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Production of Reinforced Concrete Products by Application of Energy Saving Methods is the way of Increasing the Economic Efficiency of National Economy

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A B S T R A C T

The article shows that the production of reinforced concrete products by application of energy-saving methods plays an important role in saving material and energy resources and costs, increasing the economic efficiency of the national economy, reducing the cost of concrete and reinforced concrete products.

A R T I C L E I N F O

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Along with having many positive properties, concrete is one of the most energy-intensive materials. For example, an average of 470 thousand kcal heat is consumed for the production of one cubic meter of concrete. If reinforced concrete products are produced on polygons where the production technology is not improved, this value reaches to 1 million kcal. Therefore, even a small saving of energy resources in the production of prefabricated reinforced concrete provides high economic efficiency in the national economy.

A large part of the total energy costs in the production of concrete is spent on cement. The production of one cubic meter of heavy concrete consumes an average of 110-210 kg of fuel, of which 65-75% is spent on cement production, 2-3% on aggregates, 10-15% on various technological operations, 13-18% on heat treatment. The total cost of fuel consumption increases because of increased cement consumption. In lightweight concrete, if artificial porous fillers are used, the total energy consumption will increase by 10-15% and the energy consumption for aggregate production will increase by 20-50%. Nevertheless, the cost of cement and process operations will increase slightly. In addition to the above methods, in order to reduce the overall energy costs in the production of lightweight concrete, it is advisable to use low-energy aggregates, such as thermo set or natural lightweight aggregates. Cement is the most expensive material among the concrete components. This is because energy consumption for cement production is also high. Therefore, saving cement consumption is also one of the ways to save energy resources. If the aggregates used in the concrete are of poor quality, it will lead to an increase in cement consumption. In particular, the application of sand-gravel mixture to concrete will increase cement consumption by 100 kg per cubic meter. Proper design of the concrete structure also helps to save cement consumption. In addition, the use of super-plasticizers in addition to concrete helps to save cement consumption by increasing its plasticity. For example, by adding super-plasticizers to concrete, the cement consumption per cubic meter of concrete decreases for 50-60 kg. Significant cement losses occur during loading and unloading of cement at plants and polygons. Losses also occur because of malfunction of dispensers in the concrete mixing shop, discarding of unusable concrete. Studies show that the heat consumption per cubic meter of concrete can be reduced from 470 to 300 kcal. According to calculations, 60,000 kcal heat is consumed to heat one cubic meter in a steel mold to 80 °C. During heat treatment, the temperature rise is 20 °C per

hour. This means that as the temperature rises, heat dissipates around and leads to significant heat loss. This loss foot up to 200,000 kcal per cubic meter of concrete. In most factories, the covers of the recessed chambers do not meet the demand. Studies in recent years have shown that 70% heat loss is found during heat treatment. One of the main reasons for this is that the walls of the chambers are made of heavy concrete. Therefore, the preparation of the walls of the chamber from expanded clay concrete allows reducing the amount of heat loss by 50%. According to some researchers, such an event has been proven to reduce heat losses by up to 3 times. One of the production methods that causes heat losses is the stand method. In the following years, research on the improvement of the stand method has been conducted and a number of achievements have been made. In particular, in the production of flat plates in the form of a package, several plates can be processed together with the help of electric heaters to save heat energy. The electric heater between the products transfers heat to both sides. As a result, heat losses in heat treatment are sharply reduced because they occur only through the sides. To date, several methods of heat treatment with the help of electricity have been developed.

From the point of view of saving energy resources, the most economical of them is heat treatment by passing electricity through concrete. With this method, the concrete is heated to 100 °C with the help of electricity, the production capacity of the production lines increases with a sharp decrease in heat losses. In foreign countries, energy saving by preheating concrete in the concrete mixing plant itself is widely promoted. Research in this area in our country has proved that this method can be used in our country in the winter months. This method is carried out in the following order: after loading the aggregates and cement into the concrete mixer, they are transferred to it during the mixing process. In the process of heating the concrete, the steam cools and condenses. The amount of vapor transmitted must be calculated so that it does not disturb the water-cement ratio in the concrete. The concrete is heated to 70 °C and then sent to the forming room. In many foreign countries, the volume of application of concrete and reinforced concrete structures is much higher than other materials. That is why construction firms and companies pay serious attention to the quality of constructions produced and used. They emphasized that saving energy resources would not adversely affect the quality of the material. The climatic conditions of the country provide a great opportunity to save energy resources in heat treatment. One of them is the use of solar energy in heat treatment. The analysis of the research shows that the use of solar energy in the heat treatment of concrete and reinforced concrete structures allows reducing the cost of concrete by 20%.

It can be seen that material and energy resource saving plays an important role in reducing the cost of concrete and reinforced concrete structures and increasing production efficiency. Therefore, the combined application of these measures allows bringing high economic benefits.

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