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INFLUENCE OF SURFACE - ACTIVE ADDITIVES ON THE PHYSICO - TECHNICAL PROPERTIES OF CEMENT.

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ABSTRACT

The article stipulates that at present, the grinding technology strives to increase the degree of grinding, improve the granulometric composition of cement and reduce the specific energy consumption for grinding processes, taking into account the extremely low efficiency of grinding plants. Therefore, when choosing the optimal dosages, the fineness of the grind of cements at various grindings was studied.

It is known that the fineness of cement grinding affects a number of properties of concrete mixtures, for example, water separation, plasticity, delamination, etc. Cements produced by our industry are characterized by no more than 5-10% residue on sieve No. 008, a specific surface area of 2500-2800 m2 / g and a fraction content of 3-30 microns, 40-50%. In high grade cements, the content of fractions 3-30 microns increases to 70%. At an early age (1-3 days), fractions up to 5 microns take the most active part in hardening, fractions 5-30 microns are important for curing in subsequent periods, up to about one month of age (18-20). 2.7.8. Currently, grinding technology strives to increase the degree of grinding, improve the granulometric composition of cement and reduce the specific energy consumption for grinding processes, taking into account the extremely low efficiency of grinding plants. Hydrophobic surface-active additives intensify the grinding process of cements, change its granulometry. Therefore, when choosing the optimal dosages, the fineness of the grind of cements at various grindings was studied.

Laboratory grinding was carried out in ball mills with a volume of 20 and 100 liters. The rotation speed of the mill is 57 and 35 rpm. Before each grinding, the mill was cleaned from possible contamination by grinding the sand for 40 minutes. After that, the mill was loaded with clinker and control grinding without additives began.

Effect of oxidized petrolatum on cement grinding (in a laboratory mill)

Table 1

Designation cement	Additive		Sieve residue No.,%	
	name	dosage,%	02	008
1	2	3	4	5
I-B	No additive	-	100	100
	0 P	0,15	47	64
	0 P	0,30	47	54
	0 P	0,45	46	61
4-3d	Without additives	-	100	100
	0 P	0,25	75	31
	ССБ	0,15	92	75
	МН	0,20	60	33

Effect of FFA Additives on Cement Grinding Intensification
(in a laboratory mill)

Table 2

Type of additive FFA	Additive dosage,%	Sieve residue No.	
		02	008
No additive	-	следы	100
C7 -C9	0,05	следы	54
	0,10	следы	22
	0,20	следы	14
C10 -C16	0,05	следы	92
	0,10	следы	33
	0,20	следы	29
	0,05	следы	96
	0,10	следы	50
	0,20	следы	67

Thus, all surfactants used in the work intensify the grinding of cement, increasing the productivity of mills, as a rule, by almost 20%. The specific surface area of cements measured on the PSH-2 device does not differ, since this device is not suitable for determining the specific surface area of cements with surfactant additives. The calculated specific surface according to Wagner for cements with surfactant additives is 25-30% higher than for the control ones. In hydrophobically plasticized cements, as follows from the tables above, the content of fine cement fractions (up to 20 microns) increases, which increases the rate of hydration of such cements and accelerates the set of strength in the initial period.

Sorption moistening of cements during transportation and storage leads to a loss of their activity and significant shortfalls in the strength of mortars and concretes on aged cements. Molecular adsorption hydrophobic films on the surface of cement particles significantly reduce the amount of sorption moisture, thereby increasing the safety of cements. The study of sorption humidification was carried out at a relative humidity of 95-100%. Cements were stored on special trays, as well as in waxed paper glasses. After each determination, the cements in the container were shoveled.

Table 2 shows the results of sorption wetting of cements stored on open trays. As follows from the data presented, the most intensive wetting of cements occurs in the first ten days. During this period, the control cement gained more than 50% moisture compared to 160-day storage. By the tenth day, the moistening of cements with oxidized petrolatum to bottom cleaning was 5 times, and with soap 8 times less than in the control. The same ratio changed slightly after 160 days of storage.

Additive type	Change in weight of cements x / through	Change in weight of cements x / through						
		3 days	7 days	10 days	30 days	40 days	50 days	160 days
No additive OP MN VAT residues	-	0,8 100	1,98 100	8,1 100	11,4 100	12,7 100	13,2 100	15,7 100
	0,22	0,21 26	0,52 26	1,66 21	2,0 17	2,4 19	2,6 20	3,54 23
	0,2	0,1 12	0,3 15	1,01 12	13,7 12	1,8 14	2,2 16	3,4 22
	0,22	0,15 19	0,45 22	1,6 20	1,82 16	2,45 19	2,55 19	5,9 38

x / above the line -% weight gain, below the line - the relative change in weight in comparison with the control sample.

Table 3

Additive type	Additive dosage in%			
	0	0,05	0,10	0,20
R i d o y t c e m n t				
C7- C9	5,26 100	0,61 12	0,37 7	0,45 9
C10- C16	5,26 100	2,66 51	0,62 12	0,38 8
C17- C20	5,26 100	3,25 62	1,98 38	0,38 7
Alit o v y t e n t				
C10- C16	2,28 100	1,35 59	0,28 11	0,15 7
C17- C20	2,28 100	1,13 50	0,33 14	0,12 5

Note: above the line - the absolute% of sorption moisture below the line -% in relation to the control cements. Thus, all hydrophobic surfactants used in the work significantly reduce the sorption moisture of cements and increase their safety. The change in the amount of heat released during the hydration of cement can be made by directly determining the amount of heat released during the hardening of cement, or indirectly, by calculating the heat of hydration from the difference in the heats of dissolution of unhydrated cement in the same solvent. The thermal method was used to determine the heat release. It is the most common and standardized by the current GOST for hydraulic concrete. The essence of this method is to determine the heat released during the hydration of cement by measuring the temperature of the cement-sand mortar solidifying in a thermos. The composition of the latter is selected so that the temperature rise of the cement slurry is within 10-150. The test cement was mixed with normal sand in weight

ratio 1: 1.5 (cement-sand) at $\frac{AT}{C}$ = 0.35.

The amount of materials for mixing: cement (d) -105 g, sand -158 g, water -37cm3 These tests gave the results that are shown in Table 4 and Figure 1.

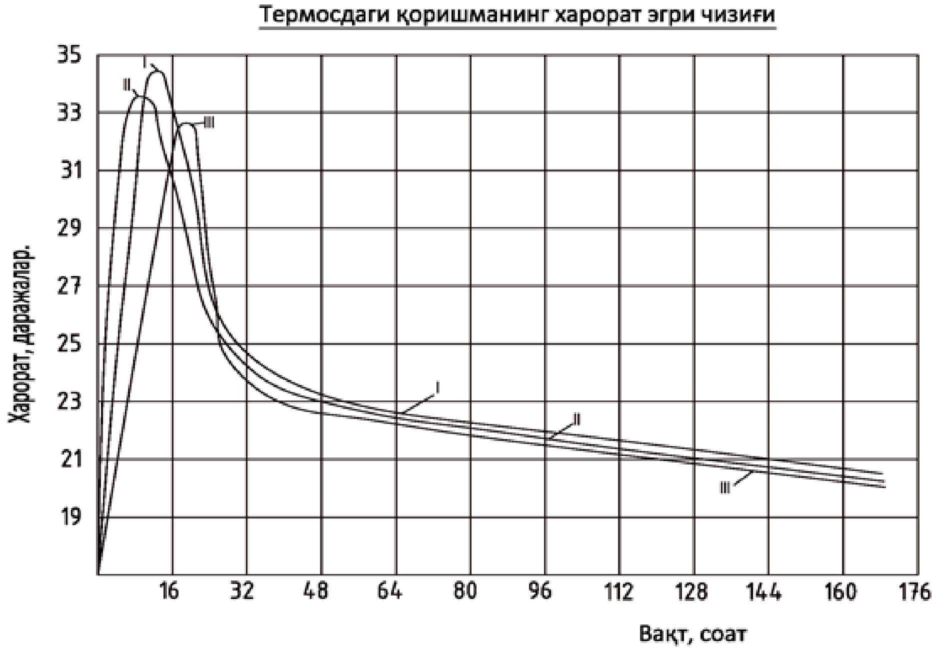

Fig. 1. Heat release of cement with additives of surfactants.

Table 4

Fig. 1. Heat release of cement with additives of surfactants. Table 4	Characteristics of thermoses	Character list of cements	Longitudinal lives. test tanya, hour	Temper cement. solution beginning end 0C	Higher temperature increase cement solution for specified time intervals (tx-to), 0C
1	2	3	4	5	6
И	Thermal value of the thermos C = 65.06 cal / deg. Thermos heat transfer constant: Қk = 14cal / deg. Thermal value of thermos with cement mortar: Cp = 154.7 cal / deg.	Clinker cement C = 2800 cm2 / g	0 2 24 33 48 72 120 168	18 20 26,2 25 23,97 22,6 21,6 20,45	- - 8,2 7,0 5,97 4,6 3,6 2,45
ИИ	The thermal value of the thermos is 53.4 cal / deg. Thermos heat transfer constant: Қк = 15.2 cal / deg. Thermal value of a thermos with cement mortar: Cp = 143 cal / deg.	Cement with 10% active mineral additive C = 2800 cm2 / g	0 1 24 33 48 72 120 168	18,3 20 25,7 24,6 23,75 22,43 21,15 20,5	- - 7,4 6,3 5,45 4,13 3,2 2,2

ИИИ	Thermal value of the thermos C = 57.7 cal / deg. Thermos heat transfer constant: Ķk = 14.3 cal / deg. Thermal value of a thermos with cement mortar: Avg = 147.3 cal / deg	Cement with 10% active mineral additive, 0.2% OP and 1% SSB C = 2800 cm2 / g	0 2 24 33 48 72 120 168	18,5 20 25,7 24,3 23,9 22,5 21,7 20,7	- - 7,2 5,8 5,4 4,0 3,2 2,2
Continuation of table 4					
	7	8	9	10	11
И	Heat, accumulate lazy in ter mose for data time intervals, Ķ1 = Cp = (tx-to), 0C cal. - - 1260 1080 922 704 556 379	- - -	- - -	- - -	The heat of cement hydration, released for the given time intervals of 1 kg of cement Ķ қ = ----- cal / g қ - - 37.4 39,0 47.0 50,6 56,3 58,5
	- - 1058 973 779 590 495 315				- - 35,2 38,3 44,2 47,6 49,5 55,0
	- - 1650 858 785 595 471 318	- - 132 194 255 292 392 364	- - 1890 2770 3655 4180 4890 5202	- - 3540 3623 4440 4775 5361 5520	- - 33,7 34,5 42,3 45,5 51,0 52,6

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