ISSN NO: 2770-2367
Date of Publication: 11-05-2022

Development of Ways to Improve the Energy Efficiency of Residential Buildings with Reinforced Concrete Tank Walls

PhD.prof. Miralimov Mirrakhim Mirmakhmutovich,
Adizov Bobur Barotovich,
Mamadaliyev Zukhriddin Rakhimjanovich
Masters (TIAC)
Tashkent Institute of Architecture and Civil Engineering, Tashkent, Uzbekistan

Annotation: The book is devoted to an important and relevant direction in the development of modern construction - energy-efficient reinforced concrete structures of buildings.

Keywords. Energy saving in the production, construction and operation of basic building materials. Energy-saving synthetic geomaterials. Modern structural and heat-insulating building materials

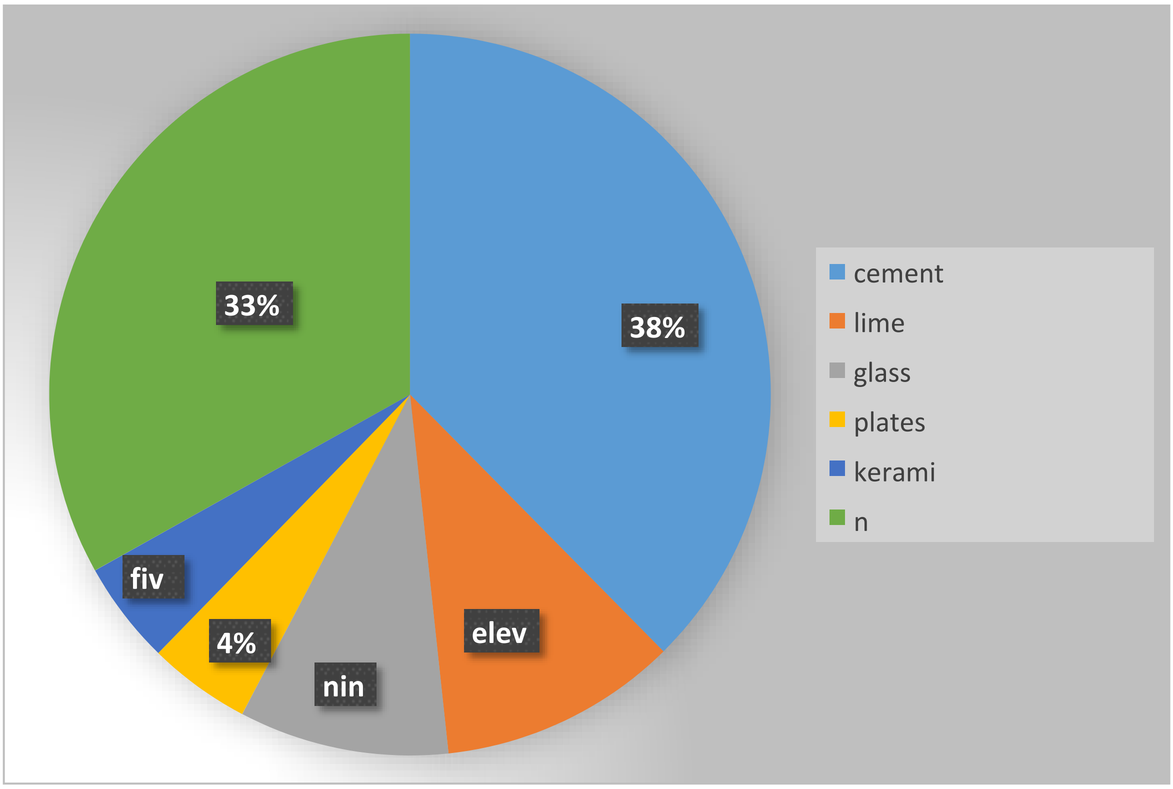
Introduction. Energy-efficient reinforced concrete buildings are a reality of our time, one of the integral factors in the sustainable development of the human environment. Since the end of the 70s of the last century, they have turned from single projects into real objects: energy-active, energy-passive, zero, energy-efficient buildings, which are a synthesis of architectural, planning, design, engineering solutions aimed at reducing the energy resources consumed by buildings without losing their reliability and comfort. The accumulated experience in the design and construction of energy efficient buildings indicates that efficiency is not a static characteristic that is set at the design stage, but a dynamic one that is formed throughout the entire life cycle of buildings. It is in this vein that the authors consider this most important characteristic. The leading role in the formation of energy efficiency belongs to the organizational processes of the life cycle of buildings, since the organizational processes in the life of any system are the most important condition for its successful passage from beginning to end - from idea to goal achievement. Thus, the current direction and one of the main tasks of modern construction production is the rational use of energy resources and increasing the energy efficiency of reinforced concrete structures.

Energy saving in the production, construction and operation of basic building materials A systematic approach to the formation of energy efficiency of buildings throughout the life cycle involves the management of energy-saving characteristics of buildings and factors that determine energy efficiency. The life cycle of buildings directly depends on the life cycle of the materials used in construction.

Construction is one of the most material-intensive sectors of the national economy. The cost of materials spent directly on the erection of buildings and structures account for more than half of the total cost of construction and installation work and about 1/3 of capital investments in the national economy of the Uzbekistan. Construction consumes more than 30% of all production in the sphere of material production. Building materials and structures of the future building are determined at the design stage. At the same time, an important selection criterion is their energy efficiency, including the cost of energy resources for their production. The main building materials from which buildings are mainly constructed are concrete, brick (ceramic and silicate) and wood. Technological processes for the production of building materials, products and structures require significant energy resources, especially such energy-intensive ones as concrete, glass, and metal products. Technological features of glass production require high temperatures (up to 1500 ⁰C), foam glass up to 1900 ⁰C, cement clinker requires a firing temperature of 1450 ⁰C, lime firing requires 62 temperatures of about 1200 ⁰C. A ton of aluminum is several times more energy intensive in production than a ton of steel [3]. The diagram of energy resources for the production of basic

ISSN NO: 2770-2367
Date of Publication: 11-05-2022

building materials, built by the authors, is presented in the figure. Lime firing requires 62 temperatures around 1200 °C. A ton of aluminum is several times more energy intensive in production than a ton of steel [4]. The diagram of energy resources for the production of basic building materials, built by the authors, is presented in the figure. Lime firing requires 62



temperatures around 1200 °C. A ton of aluminum is several times more energy intensive in production than a ton of steel [2]. The diagram of energy resources for the production of basic building materials, built by the authors, is presented in the figure.

The transition of the construction industry to energy-saving technologies makes it possible not only to reduce heat consumption per unit of output, but also to increase labor productivity in the industry. At the same time, it is necessary to take into account the fact that energy intensity, the level of thermal protection and the durability of construction products are closely related, therefore, the energy efficiency of the industry as a whole depends on the total energy consumption during the construction of buildings and their operation. In some cases, the replacement of more energy-intensive building envelopes with less energy-intensive ones has a positive effect. In others, on the contrary, such a replacement of less energy-intensive ones by less energy-intensive and durable ones can also save energy costs. The introduction of energy-saving technologies often requires additional capital and energy costs. Only by jointly considering the influence of energy intensity, durability and thermal protection of the components of building products, it is possible to obtain energy savings over a long (more than 100 years) service life of the building. Industrial enterprises for the production of building materials, products and structures are major energy consumers. The annual energy consumption by the industry is about 60 million tons of standard fuel and about 40 billion kWh of electricity, which is about 6% of all fuel and energy resources produced and consumed for internal needs. The largest fuel costs are for the production of cement - 28 million tons of fuel equivalent, and for the production of clay bricks - 13 million tons of fuel equivalent. [durability and thermal protection of the components of building products, you can get energy savings for a long (more than 100 years) life of the building. Industrial enterprises for the production of building materials, products and structures are major energy consumers. The annual energy consumption by the industry is about 60 million tons of standard fuel and about 40 billion kWh of electricity, which is about 6% of all fuel and energy resources produced and consumed for internal needs. The largest fuel costs are for the production of cement - 28 million tons of fuel equivalent, and for the production

ISSN NO: 2770-2367
Date of Publication: 11-05-2022

of clay bricks - 13 million tons of fuel equivalent. Durability and thermal protection of the components of building products, you can get energy savings for a long (more than 100 years) life of the building. Industrial enterprises for the production of building materials, products and structures are major energy consumers. The annual energy consumption by the industry is about 60 million tons of standard fuel and about 40 billion kWh of electricity, which is about 6% of all fuel and energy resources produced and consumed for internal needs. The largest fuel costs are for the production of cement - 28 million tons of fuel equivalent, and for the production of clay bricks - 13 million tons of fuel equivalent. [tons of standard fuel and about 40 billion kWh of electricity, which is about 6% of all fuel and energy resources produced and consumed for internal needs. The largest fuel costs are for the production of cement - 28 million tons of fuel equivalent, and for the production of clay bricks - 13 million tons of fuel equivalent. [tons of standard fuel and about 40 billion kWh of electricity, which is about 6% of all fuel and energy resources produced and consumed for internal needs. The largest fuel costs are for the production of cement - 28 million tons of fuel equivalent, and for the production of clay bricks - 13 million tons of fuel equivalent.

The most energy-intensive building material is cement. It is necessary to spend 140 kg of standard fuel for the production of 1 ton of cement grade 300. Energy costs are even higher in the production of 1 ton of Portland cement grade 600 - 345 kg of reference fuel. Therefore, increasing the production of Portland slag cement can result in significant energy savings. When switching from wet to dry cement production, primary energy savings of up to 55% can also be obtained. Another promising energy-saving measure in the building materials industry is the production of cement with magnetically susceptible additives. Thermal and induction treatment of molded concrete in magnetic tunnel chambers can reduce cement consumption by 15-20%. Through the use of heat treatment, labor productivity is increased.

At prefabricated reinforced concrete plants, the most energy-intensive areas are reinforcing shops, which consume 100-150 kWh of electricity per 1 ton of manufactured products. To this it should be added that about 1.8 tons of reference fuel is spent on the manufacture of reinforcing steel. The introduction of modern progressive technology with the use of automatic production control allows saving 5-15 kWh of electricity per 1 ton of products. A rational way to manufacture products at reinforced concrete plants is the use of electrical heat treatment using induction heating of products in through-type chambers instead of steam steam chambers. The economic effect with this method of processing 1 m3 of products is 100-120 kWh. The right choice of cement brand has a great influence on energy consumption in the production of reinforced concrete products. The use of highly active cements during the steaming of products makes it possible to reduce the heating temperature by 25-30°C and thus reduce the heat consumption for its production. Fast-hardening cements, for example, with crystallization additives, gain their design strength in natural conditions in 3-6 hours, which reduces energy costs by 15-20%. A reduction in the energy intensity of the production of building materials can be obtained by using cementless autoclaved (silicate) concretes. So, in comparison with conventional cements, in the production of 1 m3 of dense silicate concrete, 56 kg of standard fuel can be saved. and 15 kWh of electricity. The use of industrial passages (ash, slag) can significantly reduce the energy intensity of the structure. For example, if instead of expanded clay concrete, gas-ash concrete with a density of 800 kg / m^3 is used, then the savings will be about 106 kg of fuel equivalent. per 1 m3 of concrete. A major consumer of energy in the building materials industry is the production of clay and sand-lime bricks. The introduction of complex, mechanized and automated technological lines using computers in the brick industry can significantly reduce energy consumption and increase labor productivity. The main energy costs are drying raw bricks and firing them. Total specific energy consumption for the production of 1000 units. clay bricks are about 300 kg of equivalent fuel equivalent. Energy saving reserves are concentrated in a significant reduction of heat with flue gases in drying and firing kilns. Dryers are installed in front of tunnel kilns intended for firing. To reduce heat loss during drying and firing of bricks, a number of measures are being taken: reducing the suction of cold air, plastering furnaces and dryers, the use of suspended vaults, rational placement of burners. The use for drying the energy potential of the heat of the gases leaving the tunnel kilns, the temperature of which is 120 ° C, reduces the energy intensity of the production of clay bricks. The measures listed above made it possible to reduce the specific fuel consumption by 100 kg of reference fuel per 1000 pieces at the leading brick factories of the country. bricks. Automatic control of thermal processes during drying and firing of bricks lowers the energy intensity of the production of clay bricks. The measures listed above made it possible to reduce the specific fuel consumption by 100 kg of reference fuel per 1000 pieces at the leading brick factories of the country. bricks. Automatic control of thermal processes during drying and firing of bricks lowers the energy intensity of the production of clay bricks. The measures listed above made it possible to reduce the specific fuel consumption by 100 kg of reference fuel per 1000 pieces at the leading brick factories of the country. bricks. Automatic control of thermal processes during drying and firing of bricks

The energy intensity of silicate bricks is several times lower than that of clay bricks and is about 85 kg of fuel equivalent per 1000 bricks. bricks. The technological cycle of its production is 8-10 times shorter. At the same time, silicate brick is inferior to clay brick in terms of thermal protection and durability. In the production of clay and silicate bricks, it is possible to achieve a significant reduction in energy consumption and an increase in thermal protection due to the production of their modified products with voids. With an increase in the voidness of a brick by 20%, the energy consumption is reduced by 0.12 GJ. by 1000 pieces, and by 30% - decreases by 0.17 GJ. per 1000 units, which is approximately 10% of the average specific consumption of fuel and electrical energy for their production.

Conclusions. The authors of this monograph introduced readers to the history of the formation and development of energy efficient buildings, systematized the factors that determine their energy efficiency, described the problems that hinder the widespread introduction and replication of energy efficient buildings in the modern construction industry and suggested ways to solve them. In the process of working on the book, the authors came to the conclusion that the topic of energy efficient buildings is huge and complex in its content, does not lose its relevance, but, on the contrary, with the advent of new scientific buildings, it expands and acquires new horizons and sets tasks for further scientific research. With the development of scientific knowledge about energy efficient buildings, the methodology of scientific knowledge of the processes of their life cycle is developing.

References:

1. Aloyan R.M., Petrukhin A.B., Oparina L.A. // Application of geosynthetic materials in construction: economic aspectNews of higher educational institutions. Textile technology mentality. 2016.No. 3 (363). pp. 14-19.
2. Aloyan R.M., Petrukhin A.B., Oparina L.A. Calculation of the main parameters of pavement structures using geotextile synthetic protective-draining materials //News of higher education institutions. Textile industry technology. 2016.No. 2 (362). pp. 51-55.
3. Pulkovo-Sky: new standards of microclimate comfort (Electronic resource) URL: (Accessed 03.06.2016)
4. ..Oparina, L.A. Creation of a relational database of energy intensity of building materials / N.V. Zayanchukovskaya, I.N. Lykova // Construction and reconstruction. – 2013. – № 6(50). – Pp. 78-81. 96.
5. Oparina, L.A. Feasibility study of insulation of walls of buildings / L.A. Oparina // Information environment of the university (XVI International Scientific and Practical Conference): Collection of articles. - Ivanovo: Ivan. state archit.- builds. un-T., 2010. - pp. 364-370.