south, in order to maximize the use of solar energy to heat the house. The minimum number of windows is designed in the western and eastern walls. Shading of the house by trees and other structures is excluded. The windows are provided with three-chamber double-glazed windows filled with inert gas and a special low-emission glass coating that preserves indoors more than 50% of the solar energy falling on the glass. To such a residential building during operation, if the owner wishes, you can connect energy-efficient systems while improving his financial condition or when cheaper analogues of engineering equipment appear on the market. Such residential buildings have average price characteristics or slightly above average. Mass construction cost is of 1 m² will

decrease. Depletion of non-renewable energy resources makes us think about their conscious use. Renovation energy-efficient homes is one of the steps along the way.

REFERENCES

- [1] Sayfidinov Sadridin, Miralimov Mirakhim Mirmakhmutovich, Makhmudov Said Makhmudovich, Akhmadiyrov Ulugbek Solijonovich. Modern Methods of Increasing Energy Efficiency of Buildings In The Republic Of Uzbekistan at the Design Stage. International Journal of Scientific & Technology Research Volume 8, Issue 11, November 2019. 1333- 1336 pp. <http://www.ijstr.org/final-print/nov2019/Modern-Methods-Of-Increasing-Energy-Efficiency-Of-Buildings-In-The-Republic-Of-Uzbekistan-At-The-Design-Stage.pdf>
- [2] Sayfidinov Sadridin. Analysis of methods of heat engineering calculations of enclosing walls in Uzbekistan and abroad. Architecture and construction problems (Scientific and technical journal) Samarkand, 2019, №2. 57-61 pp.
- [3] Akhmadiyrov U.S. Features of the work of the supporting contours of hanging coatings. "Innovative technologies in construction" Tashkent 2019, №2. 46-51 pp.
- [4] Pirmatov Rakhmatullo Khamidullaevich, Shipacheva Elena Vladimirovna, Rashidov Jasur Gayrat ugli. On Peculiarities of Formation of the Thermal Mode in Operating Panel Buildings. International Journal of Scientific & Technology Research. Volume 8 - Issue 10, October 2019. 2533-2535 pp. <http://www.ijstr.org/final-print/oct2019/On-Peculiarities-Of-Formation-Of-The-Thermal-Mode-In-Operating-Panel-Buildings.pdf>
- [5] Sayfidinov Sadridin. Design of thermal protection of exterior walls of residential buildings. International Journal of Advanced Research in Science, Engineering and Technology Vol. 6, Issue 9, September 2019. 10946-10949 pp.
- [6] Pirmatov R. K., Zakharov A.V., Rashidov J. G. Graphical method for calculating sound insulation of air noise of single layer enclosing structures/ International Journal of Advanced Research in Science, Engineering and Technology. Vol. 6, Issue 7, July 2019. Pages 10294- 10298.
- [7] Akhmadiyrov U.S. Accounting for the change in longitudinal thrust in two-belt hanging systems. Problems of Architecture and Construction Scientific and Technical Journal. SamGASI 2018, Issue 4.31-33 pp.
- [8] Sayfidinov Sadridin. Transfer of heat through protective operated wall structures and their thermophysical calculation for energy efficiency. European Science Review. East West Association for Advanced Studies and Higher Education GmbH-Austria, Vena, Scientific journal № 11-12 2018 (May-June), -pp 79-80.
- [9] Akhmadiyrov U.S. Research of trailing coverings of wide-span unique buildings by the modeling method. European Science Review. East West Association for Advanced Studies and Higher Education GmbH-Austria, Vena, Scientific journal № 5-6 2018 (May-June), 274-276 pp.
- [10] Pirmatov R.Kh., Zakharov A.V. About the dependence of sound transmission on the angle of incidence on the boundary of media or a massive layer // Journal of Problems of Mechanics. 2018. No. 1. 50-55 pp.