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METHOD OF PREPARING ORE FINES FOR SINTERING

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The invention relates to a method of preparing ore fines, dusts and powders for sintering, by mixing, moistening and crumbing in mixing devices such as mixing screws, drums, barrels and the like.

In making sinters for production of iron, ore powders and dusts as well as fines are being used increasingly as the proportion of granular ores decreases. Sintering of ore fines, and especially of dusts and powders, involves great difficulty because cerain fractions, owing to variations in physical surface condition, will not moisten properly, and a major part of the dust remains in unglomerulized condition, thus impairing the sinter both qualitatively and quantitatively. In the past, the dusts and powders obtained have been treated in large sump pits. The moistened dust is then mixed with the other ores to be sintered in suitable mixing drums, screws or batch mixers, together with other additives favorable to the sintering process. In this known method, however, it has been found that an intimate mixture with the water, especially if the proportions of dust and powder are high, is very difficult to achieve, and that after sintering, the proportion of unsintered or reject material increases progressively, thereby rendering the sintering process uneconomical and reducing the quality of the sinter.

The object of the present invention is to improve known methods of preparing ore fines, dusts and powders for sintering so as to avoid the aforesaid disadvantages.

For this purpose, it has been necessary to find means of rapidly and intimately mixing ore fines, in particular dusts and powders, with the required moisture, at the same time converting them into a uniformly crumbled condition, so that upon subsequent mixing in drums, screws or barrels, an intimate and homogeneous sintering ore mixture will be obtained, without impairing the qualitative or quantitative yield of the sintering process.

This problem is solved, according to the invention, by continuously moistening and crumbling each of the ingredients singly while adding the quantity of water required for the material in question, this preliminary mixing being followed as required by mixing all the ingredients together. This method according to the present invention was compared with the conventional method in processing Folldal residues with a granulometry of 72% under 0.2 mm. into a sintering mixture. The sintering mixture consisted of:

	Percent
Folldal residues	30.77
Flue dust	23.08
Mixed ore	19.23
Wet concentrate	19.23
Wabana to 8 mm	7.69

This sintering mixture was mixed in a concrete mixer for 2 minutes with adjusted optimum moisture of 15.8% H_2O and then sintered at a suction of 1000 mm. of water. The grate bed consisted of 10–30 mm. ore, and the fuel of coke screenings to 10 mm. Half of the coke was in grain sizes to 3 mm.

The Folldal residues used in the sintering mixture were:
(1) Processed in conventional manner in condition as received;
(2) Premixed according to the present process in a mixing screw, with adjustment of optimum moisture of 25% H_2O.

When the Folldal residues were processed in condition as received, the output of a sintering belt having 42 sq. m. of suction area was 500 to 600 tons per day. When the Folldal residues were subjected to brief preliminary treatment in a mixing screw, for 120–175 seconds, with adjustment of optimum moisture of 25% H_2O, according to the present process, this output was stepped up to 750–800 tons of sinter per day.

In another comparison, a sintering mixture was processed similarly. The sintering mixture consisted of:

	Percent
Fosdalen concentrate	27.50
Wet concentrate	37.38
Mixed ore	9.50
Flue dust	5.96
Freya fines to 8 mm	4.76

This sintering mixture was adjusted to 15.2% H_2O and 4.35% C at a suction of 1000 mm. of water. Coke screenings to 10 mm. were used as fuel. Half the coke was in grain sizes to 3 mm. The grate bed consisted of 10–30 mm. ore. The Fosdalen concentrates were charged:

(1) In conventional manner in condition as received;
(2) Pretreated with adjustment of optimum moisture for various periods of time in a mixing screw, and then added to the said sintering mixture.

When the sintering mixture was made up with untreated Fosdalen concentrates, an output of 952 tons per day was attained on a belt with 42 sq. m. suction area.

By separate preliminary treatment of the Fosdalen concentrates in a moistening and mixing screw according to the present process, with adjustment of optimum moisture, a sintering output of 1198 tons per day was attained when the concentrates had remained in the mixer for 132 seconds.

A special feature of the invention is that during premixing for continuous intensive moistening and glomerulizing, the mixing device is heated. Thus the Folldal residues according to the first example were subjected to a comparative test by treating in a heated mixing screw at an outside temperature of 0° C. In one test, the screw was not heated; in another test, the screw was heated so as to bring the materials to a temperature of 35° C. As a result, the output on a sintering belt of 42 sq. m. suction area was raised from 690 tons per day with mixing screw unheated to 800 tons per day with mixing screw heated.

Another feature of the invention consists in that, to improve moistening and glomerulizing in the premixing operation, bauxite, residues, lime or dolomite powder are added.

The Folldal residues of the sintering mixture according to the first example were processed as before. Increasing amounts of bauxite residues or milk of lime were added to the Folldal residues. It was found that addition of only 0.5% bauxite residues improved the glomerulization of the separately premixed Folldal residues, simultaneously adjusted to optimum moisture.

When the Folldal residues thus prepared were sintered in the sintering mixture specified above, the yield of sinter was 6.5% higher as compared to the Folldal residues not treated with bauxite residues.

When, in the same sintering mixture, the Folldal residues were separately adjusted to optimum moisture with

addition of 0.5% CaO, the sintering output for a belt with 42 sq. m. suction area rose to 880 tons of sinter per day.

By the process according to the invention, ore fines and in particular dusts and powders can be brought to optimum moisture content within a short time.

At the same time, the dust and powder is reduced to a crumbled condition such that the subsequent mixing drum, screw or barrel need only bring about an intimate mixture of the several substances required for the sintering process. By this means, for given length of time spent in the mixing drum or the like, a more intensive mixing and glomerulizing effect is obtained, together with a greater output and higher quality of sinter than heretofore, despite a more or less elevated content of dust and powder. The mixing device for mixing the fines and in particular the dust and powder is placed behind the bunker discharge, or ahead of the conventional mixing screw, drum or barrel.

It has been found that by the process according to the invention, ore fines, dusts and powders can be moistened so intensively, for example in a mixing screw, that 70% of ore dust and powder under 0.2 mm. can be processed directly on the sintering belt in a sintering mixture, by virtue of improved moistening and glomerulizing.

It has also been found that premixing of ore fines, dusts and powders is affected by the temperature of the material and the mixing device as well as by the outside temperature. To achieve effective and intensive moistening, the mixing equipment should be heated to an extent depending on the outside temperature.

The process of moistening and glomerulizing by the method of the invention in the said mixing device may be improved by adding small amounts of bauxite residues or lime and dolomite powder, or of these substances in dissolved form, as milk of lime, dolomite or bauxite sludge.

The requisite coke screenings may advantageously also be added in advance at the time of premixing.

What we claim is:

1. The process of preparing ore fines, dusts and powders for sintering by mixing, moistening and crumbling in mixing devices, which comprises moistening and crumbling each of the ingredients severally, continuously adding the required amount of water for the particular ingredient and continuously crumbling the several ingredients separately in a mixing screw and then mixing the several ingredients together.

2. In the method of claim 1, the additional step of adding materials selected from the group consisting of dolomite, bauxite residue, lime and mixtures thereof, to each of the ingredients.

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