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DEVELOPMENT OF A METHOD FOR SELECTING THE COMPOSITIONS OF MOLDING SANDS FOR CRITICAL PARTS OF THE ROLLING STOCK

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Annotation:
Studies have been carried out on the choice of compositions of molding sands for especially critical parts of the rolling stock. Quantitative statistical dependences in the formulation of mixtures have been obtained. dependences of gas permeability, work, cost for destruction and rigidity of the sample on the magnitude of various loads.

Keywords: Core and molding sands, knockout, gas permeability, strength, bentonite, quartz sand, chalk, lime, sugar.

Introduction

Difficulty in knocking out cores from castings made from various mixtures is one of the important production problems. At different enterprises, there are different situations associated with knocking out cores from castings. If at one plant the rods are easily knocked out of the castings, under certain other conditions with the knockout of the rods; in some cases, drinking has proven to be extremely problematic, due to serious complications in the hydraulic knockout system, which is a private mechanized removal of the rods. To produce problems and improvements in rod knockout, a lot of work has been done around the world.

Numerous studies and verifications of various sources in a large number of organic and inorganic origin have been carried out.

For example, in Russia, the influence on the knockout of rods was tested: charcoal and coal, coke, black and silver graphite, wood pitch, bitumen, petroleum oils, molasses, dextrin, sulphite-alcohol stillage, pulverized bakelite, SME, wood flour and saws, clay , cement, lime, fireclay, magnesite, phosphorite and others.

These countries have low levels of consumption such as sugar, iron oxide, naphthalene, proprietary additives, etc. The dissemination from these studies concluded that the uniqueness of the origin is the addition of consumption in small quantities.

The introduction of such cases never gave positive results and there were no results.

Some of the initial substances from the ideas about the need to destroy a strong film of liquid glass, cement are individual specimens of quartz sand, with the help of a significant presence of organic formation.

The experiments carried out did not give positive results in solving this problem, which, of course, does not exclude the possibility of revealing the knockout of rods from castings in individual cases of application. After it was achieved in production and in the scientific field, how it is possible to achieve results in increasing the knockout rates, one can only explain the complex processes that occur in liquid glass mixtures when they are poured with metal, systematic research on this issue began to be gradually worked out.

The knockout mixture was mainly evaluated by the compressive strength of the samples, first heated to a high temperature, and then cooled. However, many studies do not use the reasons for choosing the heating temperature, i.e. does not increase the explanation of the density of the samples when they are preheated to one temperature and the strength changes when heated to another temperature.

Experiments to study the composition of molding and core sands were carried out at the subsidiary "Foundry and Mechanical Plant", Tashkent. For the study of the rods,

4 beautiful mixtures were prepared. The mixtures were prepared from 2K2O202 quartz sand, P1T2 bentonite clay, liquid glass, lime, chalk ($CaCO_3$), and sugar.
The preparation of the mixture was carried out by manual mixing in a mixture of containers, first the powdered components were mixed, and then the calculated amount of liquid glass was added.
Mixtures with recommendations for lime, chalk and sugar are presented in Table 1.
Table 1 - The quantitative ratio of the components of the mixture

Components		Mass fraction of components, %			
		Number 0	Number 1	Number 2	Number 3
Initial	Quartz sand	96	94	92	90
	Clay bentonite	four	four	four	four
	Liquid glass	6	6	6	6
Additives	Lime	0	2	four	6
	Chalk	0	2	four	6
	Sugar	0	2	four	6

For knock-out tests, structures 30 mm high and 50 mm in diameter were made, compacted by natural impacts on an automatic mechanism copra. After isolation, they were removed from the sleeve and transferred to the drying chamber. To carry out gas permeability tests, a structure 50 mm high and 50 mm in diameter was made and structure according to GOST 23409.7-78, which appear in Figure 1, compacted by perceived impacts on an automatic pile driver.

a) b)

Picture 1 - Samples for testing mechanical properties (a) and gas permeability (b)
Drying of the finished samples was carried out in an electric oven, after which the tests were stopped. Ready for use, to acquire high strength, dried in an electric oven, at 200 ^{0}C for 30 minutes. Then, after the samples were cooled to room temperature, they were heated to a temperature of 600 ± 10°C, kept at this temperature for 30 min, and slowly cooled in the furnace for 2 hours.

To determine the work expended on knocking out the mixture, an analytical dependence is used based on the suspicious energy of the widest mass acting on the test sample.

The obtained samples were preliminarily weighed on a balance (GOST 24104-88, fault ±0.01 g), then tightly, without a gap, inserted into a metal sleeve b, which, in turn, was installed on a pallet c. At the bottom of the pallet there was a hole 22 mm in diameter for the free exit of the striker r, which pierces the sample, a.

Using an automatic copra, 10 blows were applied to the samples. The destroyed part of the sample was again weighed on the scales (GOST 24104-88, fault ± 0.01 g) and the results obtained.

In the course of knockout tests, the physical properties of the mixture, such as gas permeability and resistance to the environment, were compared.

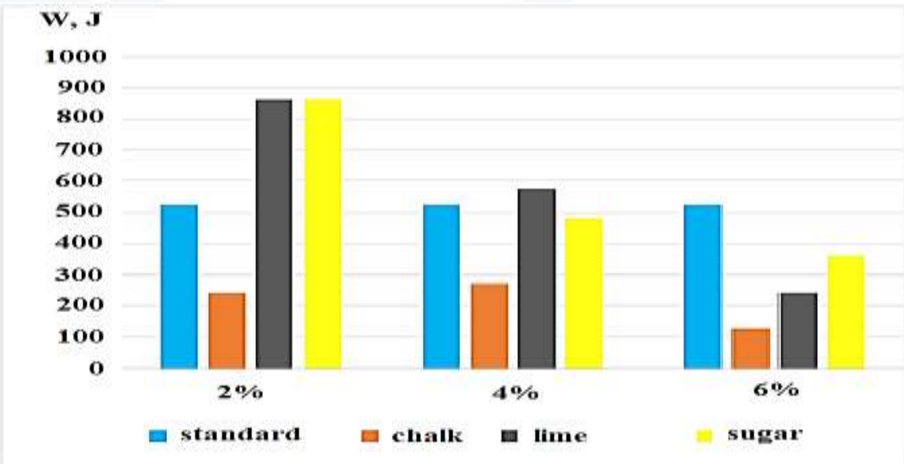
When choosing the gas permeability of a dry substance placed in a special sleeve, 2000 cm^3 of air was passed through the sample at a pressure of 980.7 Pa.

To determine the tensile strength of molding and core sands, samples were made according to GOST 23409.7-78.

The work on the destruction of samples depending on the content of additives after drying at a temperature of 200 °C is presented in Table 2 and Figure 2.

Table 2 - Work on the destruction of samples depending on the content of the additive

Additives	Work spent on destruction, J		
original	525.40		
Additives, %	**2**	**4**	**6**
Chalk	243.90	272.60	125.14
Lime	860.83	573.89	243.90
Sugar	860.83	478.24	358.68



Picture 2 - Work spent on the destruction of samples

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As can be seen from Figure 2 , the addition of 2% lime to the mixture, as well as sugar, increases the amount of work on the destruction of samples, and the introduction of a mixture of 2% chalk made it possible to reduce the work on the destruction of samples by 2 times. The presence of 4% lime and the same amount of sugar in the mixture has practically no effect on the work on the destruction of samples, and the content of 4% chalk in the mixture reduces the amount of work by almost two times. The content of lime and sugar in the mixture increased to 6% made it possible to reduce the work by half, and the addition of chalk reduces the work of destroying the sample by 3 times.

The results of testing samples for gas permeability are shown in Table 3 and Figure 3.

Table 3 - Gas permeability of samples depending on the additive

Additives	Gas permeability of the mixture, units		
original	117.83		
Additives, %	**2**	**2**	**2**
Chalk	169.50	169.50	169.50
Lime	133.97	133.97	133.97
Sugar	192.00	192.00	192.00

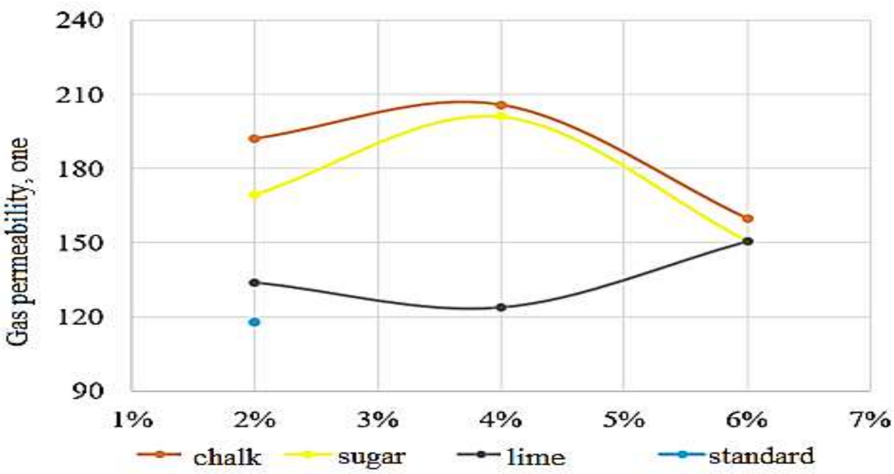

Figure 3 - Change in gas permeability of samples depending on from the amount of additive

The conducted experiments showed that the gas permeability has better values when 2% chalk is added relative to other additives. Its values reached almost 200 units, which is two times higher than the gas permeability of the standard sample. In the case of using 2% sugar and lime as additives, respectively, the results were also 1.5 and 0.5 times higher, respectively, than the gas permeability value of the standard sample.

With an increase in the lime addition to 4%, the gas permeability values did not change significantly, relative to standard samples. The content of sugar and chalk in the mixture increased to 4 percent led to a twofold increase in gas permeability.

At the next stage, the experiment was carried out with the addition of 6 percent of each of these materials. Tests of the same properties of samples showed approximately the same values, which turned out to be much lower than samples with 2% and 4% additives.

The strength tests carried out on specimens of the "eight" type showed the following results in accordance with Table 4 and Figure 4.

Table 4 - Tensile strength test results

Samples	Tensile strength, Pa		
original	184.00		
Additives, %	**2**	**2**	**2**
Chalk	134.10	134.10	134.10
Lime	80.58	80.58	80.58
Sugar	190.95	190.95	190.95

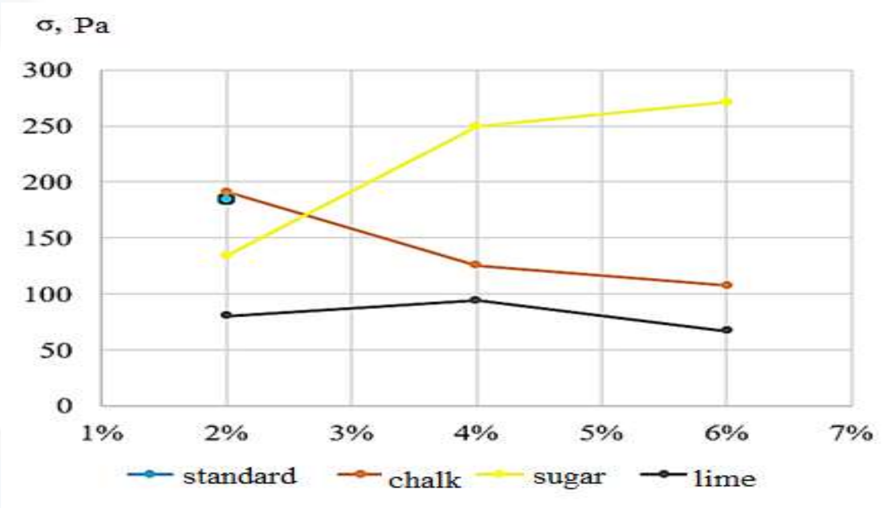

Figure 4 - The dependence of the strength of the samples depending on from the amount of additive

As can be seen from Figure 4, a 2% addition of sugar and lime reduces the strength indicators, and when chalk is added, there is a slight increase in the strength indicators of the mixture, and a 6% addition of lime and chalk reduces the strength indicators, and sugar increases this indicator by almost 1 .5 times.

Conclusions. A technology with a reduced, i.e. less than 6%, the content of liquid glass. Because liquid glass has exceptionally high adhesion to quartz, then the cohesive type of destruction of the mixture proceeds. As a result, the strength of the mixture will directly depend on the amount of binder introduced into it. The less liquid glass is

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introduced into the mixture, the easier it will be to knock out the rods from the castings.

The study of the influence of various factors on the conditions for the knockout of cores from castings showed the prospect of a direction for the search for materials and technologies that reduce the work during knockout.

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