One way of intensifying sinter production is to alleviate the adverse effect of the remoistening zone on sinter quality. The goal of studies we conducted was to find the most economical method of reducing the disintegration of granules in the sintering-machine bed by the action of condensed moisture.

To eliminate remoistening in the bed, the charge is heated by the heat from fines, steam, and gas. Here, the use of steam causes additional moistening of the charge, while the use of gas dries the charge somewhat. In order to maintain the properties of the granules after bailing, it is desirable to avoid both remoistening and drying.

Alternating zones — the zone containing finished sinter, the melt zone, the high-temperature heating zone, drying zone, and remoistening zone — are formed over the height of the bed during the sintering of iron-bearing materials. The conditions of the formation and movement of each zone affect the indices of the sintering process. For example, a reduction in the size of the drying zone is evidence of disturbance of the equilibrium between the velocity of the solid-fuel combustion front and heat-transfer conditions.

Ignition of the solid fuel in the charge under the influence of the products of combustion of a liquid or gaseous fuel begins with the heating of the moist material of the surface layer, when the drying zone has not yet formed. Thus, there is a deviation from normal sintering conditions at the beginning stage of the sintering process.

As a result of contact of the cold (20-30°C) charge with hot gases (1200-1300°C), moisture is rapidly evaporated in the upper levels of the bed. A hot vapor-gas mixture with a high moisture content is formed. This mixture descends into the lower levels of the bed and preheats the charge. Here, the charge is remoistened and the granules disintegrate.

The creation of the same conditions at the beginning of sintering as exist during normal sintering farther along the strand requires study of the effect of each sintering zone on remoistening in the bed. To conduct such a study, we investigated moisture condensation in the bed and its affect on the sintering operation during the sintering of a heated charge and its ignition a) through a layer of cold fines and b) when the surface of the bed was preheated.

We used 100% concentrate in the iron-bearing part of the charge, 25% fines smaller than 10 mm, and 4% solid fuel. The composition of the charge was dictated by the sensitivity of the concentrate to moisture in the remoistening zone. The effect of heating of the charge before it was placed on the grate was studied at charge temperatures of 20, 30, 40, 50, and 60°C. Here, we measured the shrinkage of the bed, the temperature in the remoistening zone, and the electrical resistivity of the charge.

The studies showed (Fig. 1A) that when the condensation front reaches the investigated level of the bed, the temperature in the remoistening zone increases if the initial temperature of the charge $t_i$ is 20, 30, or 40°C. When the initial temperature is 50 or 60°C, the temperature decreases at all levels of the bed. The shrinkage of the bed $\Delta h$ and the electrical resistivity of the charge $R_C$ remain constant for the first 2.5 min, which is apparently connected with the change in pressure over the height of the bed as the exhausters are turned on. During the next 2 min, the value of $R_C$ decreases and the value of $\Delta h$ increases.
This is evidence of the destructive action of the remoistening zone and a reduction in the gas permeability of the bed.

The effect of the external heating regime on the sinter was studied by placing a layer of cold 3-5-mm fines on a bed of charge 300 mm high. The depth of the layer of fines was 0, 20, 30, 40, and 60 mm. Ignition occurred in 1.5 min at 1100°C.

The highest temperature in the remoistening zone and, thus, the greatest amount of shrinkage of the bed were seen when the charge was ignited without the layer of fines on the