INTERNATIONAL JOURNAL OF RESEARCH IN COMMERCE, IT,

ENGINEERING AND SOCIAL SCIENCES

ISSN: 2349-7793 Impact Factor: 6.876., **Volume: 18 Issue: 03 in March 2024**

DEVELOPMENT AND IMPROVEMENT OF TECHNOLOGY TO REDUCE OVEN LINING CORROSION

Bekchanova Valida Baxram qizi
Namangan Engineering Construction Institute
Karimov Boxodir Yusufjonovich
Namangan Engineering Construction Institute

Abstract: problems such as reducing corrosion of the lining of electric furnaces, ensuring the degree of corrosion of the furnace lining depending on the temperature of the liquid alloy, and the corrosion of the furnace lining depending on the chemical composition of the alloy being liquefied have been solved.

Key words: lining, corrosion, magnesite, magnesite powder, solid materials, induction furnace, electric arc furnace.

Purpose. Development of technology to increase service life of electric arc furnace lining.

Methods. increasing the corrosion resistance of the furnace lining by foaming the liquid slag during the alloy liquefaction in the electric furnace is based on the change in the properties of the lining under the influence of heat.

Results. Furnace lining corrosion is designed based on the degree of dependence on the alloy being liquefied. It serves to normalize the temperature of the alloy;

It was developed on the basis of the study of the dynamics of the influence of the furnace lining on the liquefied steel alloy. It serves to obtain high-quality cast products from liquefied steel alloy;

Summary. It was developed based on the dynamics of the influence of the furnace lining on the liquefied steel alloy. As a result, it was possible to increase the inner layer of the furnace lining by 8-10%.

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, the operation in various environments and vacuum, and the production of high-quality steels with special properties from cheap solid materials. and molten metal [1-2].

The electric operation mode of the arc furnace depends on the mode of the melting process, and when the solid is liquefied, the furnace works at maximum power[3]. By changing the voltage on the electrodes or the length of the arc, the furnace mode can be adjusted, that is, the power of the arc current in the first case, the transformer is transferred from one stage to another, and in the second case, the electrodes are lowered or raised using an automatic system [4-5].

The furnace operates on a 6000 kV three-phase electric frequency network. The work on the electrodes is regulated by changing the voltage transformer. For small furnaces, 2-4 voltage steps of the transformer are provided; up to 25 steps for large furnaces, which allows choosing the optimal voltage for each melting mode. Furnace transformers are installed at a minimum distance from the furnace to reduce power losses. Currently, there are electric arc furnaces in various areas of the country and they are operating with high power [6-7].

Research methods

ISSN 2349-7793 (online), Published by INTERNATIONAL JOURNAL OF RESEARCH IN COMMERCE, IT, ENGINEERING AND SOCIAL SCIENCES.,
under Volume: 18 Issue: 03 in March-2024
https://www.gejournal.net/index.php/IJRCIESS

During the operation of the electric arc 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 [8-10]. Replacing an electric arc furnace repair liner from time to time means a valuable financial investment, as well as 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 purpose, 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. had an effect [11-15]. A basic slag was formed at the beginning of the liquefaction of the electric arc furnace. In order to immediately change this slag, the quality of slag was improved (with the addition of dolomite lime, MgO - briquettes, recycled refractory materials). Table 1 shows the chemical composition of slag [16-18].

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

Chemical composition						
CaO	**SiO_2**	**MnO**	**FeO**	**Cr_2O_3**	**TiO_2**	**CaS**

Since there is magnesium oxide in the lining, calcium oxide is necessary chemically, that is, for the efficiency of reoxidation reactions, and 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 reduces the parameters of slag foaming by reducing the refining process. helped to improve. Some electric arc furnace liners operate with undersaturated MgO. Due to this, low fire resistance, 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 iron oxide content of the slag increases, the slag content increases and the metal content increases not only did it decrease, but in the end my futerovkaniya failed. 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 to oxygen) occurred in the particles. The presence of Si, Al, Ti, P elements in the solid materials for the electric arc furnace prevents corrosion. Then (SiO2 + Al2O3 +TiO2 + P2O5) these reactions separated and increased the service life of the liner. Carbon and manganese play an important role in the decay process. If their metal content falls below a certain critical value, then as a result, excessive oxidation of the metal and a sharp increase in 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. After the practice of slag foaming of the lining of the 30-ton electric arc furnace at the "Lida metal technology" enterprise, the service life of the side walls increased by three times. When

ISSN 2349-7793 (online), Published by INTERNATIONAL JOURNAL OF RESEARCH IN COMMERCE, IT, ENGINEERING AND SOCIAL SCIENCES.,
under Volume: 18 Issue: 03 in March-2024
https://www.gejournal.net/index.php/IJRCIESS

slag foaming in an electric arc furnace, there was a significant change in the corrosion mechanism, because the presence of CO gas bubbles in the refractory material slowed down the corrosion. Also, damage to the lining is reduced. The main reason for this is that the durability of the lining was increased by placing refractory bricks in the furnace lining.

Results

MgO, %.....	30 – 40
CaO, %.....	60 – 45
Fire resistance ,°C……	1800 – 2000
Temperature of onset of deformation under load, °C……	1550 – 1700
Compressive strength resistance limit ……	19 – 98
Thermal resistance (number of water heat exchangers)..……	20

The main disadvantages of magnesite and dolomite refractories are their low resistance to moisture and slag.

40-50% of magnesite powder was included in the preparation of chrome-magnesite refractory products. During heating at a temperature of 1560°C, high-temperature compounds such as MgO Al2O3 spinel and Mg2 SiO4 forsterite were formed.

High thermal stability magnesite-chromite refractories with MgO content > 60% were prepared from a charge containing up to 65% magnesite powder and 35% chromite. Magnesite-chromite refractory products with high thermal stability were obtained from such a charge after firing at a temperature of 1650-1700°C. They were considered to have high flame resistance (2300°C) and temperature of onset of deformation under load (up to 1670°C) and high thermal stability. Magnesite-chromite products were widely used in the lining of steel melting furnaces and ladles.

Chromium-magnesite refractories contained 40-60% Cr2O3, which were used together with magnesite-chromite due to their low thermal stability.

CONCLUSION

1. In order to increase the service life of the lining of the 30-ton electric arc furnace in order to carry out research under production conditions at the "Lida Metal Technology" enterprise, 10% slag (Cr2O3, MgO, Al2O3, SiO2, less FeO, CaO) are ground together with a grinder, and after the liquid metal is removed from the furnace, it is sprinkled on the damaged parts of the furnace lining using a special device. As a result, the service life of the furnace lining was increased.
2. It was recommended to increase the amount of Cr2O3, Al2O3, SiO2 and MgO in the slag content of liquid metal and reduce FeO in order to increase the service life of the lining of a 30-ton electric arc furnace in order to carry out research under production conditions at the "Lida Metal Technology" enterprise. As a result, an increase in corrosion resistance of the oven lining was achieved.

References:

[1] Turakhodjaev, N., Saidmakhamadov, N., Turakhujaeva, S., Akramov, M., Turakhujaeva, A., & Turakhodjaeva, F. (2020). Effect of metal crystallation period on product quality. Theoretical & Applied Science, (11), 23-31.

ISSN 2349-7793 (online), Published by INTERNATIONAL JOURNAL OF RESEARCH IN COMMERCE, IT, ENGINEERING AND SOCIAL SCIENCES.,
under Volume: 18 Issue: 03 in March-2024
https://www.gejournal.net/index.php/IJRCIESS

[2] Turakhodjaev N. et al. Quality improvement of the steel melting technology in an electric arc furnace //ACADEMICIA: An International Multidisciplinary Research Journal. – 2021. – Т. 11. – №. 7. – С. 48-54.

[3] Saidmakhamadov N., Abdullaev K., Khasanov J. Теория и практика современной науки //теория и практика современной науки Учредители: ООО" Институт управления и социально-экономического развития". – №. 2. – С. 3-8.

[4] Nosir S. et al. Development of technology for obtaining quality castings from steel alloys //Eurasian Journal of Engineering and Technology. – 2022. – Т. 5. – С. 135-138.

[5] Valida B. et al. Development of Technology of Liquefaction of Steel Alloys in Electric Furnaces //Spanish Journal of Innovation and Integrity. – 2022. Т. 8. 65 – 69.

[6] Nosir S. et al. Development of quality steel alloy liquidation technology //American Journal of Interdisciplinary Research and Development. – 2022. – Т. 7. – С. 74-83.

[7] Valida B. et al. Explore of the Technology of Liquefaction of High–Quality Ingots from Steel Alloys //Czech Journal of Multidisciplinary Innovations. – 2022. – Т. 8. – С. 1-7.

[8] Valida B. et al. Technology of Increasing the Service Life of Based Lining Based on Recycling //Central Asian Journal of Theoretical and Applied Science. – 2022. – Т. 3. – №. 11. – С. 43-48.

[9] Valida B. et al. Improvement of the Technology of Liquefaction of A500 Low–Carbon Steel Alloy in an Electric ARC Furnace //Central Asian Journal of Theoretical and Applied Science. – 2022. – Т. 3. – №. 12. – С. 159-164.

[10] Valida B. et al. Extending the Service Life of The Electric ARC Furnace Lining //Central Asian Journal of Theoretical and Applied Science. – 2022. – Т. 3. – №. 12. – С. 153-158.

[11] Valida B. et al. Improvement of the Technology of Liquidation of A500 Brand Low Carbon Steel Alloy in the Induction Furnace //Central Asian Journal of Theoretical and Applied Science. – 2022. – Т. 3. – №. 12. – С. 1-6.

[12] Saidmakhamadov N. M. et al. Development of technology for liquefaction of steel alloys: development of technology for liquefaction of steel alloys. – 2023.

[13] Saidmakhamadov N. et al. Improvement of the technology of casting shaft components from 35xgcl brand steel in an electric arc furnace //American Journal of Interdisciplinary Research and Development. – 2023. – Т. 15. – С. 59-66.

[14] Saidmakhamadov N. et al. Improvement of liquidation technology of construction steels //Техника и технологии машиностроения. – 2022. – С. 57-62.

[15] Saidmakhamadov N. M. et al. Improve Casting Properties of Steel Alloy //Miasto Przyszłości. – 2023. – Т. 40. – С. 323-328.

[16] Valida B. et al. Investigation of the Effect of Liquid Metal on the Furnace Lining During the Liquidation of Steel Alloys in an Electric ARC Furnace //American Journal of Engineering, Mechanics and Architecture (2993-2637). – 2024. – Т. 2. – №. 1. – С. 60-66.

[17] Саидмахамадов Н. М. и др. Разработка технологии плавки стальных отливок современными методами //Инновационные технологии в машиностроении: сборник трудов XIV Международной научно-практической конференции, 25–27 мая 2023 г., Юрга. – Томский политехнический университет, 2023. – С. 93-98.

[18] Saidmakhamadov N. M. et al. Research on the Effect of Oxides Formed during Steel Melting on the Quality of Castings //Best Journal of Innovation in Science, Research and Development. – 2024. – Т. 3. – №. 3. – С. 593-602.

ISSN 2349-7793 (online), Published by INTERNATIONAL JOURNAL OF RESEARCH IN COMMERCE, IT, ENGINEERING AND SOCIAL SCIENCES.,
under Volume: 18 Issue: 03 in March-2024
https://www.gejournal.net/index.php/IJRCIESS