



# IMPROVEMENT OF HEAT TREATMENT IN THE PRODUCTION OF REINFORCED CONCRETE PRODUCTS

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## ANNOTATION

*The longest-lasting and most energy-intensive technological process in the production of concrete and reinforced concrete structures is the reduction of the setting time of concrete by heat treatment of concrete. In this regard, the main goal of the topic is to recommend energy-saving technologies to concrete technology. In addressing these issues positively, it would be advisable to use alternative types of energy sources. Therefore, saving material and energy consumption is one of the important tasks in concrete production technology. Cement consumption in concrete production can be reduced by 10-25% using different methods.*

**KEY WORDS:** *concrete product, energy sources, technology, material.*

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## DISCUSSION

Development of heat treatment procedures for various reinforced concrete products, taking into account the climatic conditions of Uzbekistan, from achieving economic efficiency by improving the order of heat treatment and reducing the cost of concrete and reinforced concrete.

Iron and concrete products are developed and implemented in the organization of heat treatment regimes in manufacturing enterprises in normative documents, in the sex or polygons.

It turned out that the temperature of the environment is not taken into account, the heat treatment regime for all seasons of the year is the same. To date, the recommendations in the manuals on the developed heat treatment regime have been found to be appropriate for the cold seasons of the year. As noted in the scientific literature, the optimal temperature of isothermal heating is 80-850s. In the studies we conducted, two different isothermal heating temperatures were selected. The first was the 600s, the second was the 800s, and in both studies the intermediate plates, the base of the power transmission lines, the reservoir walls were tested in

the production process by the potoc aggregate method (Tables 1 and 2). On the heat treatment chambers, along with the Reinforced Concrete Products, Cube samples with sides from the same concrete mixture were placed, from which 10 cm was obtained. After the heat treatment process was completed and the material was taken from the mold, the cube samples were also emptied from the mold and stored together with the reinforced concrete pieces. After achieving the design strength of the concrete, it was determined that the strength of the cube samples to compression using gravity press. In addition, the strength of concrete in reinforced concrete products was checked using test methods without breaking. In cases where the isothermal heating temperature is 800s, the concrete reaches its initial consistency faster, but its design consistency is determined to be 600-8% less than that of iron concrete products where the isothermal heating temperature is 10s. This means that in the hot seasons of the year in dry hot climates, when heat treatment of iron concrete products, its isothermal heating temperature is desirable to be 600s.



**Heat Treatment Mode When Isothermic Heating Temperature is 600s**

**1-TABLE**

/p	Classes of concrete	Heat treatment mode, when the item has the specified thicknesses		
		160 mm	160-300 mm	300-400
	B25	13(2+10+1)	14(2+11+1)	15(2+11,5+1,5)

**Heat Treatment Mode When Isothermic Heating Temperature is 800s**

**2-TABLE**

/p	Classes of concrete	Heat treatment mode, when the item has the specified thicknesses		
		160 mm	160-300 mm	300-400
	B25	8 (3+3+2)	9 (3+4+2)	10 (3+4,5+2,5)

Saving energy consumption in the production of concrete and reinforced concrete products.  
 We carry out the accounting work on the basis of appropriate recommendation:

The sum of the internal volumes of 6 units of the steam chamber combined into one block:

$$V_k = 7 \cdot 4 \cdot 3,5 \cdot 6 = 588 \text{ m}^3$$

The surface of the outer walls of the camera above the floor:

$$F_1 = [(3 \cdot 7 + 4 \cdot 0,3) + (2 \cdot 4 + 3 \cdot 0,3)] \cdot 2(3,5 - 0,5) = 186,6 \text{ m}^2$$

One side surface of seven curtain wall:

$$F_1 = 7 \cdot 3,5 \cdot 3 + 4 \cdot 3,5 \cdot 4 = 73,5 + 56 = 129,5 \text{ m}^2$$

The outer walls of the camera below the threshold level and the surface below it:

$$F_3 = [(3 \cdot 7 + 4 \cdot 0,3) (2,4 \cdot 3 \cdot 0,3)] \cdot 2(0,5 + 0,3) + (3 \cdot 7 + 4 \cdot 0,3) = 49,76 + 197,58 = 247,34 \text{ m}^3$$

Surface module of the camera's walls:

$$\frac{F_1}{V_k} = \frac{186,6}{588} = 0,32 \text{ m}^{-1} \text{ (0,3 will accept)}$$

Accounts in turn are executed in the form of tables

3-TABLE

Current variant of heat treatment $\tau_0^a = 3 + 6 = 9$ hours	Proposed variant of heat treatment $\tau_0^m = 3 + 3 = 6$ hours
Heat consumption for heating concrete, taking into account the thermal separation of cement	
$Q_6 = 30$ thousand kkal/m <sup>3</sup>	$K = \frac{80 - t_a}{65} = \frac{80 - 30}{65} = 0,77$ $Q_6 = 30 * 0,77 = 23,1$ thousand kkal/m <sup>3</sup>
Heat consumption for heating metal molds	
$Q_m = 23$ thousand kkal/m <sup>3</sup>	$K = 0,77$ ни ҳисобга олган ҳолда $Q_m = 23 * 0,77 = 17,71$ thousand kkal/m <sup>3</sup>
Useful consumption of heat energy	
$Q_\phi = Q_6 + Q_m = 30 + 23 = 53$ thousand kkal/m <sup>3</sup>	$Q_\phi = 23,1 + 17,71 = 40,81$ thousand kkal/m <sup>3</sup>
In the period of steaming to the camera, the surface of the walls of the camera Comparative consumption of heat loss from the surface of 1 m <sup>2</sup> :	
$\tau_0^a = 9$ hours, $\Delta t = 80 - 15 = 65^\circ\text{C}$ $Q_1 = 3,25$ thousand kkal/m <sup>3</sup>	$\tau_0^m = 6$ hours, $\Delta t = 80 - 30 = 50^\circ\text{C}$ $K = \frac{\Delta t \cdot \tau_0^m}{650} = \frac{50 \cdot 6}{650} = 0,46$ $Q = 3,25 * 0,46 = 1,5$ thousand kkal/m <sup>3</sup>
Vain consumption of heat for 1 m <sup>3</sup> concrete	
$Q_1 = \frac{q_1 \cdot F_1}{V_a} = \frac{3,25 \cdot 186,6}{64,8} = 9,36$ thousand kkal/m <sup>3</sup>	$Q_1 = \frac{1,5 \cdot 186,6}{64,8} = 4,32$ thousand kkal/m <sup>3</sup>
Comparative consumption of heat lost to the camera from the surface of 1 m <sup>2</sup> of the surface of the surface of the steaming walls:	
$\tau_1 + \tau_2 = 6 + 9 = 15$ hours $q_2 = 5,5$ thousand kkal/m <sup>2</sup>	$\tau_1 + \tau_2 = 5 + 4 = 9$ hours $q_2 = 4,54$ thousand kkal/m <sup>2</sup>
Comparable consumption of heat as a result of the cooling of the camera in the days ( $\tau_3 + \tau_4 = 56$ hours) (Through 1 m <sup>2</sup> outer surface)	
$q_2^1 = 7,8$ thousand kkal/m <sup>2</sup>	$q_2^1 = 7,8$ thousand kkal/m <sup>2</sup>
Idle consumption of heat in the quenching cycle for 1 m <sup>3</sup> concrete	
$Q_2 = \frac{(q_2 + 0,2q_2^1)F_1}{V_a} = \frac{(5,5 + 0,2 \cdot 7,8)186,6}{64,8} = 20,33$ thousand kkal/m <sup>3</sup>	$Q_2 = \frac{(4,54 + 0,2 \cdot 7,8)186,6}{64,8} = 17,76$ thousand kkal/m <sup>3</sup>
Comparative consumption of heat lost from the surface of the curtain walls 1 m <sup>2</sup> during the cooling period after the vaporization ceases:	

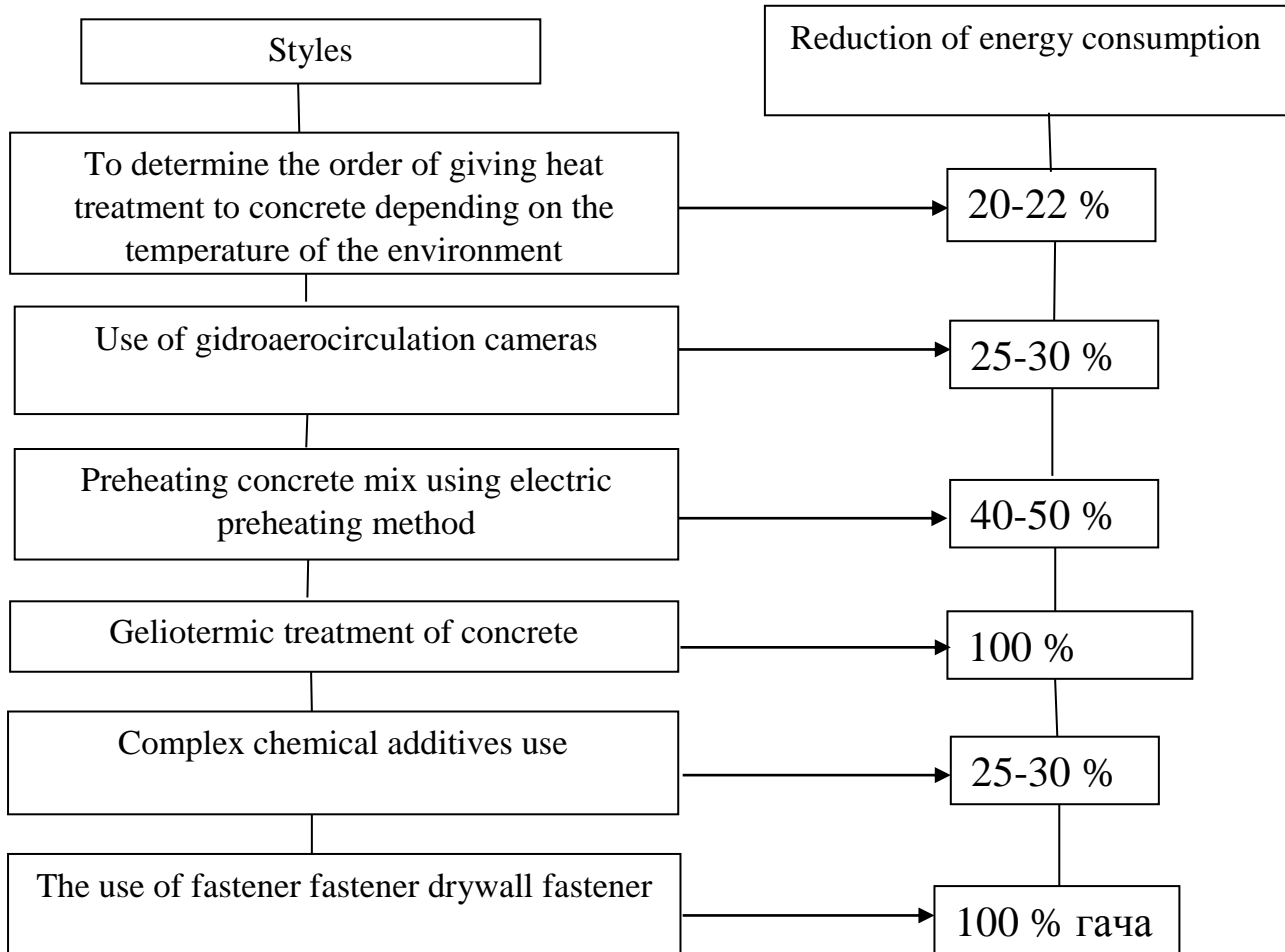


$q_3=8,15 \cdot 1,22=9,94$ thousand kkal/m <sup>2</sup>	$q_3=8,15 \cdot 0,76=6,2$ thousand kkal/m <sup>2</sup>
Comparative consumption of heat lost from the surface of the curtain walls 1m <sup>2</sup> as a result of the cooling of the camera on weekends:	
$q_3^1 = 11,3$ thousand kkal/m <sup>2</sup>	$q_3^1 = 11,3$ thousand kkal/m <sup>2</sup>
The cost of 1m <sup>3</sup> of lost heat consumption as a result of cooling of curtain walls for concrete	
$\frac{Q_3 = (q_3 + 0,2q_3^1)F_2}{V_a} = \frac{(9,94 + 0,2 \cdot 11,3)129,5}{64,8} = 24,38$ thousand kkal/m <sup>2</sup>	$Q_3 = \frac{(6,2 + 0,2 \cdot 11,3)129,5}{64,8} = 17,31$ thousand kkal/m <sup>2</sup>
The walls of the camera below the floor satchel and the comparative consumption of heat lost through the bottom:	
$\tau_0^m + \tau_1 = 9 + 6 = 15$ hours $q_4=3,23$ thousand kkal/m <sup>2</sup>	$\tau_0^m + \tau_1 = 6 + 5 = 11$ hours $q_4=3,73$ thousand kkal/m <sup>2</sup>
When 1 M <sup>3</sup> is calculated for concrete	
$Q_4 = \frac{q_4 \cdot F_3}{V_a} = \frac{3,23 \cdot 247,3}{64,8} = 12,33$ thousand kkal/m <sup>3</sup>	$Q_4 = \frac{3,73 \cdot 247,3}{64,8} = 14,24$ thousand kkal/m <sup>3</sup>
The sum of wasted heat costs:	
$\Sigma Q_0 = Q_1 + Q_2 + Q_3 + Q_4 = 9,36 + 20,33 + 24,38 + 12,33 = 66,4$ thousand kkal/m <sup>3</sup>	$\Sigma Q_0 = 4,32 + 17,76 + 17,31 + 14,24 = 53,63$ thousand kkal/m <sup>3</sup>
Total heat consumption in the camera	
$\Sigma Q + Q_\phi + \Sigma Q_0 = 53 + 66,4 = 119,4$ thousand kkal/m <sup>3</sup>	$\Sigma Q = 40,81 + 53,63 = 94,44$ thousand kkal/m <sup>3</sup>
We convert the heat consumption into steam consumption by the appropriate coefficient	
$Q_{6yr} = \Sigma Q \cdot 1,8 = 119,4 \cdot 1,8 = 2,15$ kg/m <sup>3</sup>	$Q_{6yr} = 94,44 \cdot 1,8 = 170$ kg/m <sup>3</sup>

The economic efficiency achieved as a result of heat treatment of reinforced concrete products is as follows:

Hence, in the order of the current heat treatment, the order of the heat treatment if an average of 1 kg of normative Steam is spent for 215 m<sup>3</sup> of concrete if set taking into account the ambient temperature, the steam consumption is 170 kg, or in other words, the amount of steam spent on giving heat treatment to concrete is reduced by 21%.

In conclusion, we can say that the use of concrete fastening methods in place of complex (figure 3.1), along with a significant reduction in energy consumption in the reinforced concrete industry, allows the preparation of long-lasting and durable reinforced concrete products and structures.



In the scheme presented above optimal ways and methods of reducing energy consumption in the iron concrete industry in dry-hot climates are shown.

Note: the reduction in energy consumption was calculated in relation to the method of steaming.

Experiments of foreign researchers on improving the heat treatment regime were studied, analyzed and improved in accordance with the climate of the Republic.

As a result of research on the improvement of the heat treatment regime, a heat treatment regime was developed for concrete in the B25 class. The isothermal heating temperature was tested 80s instead of 850-600s. At this temperature, the design strength of the concrete was determined to be 8-10% more.

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