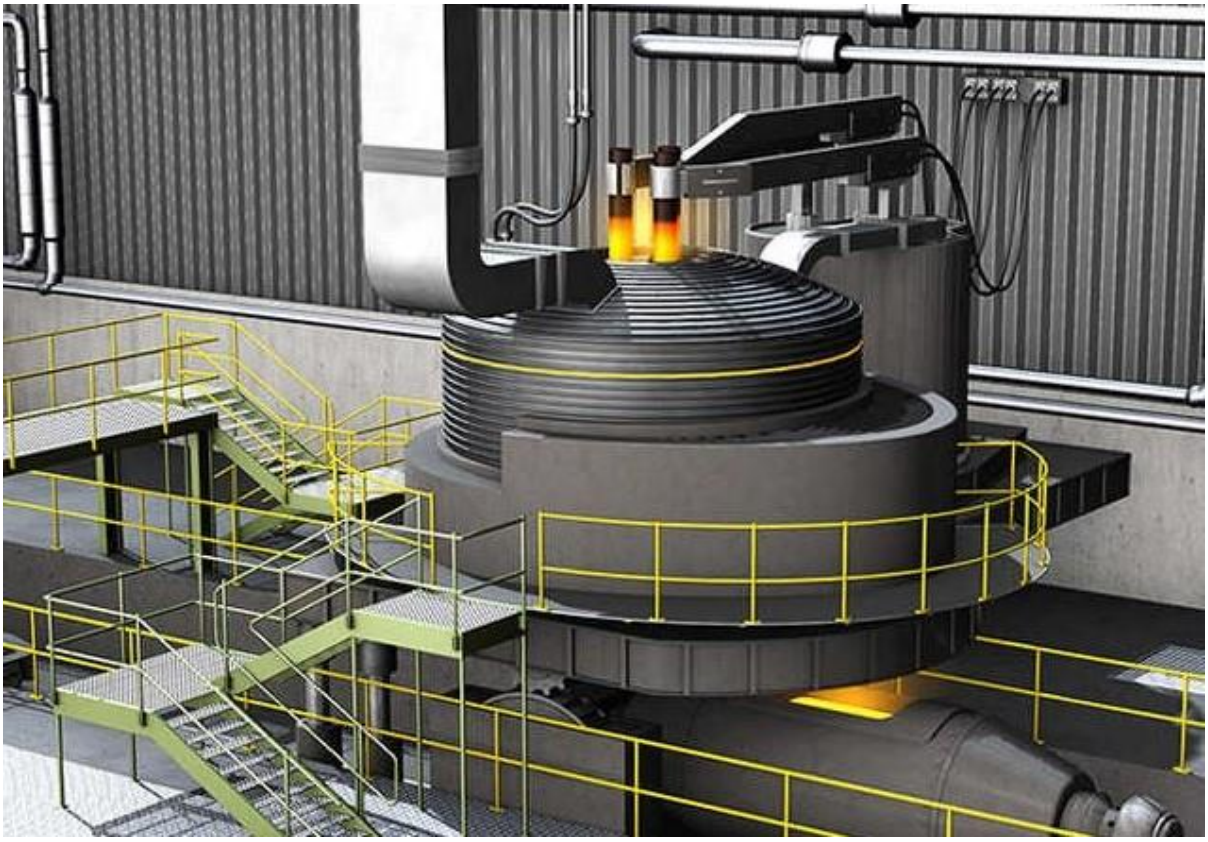

EMC DESIGN AND TECHNOLOGY

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Electric Arc Furnaces

Our business philosophy is as follows. "Quality strives for survival, science and technology strives for development, reputation strives for profit" and entrepreneurship strives for "integrity and pragmatism". For the past 25 years, EMC has delivered the lead. Same as highly qualified products for customers. And always keep researching and developing new types of electric metallurgical furnaces and environmental products in order to serve metallurgical and chemical engineering companies with all our hearts.

Our service;

EMC, as a global company. It supplies Electric Arc Furnaces and their respective Transformers to more than 50 countries. Our sales team offers quotes in an average of 48 hours from receiving the features required by the customer. We work with many of the world's leading sectors and industries and are very proud to continue to serve them.

Capacity and Types of Electric Arc Furnaces

Indirect electric arc furnace

An AC electric arc furnace (AC EAF) uses alternating current (AC) flowing through the graphite electrodes to produce the electric arc used for fusion. AC EAFs are the most popular type of furnace used for smelting steel, and by offering flexibility, they can serve multiple applications. These furnaces have a fairly simple design and can melt almost any type of scrap metal. AC furnaces are a very versatile type of electric furnace that can be turned on and off quickly, ideal for small and medium-scale steelmaking.

Direct Electric Arc Furnace (DC EAF)

Arc flash is produced using direct current (DC) in a DC electric arc furnace (DC HEA). A DC electric arc furnace requires fewer electrodes than an AC electric arc furnace, which in turn saves costs. Typically, there is only one graphite electrode in a DC furnace, which tends to stay in place for longer and provides stability to the arc. In addition, DC ovens tend to be quieter and offer greater energy efficiency. However, while they are often more structurally complicated, the initial installation cost can also be higher.

Submerged Electric Arc Furnace

Submerged arc furnace (SAF) is a specific type of furnace that is primarily used to produce ferroalloys or other metals. The electrodes are partially immersed in the charge materials to create a reducing atmosphere suitable for some metallurgical reactions in SAFs, for example. Submerged electric arc furnaces are not used to melt steel, as is the case with standard electric arc furnaces, but to process minerals such as manganese or chromium in order to produce alloy components. Specialized submerged electric arc furnaces can be designed to achieve high melting temperatures, making it easier to find suitable profiles for alloys with the desired properties.

Main components of an electric arc furnace

Housing and roof

The furnace casing is usually welded with steel sheets and has some strength and rigidity. The construction is usually made of high-strength steel to withstand the high temperatures that pass through the furnace. The roof is removable and is used to load the raw materials into the furnace. In addition, electrode ports are located on the ceiling, through which the electrodes penetrate the furnace.

Oven Liner

Refractory material The furnace lining contains refractory materials that are highly resistant to heat. It protects the furnace lining, preventing molten metal from damaging it. In addition, the refractory lining helps insulate the resulting furnace, which further conserves heat and increases energy efficiency. Over time, the liner will need to be replaced to make it work optimally.

Charging System

The loading system feeds raw materials, such as steel scrap, directly into the furnace. In this system, cranes and buckets called "loading baskets" are usually used to load the scrap into the furnace quickly and safely. Newer loading systems can be conveyor belts or other automated systems that allow for continuous loading, increasing productivity and efficiency.

Electric Arc Furnace Transformer

The transformer of the electric arc furnace converts and transports the necessary energy to the electrodes. It also transforms the high-voltage electricity from the power grid into a lower voltage suitable for arc flash. The regulation of the current provided by the transformer is important to enable stable arc conditions and control fusion. A well-designed transformer ensures that the energy used is conserved and in a safe environment.

Cooling System

Since the temperatures produced by an electric arc furnace are exceptionally high, a cooling system is required to prevent melting. Generally, cooling takes place by water-cooled panels. These absorb excessive heat and keep oven temperatures at safer levels. Effective cooling extends the life of the device and prevents overheating of the electrodes, roof and side panels.

Powder System for Electric Arc Furnaces

During the operation of an electric arc furnace, dust is produced. This dust includes harmful materials such as metal oxides and other materials. Some of this dust is captured by a dust collection system, where harmful components are separated and valuable metals are destroyed or recycled. Effective dust management is therefore key to being able to comply with environmental legislation and maintain a safe working environment

Advantages of electric arc furnaces

Recycling efficiency

This makes EAF electric furnaces extremely important in the circular economy, as they can effectively recycle scrap metal. By using scrap metal, the need to extract and refine virgin ore is reduced, so both natural resources and energy are conserved.

Flexibility

Electric arc furnaces are easy to start or stop, making them perfect for the production of small batches of steel. This is a real advantage over blast furnaces, which must run continuously.

Lower carbon emissions

In fact, electric arc furnaces emit much less carbon than blast furnaces. They help reduce greenhouse gas emissions, especially when powered by renewable energy, because they rely on electricity instead of coke.

Main materials used in the EAF

Steel scrap

Electric arc furnaces are a type of steel furnace that uses scrap steel as the main raw material. It comes from a mix of places, such as junk cars, razed houses, and factory waste. Recycling scrap steel is a greener way to use the Earth's natural resources and helps reduce waste.

Arc furnace electrodes

The electric arc that melts the steel scrap is created by passing electricity through these graphite electrodes. However, due to the melting process, these electrodes have to withstand high temperatures inside the electric arc furnace and gradually burn out. The electrodes need to be replaced periodically, which adds another cost component to the continued use of the electric arc furnace.

Electric Arc Furnace Slag

Slag is the result of impurities in raw materials It is a residue that accumulates on the molten metal and is removed during the refining process. We have also seen slag used in other fields, such as construction, along with cement and road construction material.

Carbon Raiser

Carbon Lift Since the amount of carbon in steel varies from 0 to 2.1%, it is essential that this step is performed carefully, as it results in various grades of steel that possess different hardness and breaking strength.

Refractory lining

The refractory lining is the main material used to protect the furnace and ensure that it retains heat. To maintain the integrity of the furnace, the liner must withstand elevated temperatures, chemical reactions, and mechanical wear.

Common Applications of Electric Arc Furnace

Siderurgy

EAF is mainly used for steel fabrication. But it has a wide capacity to produce from carbon steel to special alloy steels. This precise composition control is why electric arc furnaces can produce both bulk steel and specialty steel products. In addition, electric arc furnaces can smelt iron ore, which is gradually melted in the furnace and then the metal is separated.

Conclusion

Today, the electric arc furnace is an agile workhorse of modern steelmaking. This method creates an electric arc that effectively melts and refines steel scrap, making it perfect for sustainable steel production and recycling methods. These can be different types of EAF, AC EAF, DC furnace, submerged electric arc furnace, etc., depending on the suitable application. To optimize use, the components of the furnace design, such as the furnace housing, refractory lining, loading system, and cooling system. The carbon footprint is low, it allows many materials to be recycled efficiently and flexibly, and these are just some of the many advantages offered by electric arc furnaces. As modern technologies and innovations develop, electric arc furnaces continue to evolve in terms of efficiency, safety, and sustainability, making them an integral part of the steel industry worldwide.

In 2009, the high carbon ferrochrome dust removal equipment on the scene

In Mongolia in 2009 completed a 16500 kva high-carbon ferrochrome furnace equipment

2 sets of silicone furnaces completed and put into production in 2010

Steel Manufacturing Arc Furnace, Steel Field

The scene of the steel arc furnace

The DC Electric Arc Furnace Scene

Electric Arc Oven Dust Hood

Electric Arc Furnace Transformers

Description

The EAF transformer of electric arc furnace refers to the power supply for electric arc furnaces, such as various metals, ore smelting, heat treatment, alloy preparation, and electroslag return.
The arc furnace transformer is one of the main electrical equipment of the EAF.
Its function is to reduce the high input voltage from up to 10-110kV (or even more) to 100-1200V and then output it to generate a large current to power the arc furnace.

Features of EAF Transformer

The load on the EAF transformer changes over time, and the current fluctuates greatly.
Especially during the melting period, the transformer of the electric arc furnace is often at a maximum load with a large inrush current.
Compared with ordinary power transformers, electric arc furnace transformers have the following features:

1) The transform ratio is large, the primary voltage is high, and the secondary voltage is low.

2) The secondary current is large, up to several thousand to a million amperes.

3) The secondary voltage can be adjusted to meet the needs of the casting process.

4) The overload capacity is large, and the transformer is required to have a short-term overload capacity of 20%, which will not affect the service life of the transformer due to the overall increase in temperature.

5) It has high mechanical strength and can withstand the mechanical stress caused by impulse current and short-circuit current.

6) The maximum temperature of the transformer is less than 95°C during operation.

7) It is stipulated that the primary (high voltage) coil of the EAF transformer can be connected to both a Y-shape and a △ shape, while the secondary (low-voltage) coil can only be connected to a △ shape.