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USING THE BEST METHODS TO PRODUCE QUALITY STEEL TODAY

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Qurbonali Jurayev
Assistant . Termez State University of Engineering and Agrotechnology
Annamuratov Shukur
Student. Termez State University of Engineering and Agrotechnology

Abstract

Currently, electric arc furnace (EAF), BOF technology, alloying, thermal and chemical treatment, and continuous casting technologies are used to produce high-quality steel. These methods are used to produce high-quality and durable steel products based on modern technologies. Modern technologies and scientific achievements serve to improve steel production processes.

Keywords

iron slag (powder), pistachio coal, pudding process, slag, electrical steel, alloy steel, steel metallurgy, open-hearth furnaces, oxygen-converted furnaces, blast furnaces.

Ferrous metals, and in general steel, are of great importance in the national economy. There is no sector in the national economy where ferrous metals are not used. The level of economic power of any state is determined primarily by the amount of steel it produces. Without steel, mining, oil and gas industries, mechanical engineering, transport, and even agriculture would not develop.

Until the 19th century, steel was considered a very expensive metal, because a large amount of coal was used to extract steel. This led to the complete destruction of forests around metallurgical plants. In order to solve this problem, the pudding process was invented. In the pudding process, iron was obtained from cast iron in the form of a paste using coal coke. The bottom of the furnace was made of iron scale (powder) and slag. But this process was not widespread either.

In 1864, the French engineer Pierre Martin developed a method for producing liquid steel in a flame furnace. The open-hearth process allows for heat control, the removal of sulfur and phosphorus from the metal, and the processing of large amounts of iron ore. This process is widespread throughout the world. Together with the open-hearth process, the first electric steelmaking furnaces appeared. In such furnaces, complex, highly alloyed steel can be melted. In the 20th century, the production of non-ferrous metals, especially aluminum and copper, increased

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several times. However, the production of ferrous metals remained unchanged in world production. For example, in 1997, world steel production amounted to 1 billion tons per year. Additional factors of steelmaking contributed to the expansion of the scale of the chemical industry, mechanical engineering, oil and gas industries, and other industries. The alloying of steel with other metals led to the development of scientific technologies for the production of new structural materials. In particular, the production of stainless steels has grown rapidly. The methods of obtaining steel in quantities of industrial importance are called steel metallurgy. The difference between steels produced by different methods varies. For the first time in 1952 in Australia and in 1957 in Dnepropetrovsk, the oxygen-converter process was introduced at the suggestion of engineer Mozgov N.I. At present, the following main methods exist: oxygen-converter (above 50%), electric steelmaking (about 20%) and open-hearth furnaces (less than 30%).

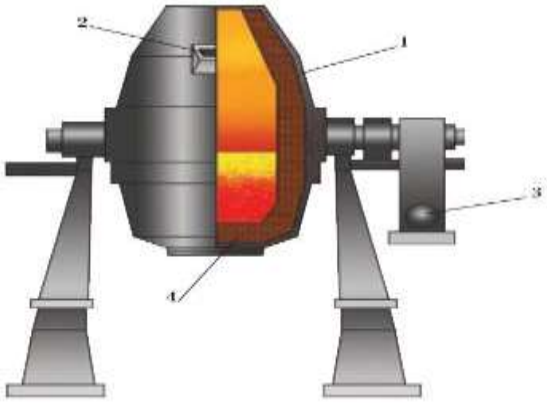

Figure 1. View of an oxygen-converted furnace

1-steel body; 2-steel outlet; 3-rotary mechanism; 4-fire-resistant lining

Currently, the metallurgical production scheme for steel is carried out in two stages:

- recovery of iron from ore or concentrate in blast furnaces;
- oxidation of C, Si, Mn, P in steelmaking units, purification of sulfur, i.e. obtaining steel of the required composition from cast iron.

Currently, the technology of direct iron extraction from ore is becoming widespread. Direct recovery plants are mainly built in the following cases:

1) if necessary, to obtain a charge free from unnecessary additives and to smelt very high-quality steel from it;

2) if necessary, to process iron ores in the form of powder, which is difficult to enlarge, and production waste (Kalashnikov dust, dust collected by dust collectors, etc.);

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3) in the construction of small-sized plants (mini-factories), since the construction of blast furnaces with a small production capacity is not economically profitable.

4) Directly obtaining parts and finished products using highly metallized product powder.

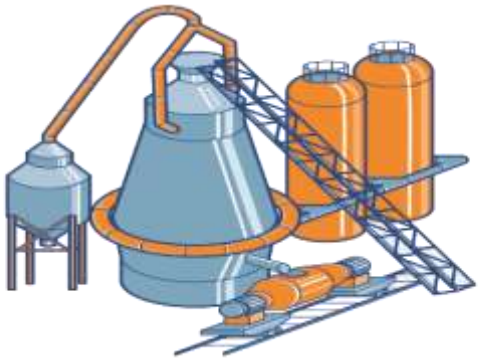

Figure 2. Blast furnace

Mini-factories of this type include: a direct recovery unit, one or two steel casting units (usually electric arc furnaces), a continuous casting machine for finished products. The production capacity of such plants is usually 150-250 tons per year. If we take into account that such electric furnaces are operating in the city of Bekabad, Piskent district of Tashkent region, and iron ore reserves have been discovered in the Parkent district of Tashkent region, this type of scheme is especially relevant for our republic.

Currently, only about 5% of the world's steel is produced directly in recovery plants. When solving the question of how long the bulk of steel will continue to be smelted using traditional methods, it is necessary to take into account the creation of continuous-flow steelmaking units (SANDstaleplavilnky agregat neprerqvnogo deystviya, UXPEAuzluk razmislya stelemelting unit), as well as the currently used high-efficiency, powerful units:

a) blast furnaces with a capacity of 4-5 thousand m2;

b) converters with a capacity of 300-350 tons;

c) electric arc furnaces with a capacity of 250-300 and above.

The cost of one ton of structural steel is 150-400 US dollars, depending on the quality. Industry experience shows that steel melted using metallized materials has a number of good properties. The main reason is that metallized materials differ from scrap in that they do not contain harmful additives and non-ferrous metals. It should be added that metallized materials do not contain gases or non-metallic additives.

SUMMARY

Modern methods and technologies used in the production of high-quality steel are of great importance for the development of the industry and the production of quality products. Electric arc furnace (EAF) and BOF technologies are characterized by high energy efficiency and environmental friendliness. Alloys and material modifications help to improve the physical and chemical properties of steel. Thermal and chemical treatment methods improve the mechanical properties of steel, such as hardness and elasticity. Continuous casting technology ensures continuity and increases the quality of steel products. In general, these methods play an important role in the production of high-quality and durable steel, as well as in industrial development and solving environmental problems.

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