Technology of Increasing the Service Period of Liquidation Furnaces Based Liquid Shibba

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ABSTRACT

This research analyze the effect of slag and metal composition in electric arc furnace, and the factory data is statistically evaluated according to the degree of corrosion of refractory lining. The degree of corrosion of the lining in an electric arc furnace under the influence of special slag (basic CaO, MgO, FeO, Al2O3, SiO2) and metal components (C, Mn) were analyzed at the factory. In these factories, together with the corrosion data, the values of the slag composition were represented by a diagram in relation to the oxidation potential between basic, acidic and oxides.

Keywords: steel, wear – resistance, refractory lining, steelmaking, electric arc furnace, oxide slag, metal, magnesite brick, liquefaction, slag, slaked lime, manganese, iron oxide, oxidation

Introduction

One of the urgent problems facing our independent Uzbekistan during the transition to the market economy is the step-by-step development of the technical and economic development of the national economy. Only then will it be possible to meet the growing material and spiritual needs of our people [1 – 3].

In this regard, the role of the machine – building industry is extremely important. Because the development of all branches of the national economy depends on the proper development of machine buildingFor this reason, the power of countries is considered depending on the level of development of mechanical engineering. It is known that only when the industry is equipped with modern, improved techniques and technologies, it is possible to produce products that meet world standards and compete with the products produced by advanced countries. [4]. For this, along with the improvement of the existing technological processes, we need to widely attract modern technologies from developed countries and investors' investments to our industry. In this regard, a lot of work has been done and is being done in our Republic. In particular, a number of modern large joint ventures based on the most advanced technology, together with investments and experts of foreign countries, are conducting scientific research. [5 – 7].

At the end of the 19th century, at the beginning of the 20th century, electric furnaces began to be used. These furnaces have

advantages such as the simplicity of the structure, the adjustment of the furnace temperature by changing the current parameter, operation in various environments and vacuum, and the production of high-quality, special steels from cheap solid materials [8 – 9]. In this regard, steel is the main construction material, and it is better than cast iron, it has good properties of fineness, plasticity, satisfactory flowability, weldability and cutting workability. But in spite of the higher specific gravity, faster corrosion, they are widely used in the machine industry to obtain cast products of various shapes, such as cast iron. In particular, the demand for their high-quality, alloyed varieties with special properties is increasing more and more. Currently, steel is produced in metallurgical enterprises mainly in converters, marten and electric furnaces. It is worth saying that in recent years electric arc and induction furnaces are widely used in foundries.

Materials And Methods.

Today, a 30 – ton electric arc furnace is used to produce high-quality steel alloy products. One of the most important priorities of electric arc furnace liquefaction is to obtain quality castings. First of all, an electric arc furnace was used to liquefy the steel alloy. Therefore, an electric arc furnace was selected, which is reasonable for the liquidization of steel alloy. The main reason for this is that the steel alloy is acidic, which quickly corrodes the lining of the furnace

1 – picture. Electric arc furnace with vertical electrodes

First of all, it is important to choose the inner layer of the furnace when melting the steel alloy. Magnesite bricks were used as refractory materials for the lining of the basic furnace. The walls of the furnace were made of magnesite bricks made of refractory materials. In making magnesite brick, natural magnesite ($MgCO_3$) is heated to 1400^0 C in special furnaces. Magnesite then decomposes into MgO and CO_2After adding a certain amount of clay and lime to the obtained MgO and mixing it with water, it was pressed and heated to a temperature of 15000 C, and the expected result was achieved. The composition of magnesite brick is shown in table 1

1 – Table
Composition of magnesite brick

MgO	CaO	Fe_2O_3	SiO_2	Al_2O_3
90 – 95%	1 – 2%	2 – 3%	2%	1%

Then, refractory bricks, i.e., magnesite bricks, were placed inside the furnace, and the inner surfaces were plastered with refractory clay. The thickness of its walls was in the range

of 700 – 1000 mm depending on the size of the furnace, and its surface was covered with steel sheets. 2 – refractory bricks were selected as shown in the picture.

2 – picture. The process of plastering the base lining of an electric arc furnace

During the operation of the electric furnace, it was achieved to increase the corrosion resistance of the furnace lining by means of slag formed from liquid metal. For this purpose, FeCr100 A and FeTi35 ferroalloys were added to the liquid metal through the furnace window. In this case, not only a high-quality steel alloy was obtained, but also a coating was formed on the lining of the furnace, and the service life of refractory materials was increased. Replacing an electric arc furnace repair liner from time to time means a valuable financial investment, as well as several hours of downtime and lost production. The maximum economic efficiency was achieved by extending the service life of the lining of the electric arc furnace. This goal, along with the elimination of negative factors, constant exposure to high temperature (1500 – 1700°C), influence on the mechanical properties of metal at low and high temperatures, damage to the lining as a result of chemical interaction with slag and metal (mainly FeO, SiO2 content), thermal shocks, erosion, direct impact of an electric arc, use of gas, oxygen, etc. An acidic slag was formed at the beginning of electric arc furnace fluidization. To immediately replace this slag, the quality of the slag was improved (with the addition of dolomite lime, MgO briquettes, recycled refractory materials). Table 2 shows the chemical composition of the obtained slag.

2 – table

Chemical composition of the slag obtained from the lining of the basic furnace

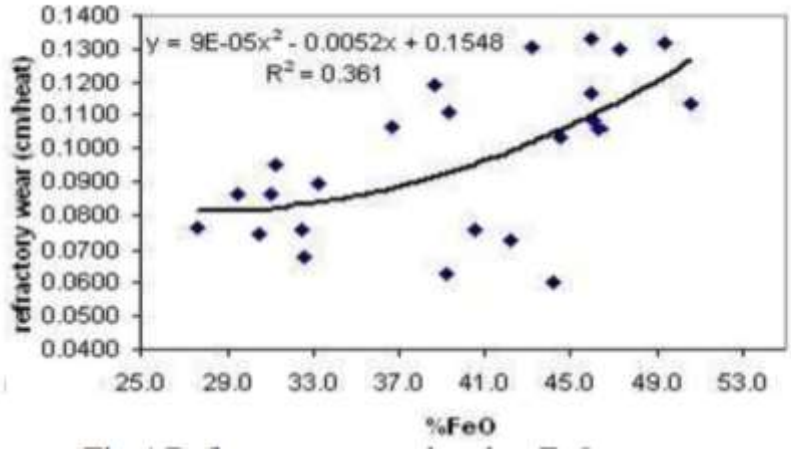
Chemical compositiona								
CaO	SiO_2	MnO	FeO	Cr_2O_3	TiO_2	CaS	CaS	MnS
41 – 42	34 – 36	17 – 18	0,5 – 0,7	0,8 – 1,2	0, – 1,1	0,2 – 0,4	0,2 – 0,4	0,1 – 0,2

Since there is magnesium oxide in the lining, calcium oxide is necessary chemically, i.e., for the efficiency of reoxidation reactions. Also, when the slag contains a sufficient amount of oxide and the slag is saturated with CaO, MgO, it not only increases the corrosion resistance of

refractory materials, but also improves the foaming parameters of slag by reducing the refining process. helped. Some electric arc furnace liners operate with undersaturated MgO. Due to this, low refractoriness, low flow rate when the slag is liquefied in the furnace, and deterioration of the foaming quality of the slag. Another common problem is that when the amount of iron oxide in the slag increases, the amount of slag increases and the metal content does not decrease, eventually causing the lining to fail. The chemical interaction between MgO should also be given great importance. When heated in an electric arc furnace, a gradual increase of oxygen in the metal and a decrease of other elements (with their affinity for oxygen) occurred in the particles. Corrosion can be prevented if Si, Al, Ti, P elements are included in the solid materials for the electric arc furnace. Then (SiO_2 + Al_2O_3 +TiO_2 + P_2O_5) these reactions separated and increased the service life of the liner. Carbon and manganese play an important role in the process of eating. If their metal content falls below a certain critical value, then as a result, excessive oxidation of the metal and a sharp increase in the FeO content in the slag occurred. Metal dissolves carbon with unsaturated carbon, and MgO–C is formed with refractory material. Due to the different connection between metal and slag, the process became intense in the slag holding zone. The lining of the electric arc furnace is made of magnesite and carbon bricks, due to the effect of the chemical reaction of metal and slag (slag oxide, reaction with metal oxygen) and the mechanical damage of the surface of the lining, the viscosity of the slag, the angle of wetting, the interphase tension between the slag and the metal. The dissolution of MgO in the slag is one of the steps to prevent the corrosion of the liner. One of the advantages of the foaming process is that it not only reduces the consumption of refractory material, but also increases the durability of the lining.

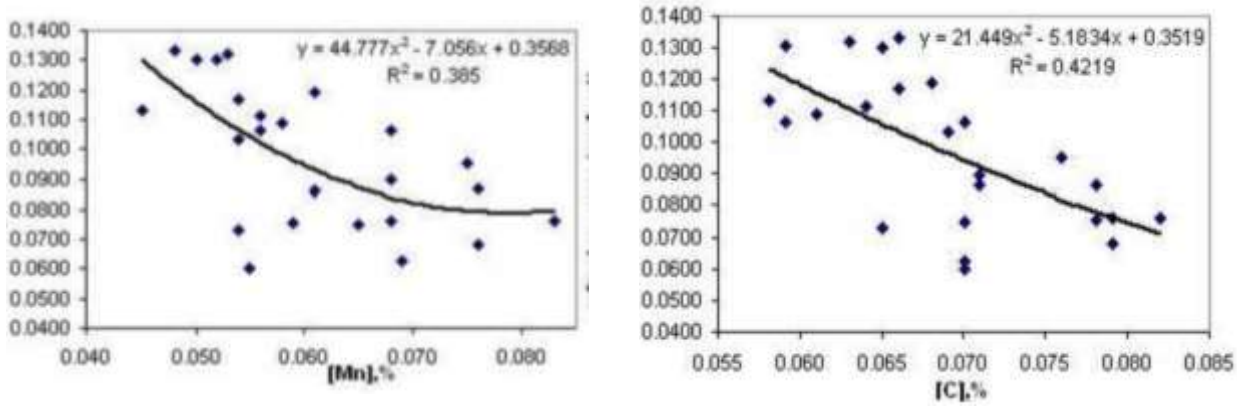
Results

The inner layer (lining) of the electric arc furnace for liquefaction of high-quality steel alloys was developed based on the above technology. Corrosion and composition of CaO, MgO in refractory lining were analyzed. As seen in the graph, it was confirmed that basic oxides increased corrosion resistance and statements (increasing the content of CaO or MgO showed that corrosion decreased).



3 – picture. Relationship of refractory materials with FeO.

When metal is liquefied in an electric arc furnace (C, Mn), important elements increase the corrosion resistance of refractory materials, is shown in the 4 – picture.



4 – picture. Dependence of manganese and carbon content of metal on the consumption of refractory material.

As the amount of carbon and manganese in the metal decreased, the amount of oxygen in the metal increased. As a result, the corrosion resistance of the metal and the iron oxide have increased in a satisfactory condition.

Conslucion

In conclusion, it can be said that as a result of this study, the effect of slag and metal on increasing the consumption of refractory materials in electric arc furnaces in factories was analyzed. The most critical corrosion zone of the lining based on magnesium oxide is in the slag conductor where the slag - metal - lining interacts. It can be seen in both graphs that the main oxides, alkalinity, carbon and manganese content analyzed in the factories decreased, the corrosion resistance was increased, the FeO content of the metal decreased and the corrosion resistance was increased.

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