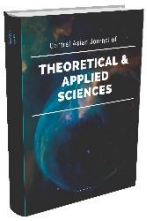

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Technology of Increasing the Service Life of Based Lining Based on Recycling

Bekchanova Valida
PhD researcher, Tashkent state technical university, University Street 2, Tashkent, Uzbekistan

Abdullaev Kamol
Docent, Namangan engineering – construction institute, Islam Karimov street 12, Namangan

Saidmakhamadov Nosir
PhD candidate, Tashkent state technical university, University Street 2, Tashkent, Uzbekistan

Tadjiev Nuritdin
Researcher, Tashkent state technical university, University Street 2, Tashkent, Uzbekistan

Abdurakhmonova Mukhlisakhon
Teacher, Tashkent state technical university, University Street 2, Tashkent, Uzbekistan

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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 satisfy 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 building. For 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 the implementation of these great tasks, it is necessary to rely on the achievements of science. 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 their structure, 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 inexpensive 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. However, 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 [10 – 12].

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, as a result of the creation and development of jet, atomic technology and other fields, the need for metal alloys with almost high precision, corrosion resistance and plasticity, working in an aggressive environment, at high pressures and temperatures, has increased. This led to the creation of new scientific centers and laboratories [13 – 15]. Deeper observations are being made in these centers and laboratories with the help of electron microscopes, X – rays and other modern equipment.

Materials And Methods

A 30 – ton electric arc furnace was used to produce reinforcement products from high – quality steel alloys. One of the most important priorities of electric arc furnace liquefaction is to obtain quality castings.

1 – picture. 30 ton electric arc furnace

First of all, it is important to choose the inner layer of the furnace when melting the steel alloy. Currently, an electric arc furnace with a basic inner layer of the furnace has been selected for the fluidization of steel

alloy [16, 17]. The walls of the furnace were made of bricks and blocks made of refractory materials. The inner surfaces of the oven are plastered with refractory clay. Magnesite bricks were used as refractory materials for the lining of the basic furnace.

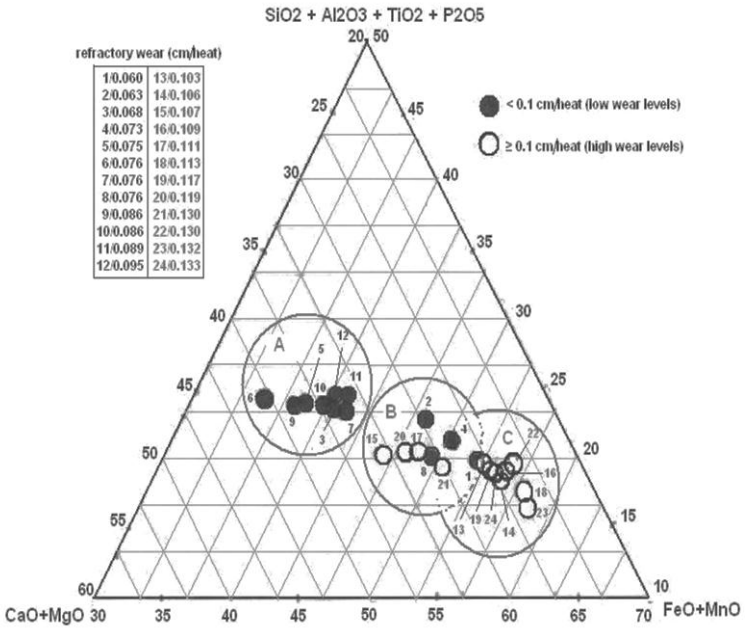
The consumption of refractory materials of an electric arc furnace should be the same, but due to various factors, it may be more or less observed in different parts of the furnace. The reason for this is that different parts of the lining layer of the electric arc furnace have different thicknesses, and the wear of the lining can be different due to the different layers of refractory materials. The most important part of the furnace, i.e. lining, MgO – C slag line, materials with various carbon and antioxidant additives are used. Advantages: high strength, fire resistance, low porosity, good mechanical properties, abrasive wear and low wetting by slag. Water cooling panels or furnaces are usually installed in the upper part of the furnace body [18 – 21]. In modern ovens, it is located in the area of the side walls. It is necessary to control the thermal regime, and it is important to prevent an emergency situation by means of fire-resistant lining (checking its temperature, measuring the temperature of the coolant, etc.) [21 – 24]. The most important thing is to distinguish negative factors. Since there is magnesium oxide in the lining, calcium oxide is necessary chemically, that is, for the efficiency of reoxidation reactions, and the slag contains a sufficient amount of oxide. When slag is saturated with CaO, MgO, it not only increases the corrosion resistance of refractory materials, but also improves the parameters of slag foaming by reducing the refining process. If we want to evaluate by adding a certain amount of flux additive, the slag separation becomes easier. Some electric arc furnace liners operate with under saturated MgO. Due to this, low fire resistance, low flow rate when slag is liquefied in the furnace, and poor foaming quality of slag. Another common problem is that when the iron oxide content of the slag increases, the slag increases and the metal content decreases, eventually causing the lining to fail. The chemical interaction between MgO should also be given great importance. The presence of elements Si, Al, Ti, P in the solid materials in the electric arc furnace prevents corrosion. But the abundance of these elements means a high price. Then (SiO_2 + Al_2O_3 +TiO_2 + P_2O_5) these reactions separate and increase the service life of the liner. Carbon and manganese play an important role in the process of digestion. 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 occur. Metal dissolves carbon with unsaturated carbon and with refractory material MgO – C is formed.

Due to the different connection between metal and slag, the process becomes intense in the slag holding zone. The lining of the electric arc furnace is made of magnesite and carbon bricks, and due to the chemical reaction of metal and slag (slag oxide, reaction with metal oxygen) and mechanical damage of the lining surface, the viscosity of the slag, the angle of wetting, and the interphase tension between the slag and the metal. The dissolution of MgO in the slag prevents 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 life of the lining. After the slag foaming operation in the electric arc furnace, the service life of the sidewalls was tripled. When the slag is foamed in an electric arc furnace, there is a significant change in the corrosion mechanism, as the corrosion is slowed down by the presence of CO gas bubbles in the refractory material. Also, damage to the lining is reduced. The main reason for this is the increased durability of refractory bricks, and the durability of the lining of these furnaces has increased from 400 to 600 times to steel liquefaction.

Result

The inner layer (lining) of the electric arc furnace for liquefaction of high – quality steel alloys was developed based on the above technology. The liquefaction process was started at low power to prevent overheating of the side walls of the furnace. In order to protect the inner wall of the furnace and to speed up the liquefaction process, a liquid metal residue was left at the bottom of the furnace. After liquidizing the steel alloy, the carbon content increased by 0.25%. As a result, the oxidation process was prevented.

By this time, the main slag was formed, i.e. 55% manganese, 15% silicon and 15 – 20% iron oxide. Carbon monoxide from the slaked lime-coke mixture reacting with the iron oxide in the slag caused the slag to foam. This foam protected the sidewalls and provided a high strength parameter. When metal is liquefied in an electric arc furnace (C, Mn), important elements increase the resistance to corrosion of refractory materials.



2 – picture. (CaO + MgO) – (FeO + MnO) – (SiO_2 + Al_2O_3 + TiO_2 + P_2O_5) net corrosion rate diagram

A statistical analysis of the corrosion and composition of CaO, MgO in the refractory lining was expected to be confirmed. As we can see in pic. 2, it was confirmed that basic oxides increased the corrosion resistance and statements (increasing the content of CaO or MgO showed a decrease in corrosion).

As the amount of carbon and manganese in the metal decreased, the amount of oxygen in the metal increased. As a result, the metal's corrosion resistance and iron oxide content increased satisfactorily.

Conclusion

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 is devoted to analysis. The slag – metal – lining interaction, the most critical corrosion zone of lining based on magnesium oxide, was studied. Slag foaming was performed in an electric arc furnace, and the life of the sidewalls was increased by 1.4 – 1.5 times. When the slag is foamed in an electric arc furnace, there is a significant change in the corrosion mechanism, as the corrosion is slowed down by the presence of CO gas bubbles in the refractory material.

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