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Development Of Technology To Increase Resistance Of High Chromium Cast Iron

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ABSTRACT

Development of the chemical composition of the charge on the basis of alloying elements for the production of stable structural high chromium cast iron and high friction of CEMCO and BARMAK crushers operating under the influence of centrifugal forces and spare parts for corrosion-resistant pumps at Navoi NMEP the issues of casting rotors operating under severe conditions were considered.

The analysis shows that it is proposed to use heat treatment and a number of similar methods to increase the service life of the product obtained by casting in the conditions of the enterprise "NMEP" of Navoi NMMP.

KEYWORDS

Crusher, rotor, pump spare parts, friction, heat treatment, temperature, charge, alloy, white cast iron.

INTRODUCTION

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The high alloy white irons are primarily used for abrasion resistant applications and are readily cast in the shape needed in machinery used for crushing, grinding and general handling of the abrasive materials. The presence of M7C3 eutectic carbides in the microstructure provides high hardness needed for abrasion resistant applications. The metallic matrix supporting the carbide phase in these irons can be adjusted by the alloy content and heat treatment to develop the proper balance between resistance to abrasion and toughness. All high alloy white irons contain chromium to prevent the formation of graphite on solidification, stabilize the carbide and to form chromium carbides which are harder than iron ones. Most of them also contain nickel, molybdenum, titanium, copper or combinations of these alloying elements in order to prevent the formation of pearlite in the microstructure [1,2].

The corrosion resistance of cast iron is mainly provided by carbides with a structure of (Cr, Fe)7 C3, (Cr, Fe)3 C or Cr (Cr, Fe)23 C6 when the content of Cr is 9.5-15%. 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% S to form carbides in the system (Cr, Fe)7 C3, (Cr, Fe)3 C, (Cr, Fe)23 C6, is very high at 9.5. is formed in the range of 30% [3,4].

Also the chromium-molybdenum white irons contain Cr, Mo, Ti, Ni and Cu and can be supplied; either as-cast with an austenitic or austenitic-martensitic matrix, or heat treated with a martensitic matrix microstructure for maximum abrasion resistance and toughness. These irons provide the best combination of toughness and abrasion resistance of all white irons and are used in hard rock mining equipment, slurry pumps, coal grinding mills, and brick molds.

MATERIALS AND METHODS

The causes of defects in the high-friction heavy-duty rotors and pumps of CEMCO and BARMAK crushers, which are currently used in the crushing of ore at the NMEC of Navoi Mining and Metallurgical Plant, were studied and analyzed. An action plan has been developed for liquefaction in an economically inexpensive, flexible and durable high-chromium cast iron IST-2.5 furnace without increasing the strength and service life of parts on surfaces that are prone to corrosion under high stress and prone to cracking tasks were identified [5,6,7].

The research work of local and foreign manufacturers on corrosion-resistant high-chromium cast iron-based cast alloys and the manufacturers' research on extending the service life of cast parts made of corrosive high-chromium cast iron were analyzed.

High-chromium cast iron pumps have been used to improve the chemical composition of the casting material and to enrich it with alloying elements to produce stable structural corrosion-resistant alloyed white cast iron.

In order to obtain brittle high-chromium cast iron, liquefied liquid alloy was developed for out-of-furnace processing and mold crystallization modes [8,9].

Tashkent State Technical University has developed a technology for liquefaction and molding of alloyed white cast iron in the laboratory.

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Modern, efficient methods of heat treatment were used to change the internal structure, physical, mechanical and other properties of alloys obtained by casting.

The results of the study used a scanning electron microscope (SEM) to determine the chemical composition of the metal sample as well as the formation of several clear images and surface properties to increase the service life of the pump parts and the rotors of the crushers.

Cast chrome-plated high-chromium cast iron is mainly used to develop technology to increase the wear resistance of alloyed white cast iron products in order to increase the service life of high-friction heavy-duty rotors of pump parts and centrifugal CEMCO and BARMAK crushers. for the production of high-chromium cast iron with a stable structure, the chemical composition of the shale material was enriched with alloying elements [10,11].

RESULT

Table 1

Chemical composition of recommended alloys

Alloys	Элементлар, %									
	C	Si	Mn	P	S	Cr	Ni	Mo	Ti	Cu
280X29NC	2,92	0,51	0,57	0,067	0,032	28,86	1,54	0,057	-	0,2
300X32N2M2TC	2,67	1,13	0,57	0,043	0,018	31,58	1,93	0,37	0,2	0,07
The recommended composition of alloys of 280X29NC and 300X32N2M2TC										
Cast iron	Л2			GOST 4832-95						
Cast iron (return)	Б 65			GOST 2787-75						
Steel	Nickel N12			GOST 1969-2009						
Ferrochrome	FX-100			GOST 4757-91						
Ferromanganese	FMn-88			GOST 4755-91						

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Ferrosilicon	FS-45	GOST 1415-93	

The length of the projection of the geometric distances in the horizontal plane, aslo the distance between the corresponding points on the flat and horizontally oriented surface of the object, was measured using an electron microscope scanning the image of the element analysis before and after the heat treatment of our sample [6]. The electron beams were constantly examined on the surface of the object, the part of its image formed by the microscope. In addition, each point on the surface of the object was indicated by a corresponding point on the image generated in the microscope view. When electron beams were exposed to the surface of an object, multiple response signals occurred simultaneously [12]. Depending on which signal detector was introduced, the microscopes produced one or more clear images.

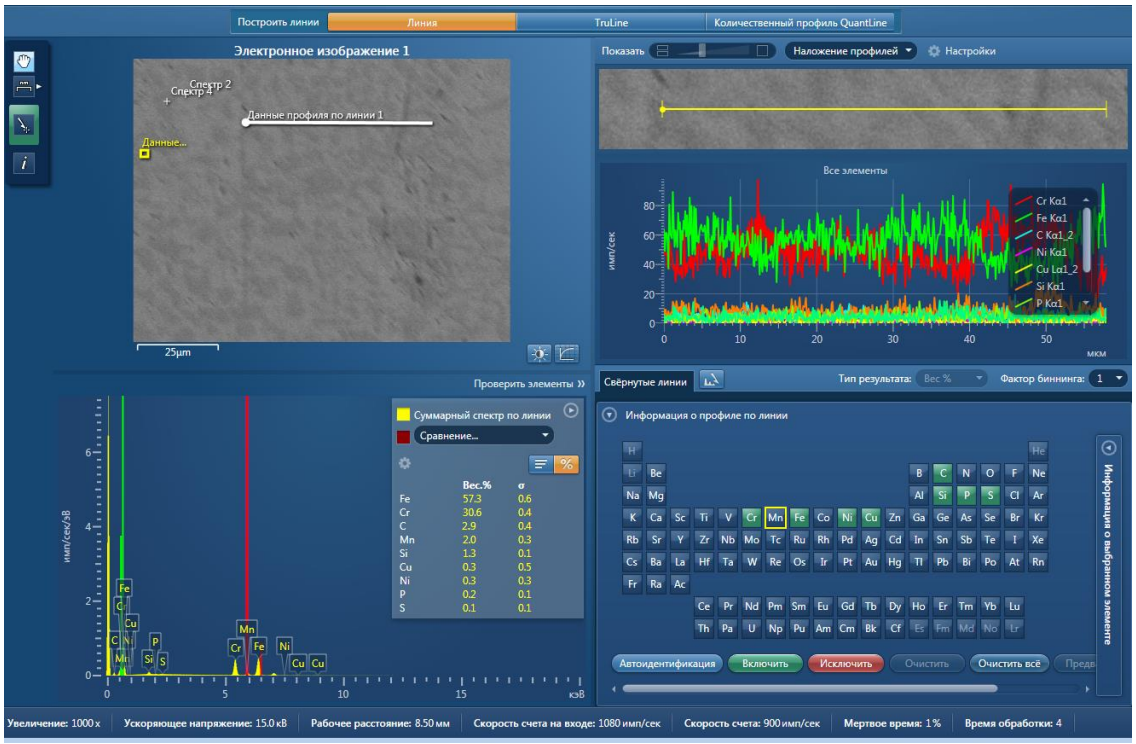

Figure 1. The chemical composition of high-chromium cast iron based on the electron microscope scanning SEM Zeiss EVO MA 10 was observed.

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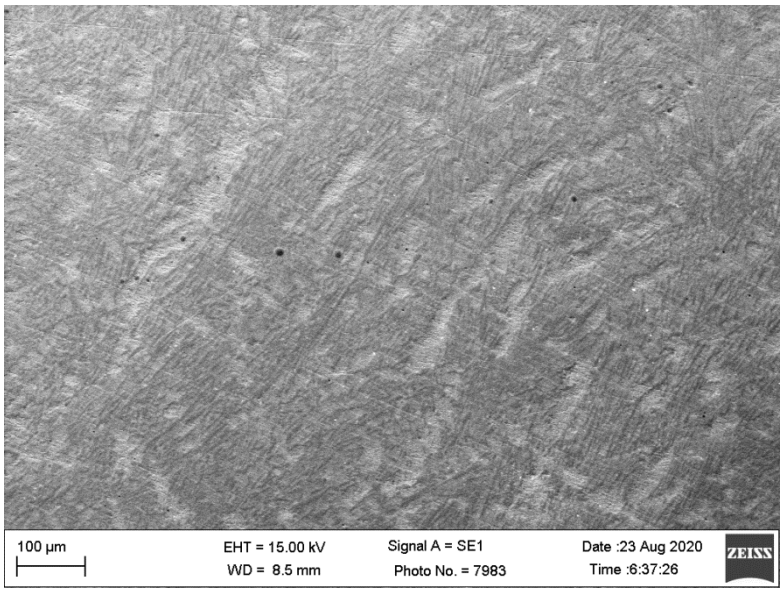

Figure 2. 280X29NC high chromium cast iron before heat treatment SEM Zeiss EVO MA 10 scanning electron microscope 100x view.

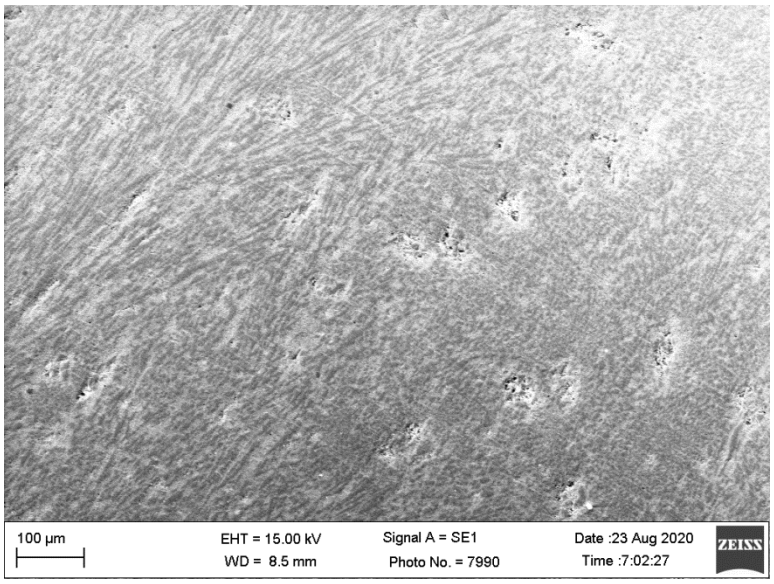

Figure 3. 300X32H2M2TC alloy white cast iron before heat treatment SEM Zeiss EVO MA 10 scanning electron microscope 100x view.

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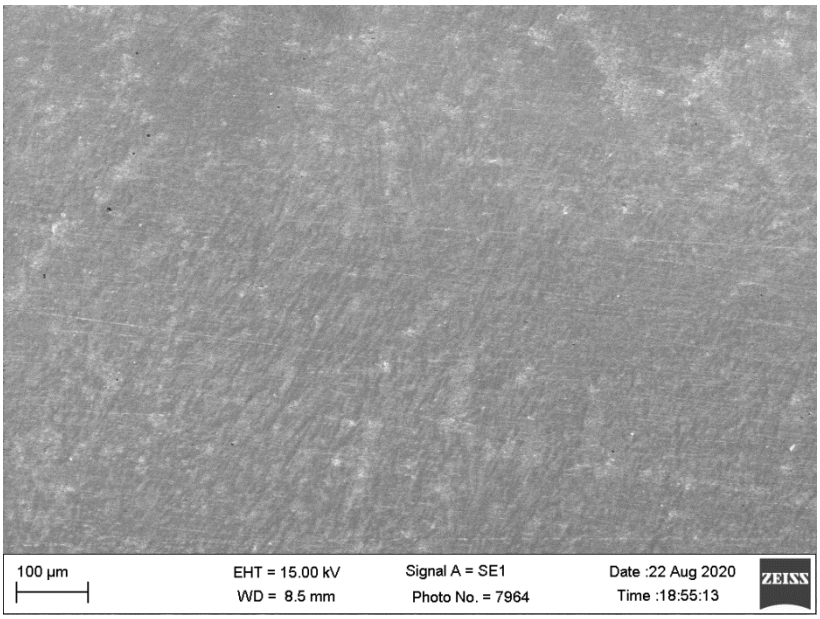

Figure 4. 280X29NC high chromium cast iron after heat treatment SEM Zeiss EVO MA 10 scanning electron microscope 100x view.

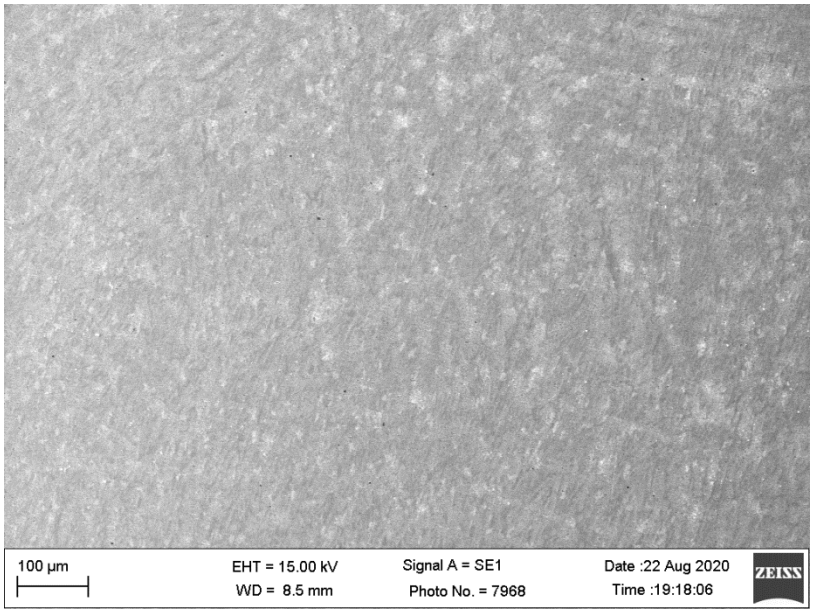

Figure 5. 300X32H2M2TC high chromium cast iron after heat treatment SEM Zeiss EVO MA 10 scanning electron microscope 100x view.

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CONSLUSION

Based on the above, to develop a technology to increase the service life of high-friction heavy-duty rotors of CEMCO and BARMAK crushers, which are obtained by casting from ductile high chromium cast iron, mainly under the influence of pump parts and centrifugal force [13];

- Development of resource-saving technology in the production of spare parts for pumps and rotors of crushers (crushers) to increase the operating resource by 1.2-1.4 times;
- Increased resource savings by 6-8% based on its application;
- Enrichment of the chemical composition of the charge with alloying elements for the production of white cast iron with a stable structure;
- Heat treatment to increase the service life of the product;
- Hardness of alloys increased to 550 NB before heat treatment, 650-660 NB after heat treatment;
- Based on the development and application of energy-saving technology in the production of spare parts for pumps and rotors of crushers, it was found that energy savings can reach 10-12%.

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