Figure 3 shows results of statistical studies of the effect of the value of the ore burden in annular central zones of the top on furnace performance indices. An increase in the ore burdens in the central zones of the top within practical limits was accompanied by a significant reduction in coke consumption; here, productivity increased only to a certain level, after which signs of uneven running of the furnace began to appear. This made it necessary to appreciably reduce the smelting rate. The optimum values of the ore burden in annular central zones of the top of the furnace are therefore found within relatively narrow ranges under normal operating conditions.

As rapid a changeover as possible to an extended ore ridge, with relatively constant ore burdens, is necessary beyond the four central zones (Fig. 3). Such a character of ore-burden distribution in the intermediate section of the radius of the top helped minimize coke consumption and maximum furnace productivity.

The amount of ore-bearing materials charged into the peripheral zone is usually smaller than the loading of the intermediate zone. The lack of a substantial reduction in the ore burden at the periphery compared to the intermediate section of the radius in the present practice increases the degree of gas utilization on the one hand and, on the other hand, leads to instability of the gasdynamic regime during smelting and to more frequent tuyere burning. This has made productive and efficient operation of the furnace impossible. The "Krivorozhstal" combine has achieved the best results on blast furnace No. 9 with mean values of the ore burden of 3.2-3.8 tons/ton coke in a peripheral ring 0.9 m wide.

The ore-burden distribution over the radius of the top shown in Fig. 4 can be recommended for blast furnace No. 9 at the "Krivorozhstal" plant on the basis of the results of the completed studies; the hatched region represents the range of possible values of the ore burden with the selection of an optimum charge distribution for different furnace operating conditions and different production plans.

The data obtained on the efficient distribution of charge components across the top is being used on blast furnace No. 9 (Fig. 5) in an automated search for the charging regimes which will ensure a distribution of ore burdens over the furnace radius that is as close as possible to the prescribed distribution.

CLASS I OVERHAUL OF A 1719-m³ BLAST FURNACE

L. F. Lutsik

From December 23, 1983 to February 16, 1984, the Kommunarsk Metallurgical Combine performed a class I overhaul of its 1719-m³ blast furnace No. 5. The planned duration of the repair according to the schedule drawn up by the Ministry of Ferrous Metallurgy of the Ukrainian SSR was 60 days, while the actual repair time was 55 days. The furnace, built from a "Giprostopal" design and brought on line in September 1960, operated without a class I overhaul until December 1983.

Besides the work normally called for in a class I overhaul, the repair plan provided for replacement of the shell in the tuyere zone and the installation of 24 tuyeres instead of 18; replacement of the bustle pipe and an increase in the thickness of the metal wall to 24 mm and the diameter of the pipe to 2100 mm (the bell-shaped and spherical pipes were connected by welding); replacement of the bottom part of the shell with an increase in its thickness to 40 mm and its diameter to 300 mm, beginning at the 3610-mm level, and the installation of two iron notches for one cast house and one slag notch; reconstruction of the cast house in connection with the installation of two iron notches; installation of two electric clay guns and one drill to service the two notches, the construction of two gun control stations, and shifting of the first hearth column 15° in the direction of column No. 6; reconstruction of the evaporative cooling system, with the replacement of six separating tanks by four tanks and repair of the metal structures of the tank corridor, as well as reconstruction of the external water-supply system with the construction of a central filtering station;

Fig. 1. Diagram of consolidated and controlled assembly of furnace shell and bustle pipe: 1) rack for assembly of shaft part of the shell; 2) rack for assembly of bottom part of shell; 3) MK-25Br construction crane; 4) DEL-50 construction crane; 5) welding manipulator; 6) K-700 tractor; 7) 40-ton-capacity trailer; 8) rack for assembly of bustle pipe and shell in tuyere zone; 9) jig for consolidation of elements of bustle pipe into a larger component; A) Donbassdormarremont construction facilities; B) site of assembly of shaft and bottom parts of shell; C) site of assembly of bustle pipe and hearth part of shell with the tuyere zone.

Fig. 2. Disassembly of lining plates of the furnace top: 1) opening in the shell; 2) consolidated component; 3) cut in the lining plates; 4) sling 46 mm in diameter and 24 m long; 5) stay to 5-ton-capacity electric winch; 6) 60-ton-capacity pulley of main hoist.