

## **BALANCE OF CONSUMPTION OF ENERGY RESOURCES IN THE STEEL INDUSTRY**

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Progress in electric steel production equipment and technology, reducing specific energy consumption per unit of production, as close as possible to the electric performance level converters, as well as environmentally friendly electric steel production make it more attractive to the industry.

Priority development of secondary metallurgy processes using modern electric smelting and rolling should be one of the areas of restructuring in the steel industry. The use of powerful electric furnaces will provide savings of up to half of the energy costs compared to integrated steel-making enterprises.

Given the global trend of faster growth of electric smelting steel production that by improving the process has reached 34% of world production and its cost has become competitive with the converter mode of production, it is proposed to install 80 tons of AC electric arc furnace (EAF) with scrap drying capable of production volume of 700,000 tonnes per year.

Currently, the share of steel produced in electric arc furnaces around the world is more than 30% (33% in 2010). Steel output in 2020 is forecast at 830 million tonnes / year, with the share of 40% of electric. Electric steel smelting with oxygen converter steel production continues to increase to 14-16% surpassing the

open-hearth production, which was a major in steel production in the early 20th century. Capacity furnaces increased from 3 tons in 1900 to 150-200 tonnes in 2000. Experience has shown that the use of 1 ton of metal saves 4-5 tons of crude ore, 1.2 tons of coking coal, reduces emissions of pollutants into the atmosphere in 6.5 times, reduces the consumption of energy throughout the metallurgical cycle in 3 times. Electric smelting plays leading role in the production of high-quality and high-alloy steel. Due to a number of fundamental features this method is adapted to produce a diverse in composition superior metal with a low content of sulfur, oxygen and other harmful and undesirable impurities and a high content of alloying elements imparting steel special properties - chromium, nickel, manganese, silicon, molybdenum, tungsten, vanadium, titanium, zirconium, and other elements.

Arc furnace compared with other melting units have advantages as in electric furnaces metals can be quickly heated, melted with fine-tuned temperature, creating an oxidizing, reducing and neutral atmosphere or vacuum. These furnaces can produce steel and alloys of any composition, more fully deoxidize the metal to form a minimum number of nonmetallic inclusions - deoxidation products.

Minimizing the raw material and energy costs, the share of which in the production of electric is more than 70%, it is the main focus of the art and technology of melting in an arc furnace.

The most complete characterization of the complex state of the energy sector can be obtained from a study of the energy balance, which is the basis for the analysis of current state and means of rationalization of energy consumption, measures of forecast estimates. The energy balance provides an indication of the structure and efficiency of production, conversion and use of energy, fuel and energy for the production of major products, correlation to major material balances of the enterprise.

Energy balance of industrial enterprises is the subject of many studies in the CIS countries and abroad.

The basis for establishing norms of specific consumption of energy per unit of output in the iron and steel enterprises are the energy consumption balances by expenditures and loss sites.

Balance of energy consumption clearly and fully reveals the structure of the energy consumption of technology operation, shop and enterprise characterizes the level of energy use.

To compose the balance sheet of energy special tests of power equipment are conducted, components of the energy consumption is estimated by individual shops and enterprises, the energy accounting and non-recurring measurements are being held.

With the help of energy balance we reveal the possibility and outline specific activities in the field of energy management.

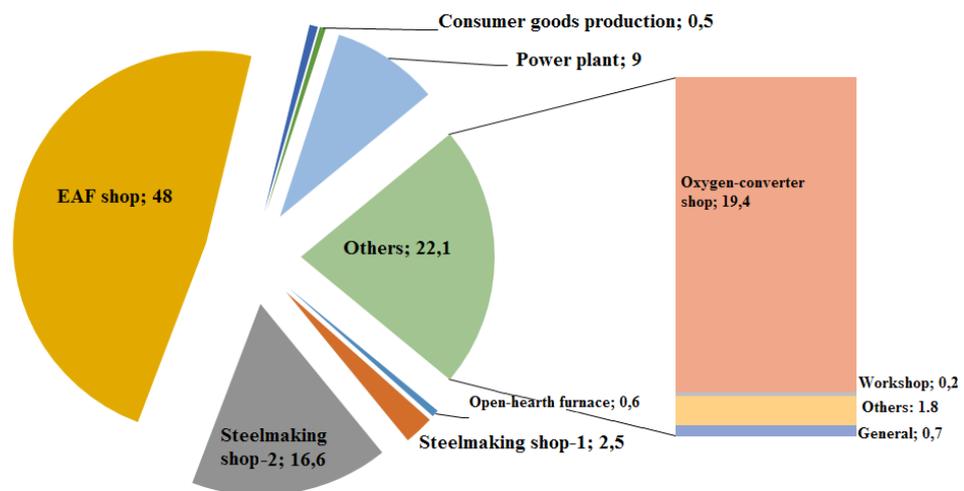
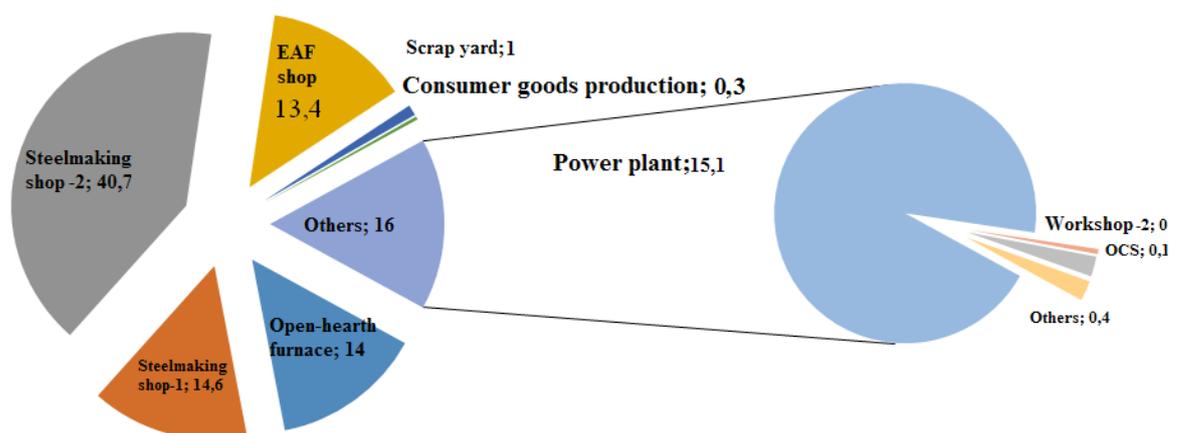


Figure 1. Balance of electricity consumption



## Figure 1. Balance of gas

At the enterprises of ferrous metallurgy in process raw materials and semi-finished products go through a series of operations, ie, melting, rolling mills etc; each operation is meant to perform a particular process.

At the enterprises of ferrous metallurgy in the process of processing the raw materials pass through a series of operations, i.e., melting, rolling mills, each operation is meant to perform a particular process.

Below in Figures 1. and 2 are balances of energy and gas resources spent for melting.

From the analysis of the figure 1 we see that the main consumers of electricity are the electric arc production which consumes 40+ percent of electricity and the production of rolling mills, which use, respectively, 16.6% of the total electricity consumption.

The high specific weight of electricity in smelting steel enterprises is due to the melting of steel in electric arc furnaces.

In heat consumption in the steel industry the most heat is consumed by bar-rolling production, which stands for 56% of the total gas consumption.