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Development Of A New Brand Of Alloy Instead Of 280x29nl Brand Spreadable Cast Alloy

Nodir Turakhodjaev
Tashkent State Technical University, Tashkent, Uzbekistan

Nosir Saidmakhamadov
Tashkent State Technical University, Tashkent, Uzbekistan

Fatkhulla Abdullaev
Tashkent State Technical University, Tashkent, Uzbekistan

Shirinkhon Turakhujaeva
Turin Polytechnic University In Tashkent, Tashkent, Uzbekistan

Zafar Bobodustov
Navoi Machine-Building Plant, Navoi Region, Uzbekistan

Ulugbek Rakhmanov
Navoi Machine-Building Plant, Navoi Region, Uzbekistan

Furkhat Odilov
Tashkent State Technical University, Tashkent, Uzbekistan

ABSTRACT

This article a new brand 280X29NL (sample 1) alloy, which is economically inexpensive and corrosive, was developed without changing the chemical composition of high-chromium 280X29NL cast iron and reducing the mechanical properties of the alloy.

KEYWORDS

Alloy, chrome, ductile, microstructure, carbide, IST - 0,4 induction furnace, SNOL - 7,2 / 1100 muffle furnace, "SPEKTROLAB-10M" equipment, hardness measuring device TK-2M.

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INTRODUCTION

At present, one of the most important issues is the supply of machine-building, agriculture and machine-building industries with casting products. The main reason for this is that in order to obtain quality castings, it is necessary to take into account the composition of the ingot together with quality molds, at what temperature and in what furnace liquefaction, the correct choice of casting system and the temperature of the liquid alloy poured into the mold [1,2].

According to the results of research conducted by professors of the Department of "Casting Technologies" of Tashkent State Technical University on the basis of research conducted by NMZ of Navoi Mining and Metallurgical Complex, currently in abrasive operating conditions in mining, metallurgy, chemical engineering and other enterprises. casting of working machine parts from alloy cast iron is underway. The main brands of cast iron are ChX16, ChX16M2, ChX22, ChX22S, ChX28D2, ChX32, ICh290X12M, 280X29NL and others. [3].

Alloy castings are used to make parts that are mainly used in operating conditions with high aggressive environments and abrasive wear. Therefore, these cast irons are in great demand by the production and processing industries of the republic.

Alloy cast irons have high performance properties, from which the production of quality castings is important. Because cast iron is alloyed with various alloying elements, including chromium, its alloying properties increase depending on the amount of chromium. In addition, the brittleness of alloy cast irons depends on its microstructure, which means that in the production of alloy castings it is important to ensure not only the quality of the casting, but also the formation of a microstructure that provides corrosion resistance of cast iron [4].

The corrosion resistance of cast iron is mainly provided by carbides with a structure of (Cr, Fe, Mn) 7 C3. The reason is that this carbide is 1.5-2.0 times harder than cementite carbide. Another complication associated with this is that the amount of chromium in cast iron, which has 3% C for the formation of carbides in the system (Cr, Fe, Mn) 7 C3, ranges from a maximum of 12 to 27% [6,7].

MATERIALS AND METHODS

At present, the defects of CEMCO and BARMAK crushers operating on the basis of centrifugal force in the process of crushing ores in the production conditions of NMZ of Navoi Mining and Metallurgical Plant under high friction conditions and the causes of their formation were analyzed.

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Figure 1. Appearance of a disk 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 surface of the part, which has a high tendency to corrosion under the influence of strong stress and is more likely to crack. The 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 disks made of high-refractory chromium cast iron. High-chromium cast iron was liquefied in sand-clay molds in the IST-0.4 induction furnace and poured into special molds in the conditions of the enterprise "NMZ" of the State Enterprise “Navoi MMC” [8,9].

Figure 2. Sand-clay mold to get the disk cast

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In order to increase the strength of disks of 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 strong and dendritic structure was increased on the basis of alloying elements [10,11]. The results obtained showed that research in this area may yield the expected results. SNOL - 7.2 / 1100 muffle furnace was used for heat treatment to improve the internal structure (structure), physical and mechanical properties of cast alloys.

Figure 3. SNOL - 7.2 / 1100 muffle furnace for heat treatment of samples

SPEKTROLAB-10M equipment, TK-2M hardness tester to determine the hardness of the alloy and METAM RV-23 microscope to analyze the microstructure of the alloy were used to determine the chemical composition of the samples.

RESULT AND DISCUSSION

The chemical composition of the cast iron has been developed to increase the ductility of high-chromium castings in order to increase

the service life of high-chromium cast iron castings [12,13]. The chemical composition of the alloy is given in Table 1.

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Table 1

Chemical composition of the alloy

Brand	**Elements, %**						
	C	Si	Mn	Cr	Mo	P	S
280X29NL (Sample 1)	2,8-3,0	1,1-1,2	0,6-0,8	17,2-18,2	1,8-2,0	0,022-0,024	0,007-0,009
Charcoal composition of the brand 280X29NL							
Cast iron	L2			GOST 4832-95			
Cast iron (return)	B 65			GOST 2787-75			
Steel	Nickel N12			GOST 1969-2009			
Ferrochrome	FX-100			GOST 4757-91			
Ferromanganese	FMn-88			GOST 4755-91			
Cast iron	FS-45			GOST 1415-93			

After coordination, the slag was heated in an induction furnace IST-0.4 to 1400-1450° C, ferroalloys were introduced after the slag was removed and after holding for 10 minutes it was poured into a sand-clay mold.

Figure 4. Appearance of disk cast cast in sand-clay mold

After cooling the casting in a sand-clay mold, it was heat treated to increase its strength and brittleness.

The sample was cooled in air after being kept in a SNOL-7.2 / 1100 muffle furnace at 1000° C for 12 h. When the samples were examined on the SPEKTROLAB-10M equipment, a uniformly distributed dendritic structure was observed on the surface of the microfields of the samples.

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Figure 5. 100X magnification view using SPEKTROLAB-10M

To determine the stiffness of the sample, a hardness measuring device brand TK-2M was used and the hardness was found to be in the range of 46 HRC - 48 HRC.

CONCLUSION

Based on the above data, a technology has been developed to increase the service life of the disks 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 made:

- There is an opportunity to increase the processing resource by 1.3-1.5 times and to develop resource-saving technology in the production of disks;
- The samples were cooled in air after being kept in a SNOL-7.2 / 1100 muffle furnace at 1000° C for 12 h. As a result, a uniformly distributed dendritic structure was observed on the surface of the sample microvilli, and the hardness index obtained using the TK-2M hardness tester to determine the hardness of the sample was 46 HRC - 48 HRC;
- A new brand of alloy 280X29NL (sample 1), which is 10-15% cheaper and more corrosive, has been developed, without changing the chemical composition of high-chromium 280X29NL cast iron and reducing the mechanical properties of the alloy.

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