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Influence of Superplasticators on the Properties of Cement

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Annotation: *This article discusses the possibility of increasing the strength of the cement grade by using super plasticizing additives. Revealed and justified the need to reduce the water-cement ratio in order to achieve the best results of strength indicators. We concluded that, when using additives, it helps to reduce the amount of mixing water while maintaining the mobility of the mixture, which subsequently allows increasing the strength.*

Keywords: *cement strength, super plasticizer, and high-quality concrete.*

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Introduction. The use of superplasticizing additives cannot be considered a new direction in the field of construction, but, nevertheless, developments in this direction are carried out to this day. Great interest in research in this area is due to the desire of technologists to obtain high-strength concretes using ordinary grades of Portland cement, which becomes possible with a maximum reduction in the amount of mixing water [1, p. 93]. In view of the above, the active use of superplasticizing additives in practice is predetermined.

Purpose of work.

To study the effect of the value of the water-cement ratio and superplasticizers of different generations on the processes of heat release, hydration and hardening of cement. Establish the relationship between the water-cement ratio, structure and properties of cement stone.

To substantiate the inexpediency of using calorimetric analysis at W / C = 0.5 for research purposes associated primarily with obtaining highly functional concretes.

In this study, the following materials were used:

- cement PC 500 D-0, medium aluminate LLC "Almalyk MMC"
- Super plasticizer: BETON MIX (Uzbekistan).

To assess the strength gain in compression of cement stone during hardening, cube samples with a facet size of 2 cm were made, tests were carried out in accordance with paragraphs 7.1 and 7.2 of GOST 10180-2012 “Concrete. Methods for Determining Strength Using Control Samples”. Samples of cement stone made at W / C = 0.3 and 0.5, without additives and with additives-superplasticizers (1% of the cement mass), hardened for up to 28 days at a temperature of 20 ± 5 ° C and a relative humidity of 95 ± 5%.

Results and discussion. At the first stage of the work, the normal density of the tested compositions was determined. Based on the recommendations of the additive manufacturer, the studies were carried out for each additive in the concentration range from 0.1 to 2.5% by weight of the binder. The results obtained are presented in table 1, which displays the quantitative decrease in the water-cement ratio (depending on the dosage of the additive) in relation to the non-additive cement (hereinafter B / D) in percent.

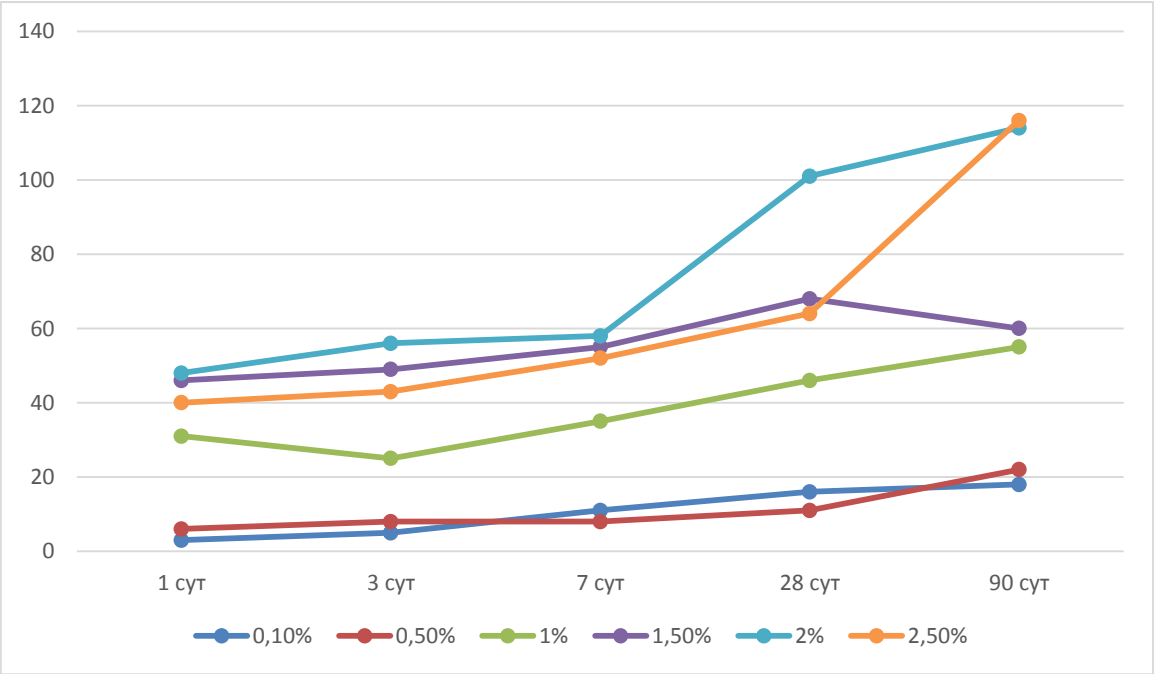
Table 1

Additive / Content %	Strength MPa				
	1 days	3 days	7 days	28 days	90 days
0.1	3	5	11	16	18
0.5	6	8	8	11	22
1.0	31	25	35	46	55
1.5	46	49	55	68	60
2.0	48	56	58	101	114
2.5	40	43	52	64	116

A decrease in the water-cement ratio with an increase in the concentration of additives was established, however, the degree of decrease in W / C strongly depends on the percentage of additives. A further increase in the content of superplasticizer is not able to have a significant effect on the value of internal friction of particles and no longer leads to a significant decrease in the water demand of the cement paste, and can even subsequently reduce the strength characteristics of the cement stone, especially in the initial periods of hardening due to the excessive mobility of the cement mortar.

After determining the value of NG, the most interesting compositions were selected for research and specimens-beams 1x1x3 cm were molded, hardened in humid conditions for 28 days. After that, the brand compressive strength was established and, based on the data obtained; the most effective dosages for each additive were selected. The values of the brand strength of the tested compositions are shown in Figure 1.

Figure 1 - Indicators of strength of modified compositions



The results obtained show that the addition of additives leads to a significant increase in strength. The most effective was the increase in strength by almost 30% in the amount of only 1.5 and 2% of the cement mass, respectively.

The study of the strength characteristics led to the conclusion that superplasticized compositions gain strength faster, compared with no additional one, practically throughout the entire hardening interval. This can be explained by the fact that the adsorption layer of the additive formed around the surface of the cement particle is water-permeable [3, p. 48].

Conclusions. The use of superplasticizing additives allows to reduce the amount of mixing water (up to 23%), which has a positive effect on the strength characteristics of the cement stone.

In the course of the conducted studies, it was determined that all superplasticizers contribute to:

- disaggregation and dispersion of cement;
- the formation of an additional shell on primary hydrates, as a result of which the induction period significantly increases and the active stage of cement hydration slows down;
- The formation of a cement stone without a significant change in its phase composition.
- It was found that with an increased V / C = 0.5:
- the induction period increases significantly, the stage of active cement hydration slows down and the intensity of the heat flow decreases, especially with the use of additives - superplasticizers;
- the total thermal energy of hydration and hardening of cement systems does not at all have a directly proportional relationship with the rate of strength development;
- Hydration and hardening is accompanied by the formation of other hydrated phases - with reduced basicity, due to a larger amount of crystallized Ca $(OH)_2$.

It is also worth noting that the presence of superplasticizer additives in the cement mixture contributes to the most complete process of cement hydration due to the formation of films by them on the surfaces of cement particles, which further leads to an increase in the area of contact with water.

List of used literature:

1. Mironov S.A. Theory and methods of winter concreting. Third edition, revised and additional - Moscow: Stroyizdat, 1975. - 701 p.
2. Shtark J., Wicht B. Durability of concrete / Per. with him. - A. Tulaganova. Ed. P. Krivenko. - Kiev: Oranta, 2004. -- 301 p.
3. Korchunov I. V., Sidorova E. N., Akhmetzhanov A. M., Potapova E. N. Increasing the durability of products based on cement / Problems of construction production and property management: Materials of the IV Intern. scientific-practical Conf.", 23-24 November 2016, Kemerovo: FSBEI VO" Kuzbass. State tech. un-t them. T.F. Gorbacheva. - 2016. - S. 47-49;