UDK 001

DEVELOPMENT OF 280X29NL BRAND RESISTANCE WHITE CAST IRON LIQUEFACTION TECHNOLOGY

PhD Candidate Saidmakhamadov Nosir[1]., docent Abdullaev Kamol[2]., PhD student Khasanov Jamshidbek[3]., teacher Bulitova Shahnoza[4]

Tashkent State Technical University[1,3]

Namangan Engineering Construction Institute[2]

Almazar district 15th school[4]

Abstract: This article describes the technology of pouring ductile white cast iron 280X29NL into the sand-clay mold by liquefaction in a 0.4 induction furnace in the shop "Dilution of non-ferrous metals" of Navoi Machine-Building Plant. In addition, the structures obtained were analyzed by scanning electron microscopy and MiM 7 microscopes.

Keywords: white cast iron, induction furnace, structure, mold, ductility, hardness, liquid metal, alloy, iron-carbon

INTRODUCTION. According to the results of research conducted by professors of the Department of "Casting Technology" of Tashkent State Technical University on the basis of research conducted at the enterprise "Navoi MMC" NMZ, currently in a number of enterprises in mining, metallurgy, chemical engineering and other similar abrasive operating conditions. The development of working machine parts from alloy cast iron in the form of casting is underway.

Nowadays, mechanical engineering requires the use of materials with good mechanical properties, but alloys that increase the tensile strength, relative elongation and strength, as well as their properties such as abrasion resistance, corrosion resistance, heat resistance, other types of abrasive and aggressive details are important to increase the service life of parts under different operating conditions.

First of all, it applies to alloys such as iron-carbon alloys, including high-chromium cast iron, the production of which is increasing year by year [1].

MATERIALS AND METHODS. At present, in the process of crushing ores in the production conditions of NMZ of Navoi Mining and Metallurgical Complex, defects and causes of high-friction disks of CEMCO and BARMAK crushers operating on the basis of centrifugal force were analyzed [2].

Figure 1. Appearance of a disc cast that has become unusable

In order to increase the service life of the part by changing its chemical composition, the results were obtained by providing strength on the surfaces of parts with a high tendency to corrosion under the influence of strong stress and a high probability of cracking. Research work of domestic and foreign manufacturers on corrosion-resistant high-chromium cast iron-based cast alloys, as well as research conducted by foreign research institutions and laboratories to extend the service life of cast discs made of high-refractory chromium cast iron.

Cast-in-place high-chromium cast iron CEMCO and BARMAK crushers, which operate mainly under centrifugal force, work under high friction conditions and to increase their service life [3]. The chemical composition of the alloy is proposed below Table 1.

Table 1

The chemical composition of the proposed alloy

Brand	**Elements, %**						
	C	Si	Mn	Cr	Ni	P	S
280X29NL	2,92-3,0	0,5-0,7	0,6-0,8	28-31	1,2-1,5	0,045-0,067	0,032-0,048

After coordination, the slag material was heated in an IST-0.4 furnace to a temperature of 1430-1450^{0} C, ferroalloys were introduced after the slag was removed, and after holding for 10 minutes, it was poured into a sand-clay mold. After cooling in a cast-sand-clay mold, it was mechanically processed and the chemical composition of the alloy was determined using the equipment “SPEKTROLAB-10M”.

Table 2

Chemical composition of the alloy

Brand	**Elements, %**								
	C	Si	Mn	Cr	Mo	Ni	Cu	P	S
280X29NL	2,92	0,51	0,57	28,86	0,057	1,54	0,2	0,067	0,032

RESULTS. In order to increase the strength of the discs of crushers (crushers) operating under high stress from high chromium cast iron, the chemical composition of the charge material for the production of high-chromium cast iron with a strong and dendritic structure was increased on the basis of alloying elements [4]. The results showed that research in this area could yield the expected results.

The sample is a technological process defect due to the origin of large pores located in the center of the macro-graft and large cracks from the edge of the graft to the center, which may be related to the technological process of casting.

According to the structural analysis of acid-immersed cuttings, the structure of the cast iron sample of grade 280X29NL consisted mainly of martensite + perlite and ledeburite distributed in it in the form of a grid. The structure and distribution of chromium carbides and cementites in the structure are different, with some having a rough structure and some having a needle-like structure.

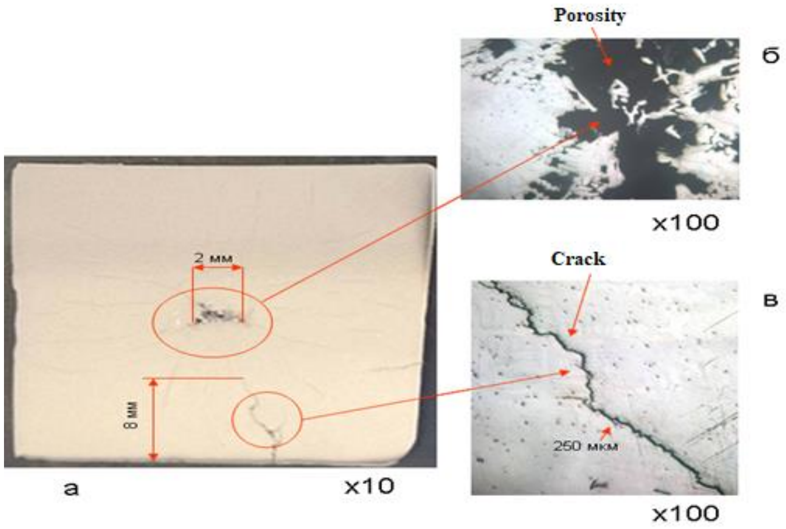

Figure 2. Defects on the unobtrusive surface of the macrosection of the cast iron sample brand 280X29NL: a - defects on the surface of the macrosection; b - a large porosity located in the center of the cut; v - a large crack at the edge of the cut

Structural analyzes show that the chemical composition of the sample is unevenly distributed by volume. Therefore, in the center of the structure is formed mainly pre-eutectic chromium white cast iron structure (Fig. 3, a), in the middle zones of the sample eutectic chrome white cast iron (Fig. 3, b) - picture, v).

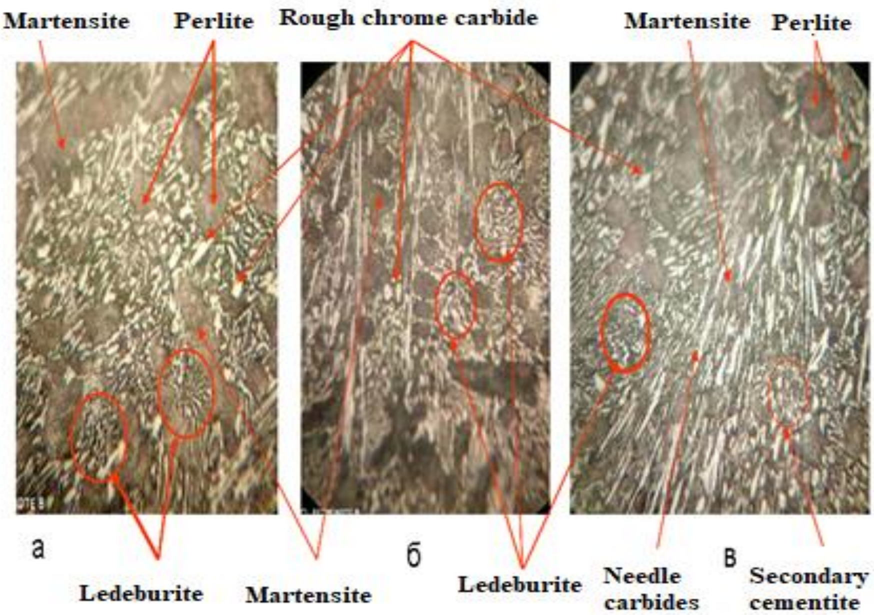

Figure 3. Microstructural image of a cast iron sample brand 280X29NL, (immersed in a mixture of picric and nitric acid for 10… 15 seconds) x200: a - sample center; b - the middle of the sample: c - the edge of the sample

The microcatality of the martensite + perlite and ledeburite base in the 280X29NL cast iron sample was carried out under the loading effect of 200 gr using PMT-3 on HV. Figure 3 shows a trace of a diamond pyramid in perlite and ledeburite in the sample structure using the PMT-3 device.

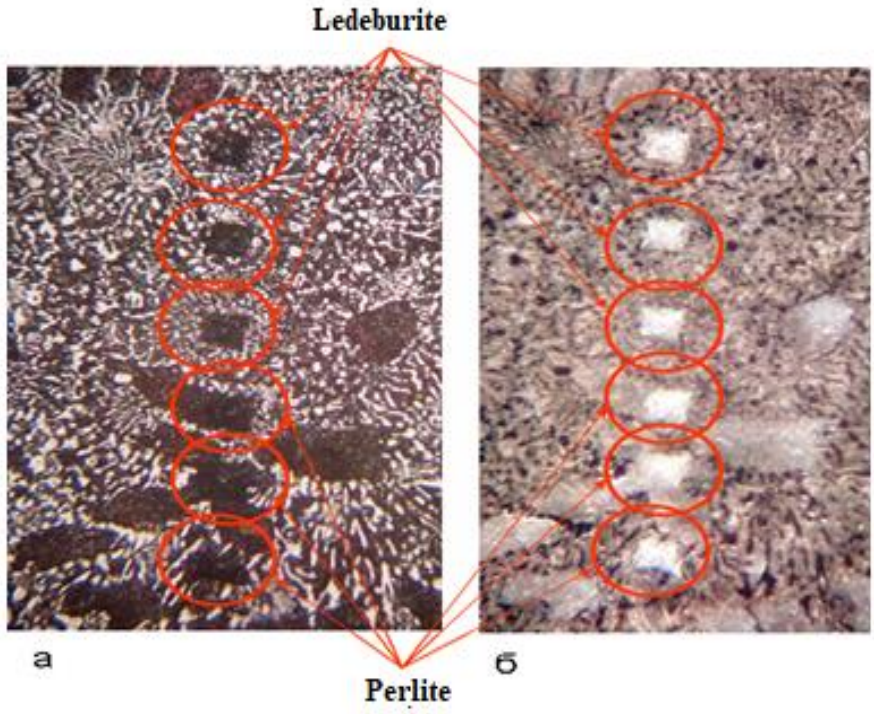

Figure 4. 280X29NL cast iron specimen, mainly a diamond pyramid, x600: a - on an open background; b - in the closed background

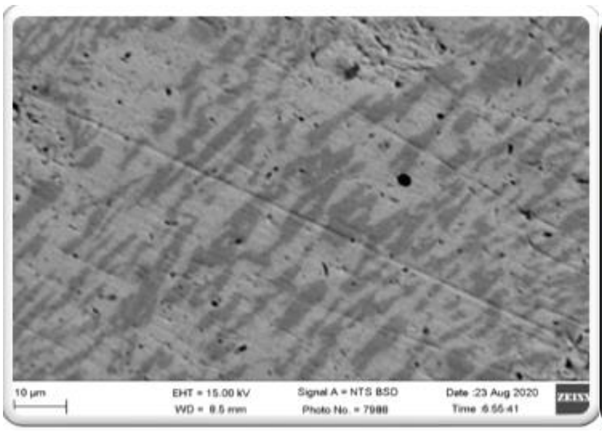

Figure 5. CEM Zeiss EVO MA 10 scanner electron microscope based 280X29NL alloy 1000x viewed

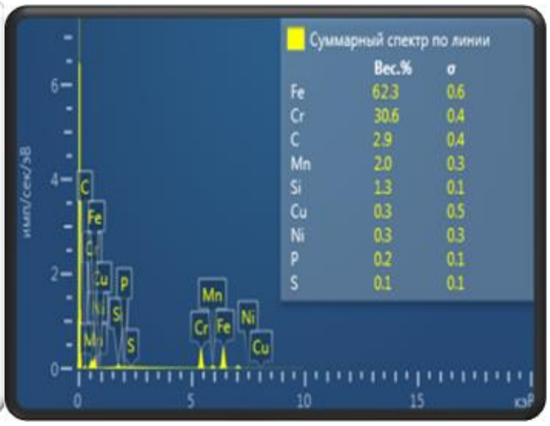

Figure 6. Line 280X29NL alloy element analysis image on a scanning electron microscope

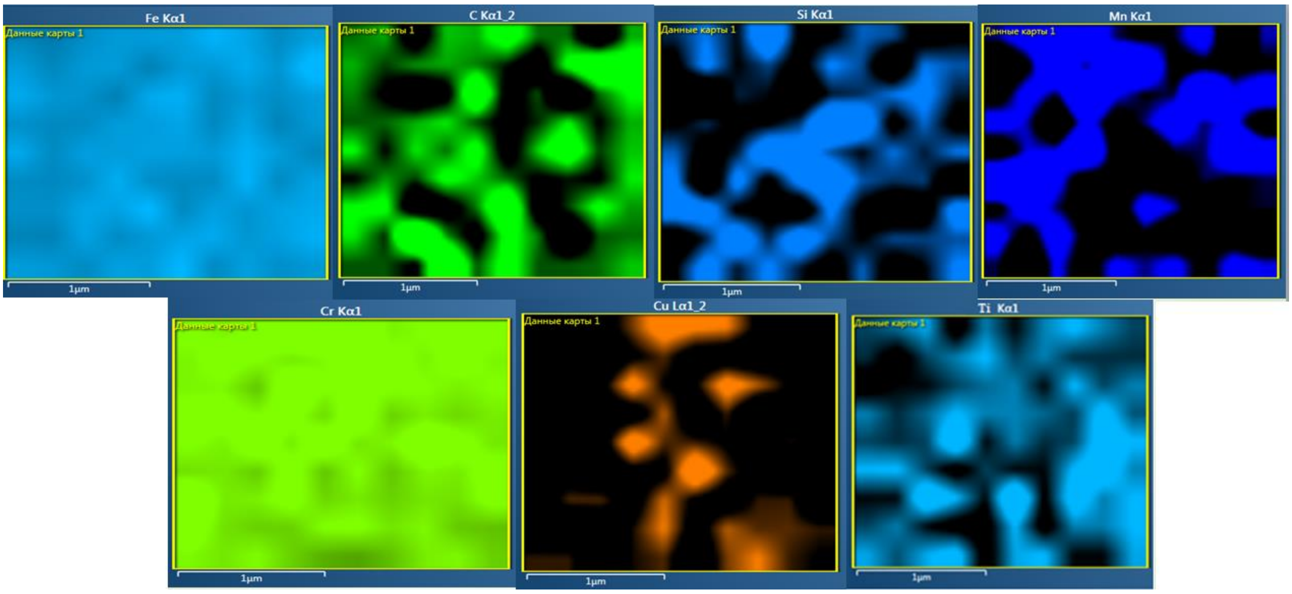

Figure 7. Distribution of elements in the 280X29NL alloy in units of volume CEM Zeiss EVO MA 10 scanned electron microscope image magnified 500X times

When checking the 1 mm area of the alloy of elements in the composition of ductile white cast iron brand 280X29NL, it can be seen in Figure 7 that the elements of carbon, silicon, manganese, titanium and copper are not evenly distributed in the unit of volume except iron and chromium. This is a liquidation process, and such alloys cause various defects during corrosion and friction.

According to the results of the study, the microhardness of the perlite base was 2065 N/mm^2, the microhardness of ledeburite was 6893 - 7400 N/mm^2, the microhardness of martensite was 5065 N/mm^2, and the hardness of the volume was 410 - 470 N/mm^2.

CONCLUSION

Based on the above data, a technology has been developed to increase the service life of the discs of CEMCO and BARMAK crushers, which operate under the influence of centrifugal force, which is obtained by casting from high-strength chromium cast iron. Based on the analysis of the initial results obtained, the following conclusion was developed:

- the new brand of brittle white cast iron casting molding technology has been developed based on the regulation of the crystallization intensity of the alloy inside the mold. This made it possible to regulate the hardness distribution on the friction surface;

- the scheme of placement of the disk in the casting mold, which provides for a uniform distribution of the elasticity of the reinforcing surface during the cooling process of the casting, was developed on the basis of the thermal conductivity of the mold walls. This serves to select the mold item;

- developed a new brand of brittle white cast iron injection molding technology. The introduction of the developed technology allowed to increase the hardness of the working surface of the casting by 22-24%;

- a scheme of placing the disk in the casting mold, which provides a uniform distribution of the reinforcing surface during the cooling of the casting, was introduced. The introduction of the developed scheme allowed to increase the bending strength of cast parts in the thin part of the working surface by 10-12%.

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