The production volume and quality of magnesia refractories is determined foremost by the tendencies and rates of development of consumers of the products, e.g., ferrous metallurgy, the industry building-materials (production of cement, glass, etc.), mechanical engineering, and the chemical industry. Ferrous metallurgy is a highly material- and power-consuming industry. It consumes about 9% of the fuel and power resources in the country and the proportion of material expenses in this branch amounts to almost 80% of the total cost of production [1].

The general features of the structural changes of today consist in a gradual transformation of the structure of an production with a high proportion of branches dealing with raw materials, which consume much money and materials and produce intermediate products, to more progressive and dynamic science-intensive branches. The change in the priorities is manifested by the steady decline of the proportion of ferrous metallurgy in the structure of the production of developed countries [2]. In the last 10–20 years the production producing refractory materials has been affected by the following factors:

- reduction of the volume of production of the iron- and steel-melting production [3], foremost due to the introduction of other materials such as plastic mixtures;
- introduction of new technological processes into the production of iron and steel, such as direct reduction of iron ore and continuous casting and out-of-furnace treatment of steel;
- decline of the production of cement, glass, products for machine building, etc.;
- structural rearrangement of ferrous metallurgy and, foremost, liquidation of open-hearth furnaces in the leading countries, radical improvement of the quality of magnesia refractories due to the use of pure and superpure raw materials, modernization of equipment and computerization, use of periclase-carbon refractories, cooling and protection of refractories, guniting, restoration repairs, etc.;
- introduction of new shaping techniques, vibrocompaction, fiber materials, etc.

STEEL-MELTING PRODUCTION OF UKRAINE

In connection with the disintegration of the USSR, under conditions of a general economic crisis, disruption of industrial ties, financial instability, market reforms of production relations, outdated equipment of the enterprises, absence of investments, and other social and economic factors the production of steel in Ukraine and Russia has been more than halved in 1990–1995. The structure of steel-melting production in Ukraine (as in Russia) is imperfect; about 50% of the...
steel is melted in morally-wise and physically outdated open-hearth, twin-bath, and direct-flow furnaces (Fig. 1). 2

Figure 2 presents data on the specific consumption of magnesia refractories in steel-melting production of Ukraine (and in Russia for comparison). 3 The specific consumption of magnesia refractories and unshaped materials in Ukraine and in Russia is close; the consumption of periclase-lime refractories in Russia is lower and that of periclase filler powders (in proportion to dolomite ones) is higher. On the whole, the specific consumption of magnesia refractories in steel-melting production of Ukraine and Russia exceeds that in the leading industrial countries by a factor of 2 - 3 due to the imperfect structure of steel-melting production and for some other reasons [4].

Open-hearth production in Ukraine is represented by 600 - 900-ton furnaces built in the 70s (Krivorozhstal' and II'ich Plants) and 200 - 500-ton furnaces built in the 60s (Makeevskii, Dzerzhinskii, Zaporozhstal', Alchevskii, Azovstal', Libeknekt plants); there are also two twin-bath furnaces (Alchevskii and Zaporozhstal' plants) and two direct-flow steel-melting units (Alchevskii, Krivorozyhstal').

Converter production is represented by 350-ton converters of the Azovstal' plant, 250-ton converters with combined blowing of the Dzerzhinskii plant, and 160-ton converters of the II'ich, Krivorozhstal', and Enakievskii plants. There are also 50-ton converters in the Petrovskii plant.

Figures 3 and 4 present sample data on the endurance of linings and the specific consumption of magnesia refractories in open-hearth and converter production of Ukraine and Russia in 1991 - 1995, and Table 1 presents operational characteristics of 500 - 900-ton open-hearth furnaces in Ukraine in 1992 (a period of stable functioning of the production). Analyzing the data of Fig. 3 and Table 1 we will see that:

- the endurance of linings of 200 - 900-ton open-hearth furnaces in Ukraine fluctuates from 350 to 230 heats with a certain tendency toward decreasing by 1995; the endurance of the arch of the twin-bath steel-melting unit (DSPA) of the Krivorozhstal' plant is quite stable and amounts to 870 - 930 heats due to the use of water-cooled parts (slot beams) in the arch;

- the specific consumption of magnesia refractories in 1991 - 1994 has increased from 8.8 to 10.4 kg per ton of steel and that of filler powders, on the other hand, has decreased from 19.2 to 14.4 kg/ton, providing a total reduction in consumption from 27.0 to 23.8 kg/ton;

- in Russia the endurance of arches of 200 - 860-ton open-hearth furnaces differs slightly from that of Ukrainian furnaces except for the DSPA of the Magnitogorski plant, which has decreased from 830 heats in 1991 to 600 heats in 1995;

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2 Data have been kindly presented by the Ogneupory Engineering Center (P. A. Chukhal') and UkrNII Refractory Service (E. I. Popova).

3 The year 1994 (for Ukraine) and the year 1993 (for Russia) are taken as a base being the years of most stable functioning of the industry in afore-mentioned republics.