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3,748,117

PROCESS OF MAKING A WAEZL OXIDE CONTAINING SINTER FOR USE IN ZINC SMELTING FURNACES

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No Drawing, Filed Sept. 7, 1971, Ser. No. 178,446

Claims priority, application Germany, Sept. 10, 1970,

P 20 44 739.6

Int. Cl. C22b 19/02

U.S. Cl. 75—5

10 Claims

ABSTRACT OF THE DISCLOSURE

A Waelz oxide containing sinter for use in zinc smelting shaft furnaces is made by subjecting the Waelz oxide to a separate homogenizing moistening and compacting step prior to adding it to the sinter mixture.

BACKGROUND OF THE INVENTION

The present invention relates to a process of making a Waelz oxide containing sinter for use in zinc smelting shaft furnaces.

Part of present-day starting products for the lead and zinc recovery is available in oxide form. These raw materials usually must undergo a concentration process before they can be used in an industrially acceptable manner in the conventional metal recovery operations.

The processes used for concentration of sulfidic materials such as flotation are not suitable for oxide raw materials. There is, however, available the well known Waelz process in which the important non-ferrous metals are vaporized and are recovered in form of a Waelz oxide having metal contents between usually 60 and 70%, in which form they can be used for further processing.

One of the processes in which the non-ferrous metals of the Waelz oxide is used is the IS-process. The initial material in this process must be present in lumpy form, which implies strict requirements regarding grain size and abrasion-resistance.

The Waelz oxide can be used in clinkered form without causing any difficulties during the sintering. The clinkering of the Waelz oxide, however, requires a separate operation which increases the cost of the procedure.

A direct use of the Waelz oxide in non-clinkered form in the sinter mixture of sulfidic raw material is possible only in minor amounts, since otherwise the quality of the sinter is impaired to an extent that the final sinter is no longer suitable for the subsequent shaft furnace operation.

It is therefore an object of the present invention to incorporate a high fraction of Waelz oxide as raw material in the sinter for use in zinc smelting shaft furnaces, while still providing a sinter which meets all requirements regarding grain size and abrasion-resistance and increases the cost of the incorporation of the Waelz oxide in the sinter as little as possible.

SUMMARY OF THE INVENTION

This object is met by subjecting the Waelz oxide to a separate homogenizing moistening and compacting step prior to adding it to the sinter mixture.

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DETAILED DESCRIPTION OF THE INVENTION AND OF SPECIFIC EMBODIMENTS

The homogenizing, moistening and compacting of the Waelz oxide may be effected by pelletizing the same while simultaneously incorporating the fuel in it. According to a preferred embodiment, the percentage of the incorporated fuel is below the percentage of the fuel in the final sinter mixture.

According to another preferred embodiment of the invention, the fuel is incorporated in the form of a sulfur containing material.

Another preferred embodiment is that the pellets have a size up to 10 mm., and most preferably between 4 and 8 mm.

It was surprising that, in case of a pretreatment of the Waelz oxide by pelletizing, no specific advantage was obtained in regard to the sinter quality, while on the other hand, in case of a pelletizing with incorporation of the fuel itself, an addition of 50% of Waelz oxide pellets to the sinter mixture does not cause any impairment of the quality of the sinter.

Even small amounts of incorporated fuel are sufficient. The fuel can be in the form of coke fines, sulfidic concentrates or a mixture of these two materials. Preferably, sulfidic concentrates are employed.

If the sulfidic concentrates are used, the percentage content of fuel in the pellets should be below the percentage of fuel in the final sinter mixture. In case of coke fines, the fuel percentage of the pellets may be higher, but it is preferred to keep it low even in this case. In calculating the amount of fuel it is assumed that 1% of coke corresponds to 1.8–2.0% sulfur in the sulfidic material.

The Waelz oxide is mixed with the required amount of fuel and is then moistened and pelletized in accordance with the invention. The pellets are then introduced into the sinter mixture and mixed with the latter prior to passing the mass into the sinter machine.

According to an embodiment of the invention, the homogenizing, moistening and compacting are effected by moistening and intensively kneading the mixture so as to accomplish the completely uniform penetration by the moisture. Simultaneously an aging of the mixture is effected in this process, as distinguished from normal mixing. The mixing preferably is carried out in knife-edge screws (so called "MAUK" process).

Preferably, the mixing time in this embodiment is longer than the time of mixing of the final sinter mixture. According to a preferred embodiment of the invention, the moisture content in this embodiment is between 3 and 20%, and most preferably between 5 and 10%.

It was surprising that an intensive moistening prior to the addition to the sinter mixture permitted the use of a higher amount of Waelz oxide in the final mixture. Even when using an addition of 40% Waelz oxide, there was no impairment of the sinter quality. A comparatively short time of moistening and intensive kneading and aging of the mixture was sufficient. However, the time of pretreatment in this case must be higher than the conventional mixing time for the final sinter mixture. The thus-homogenized moistened and aged Waelz oxide is then introduced into the sinter mixture and is mixed therewith prior to passing the mixture into the conventional sintering machine.

The advantage of the process of the invention is that the Waelz oxide can be used in making the sinter in amounts which could otherwise be employed only after a costly and laborious pretreatment such as clinkering. The process requires only a small amount of additional apparatus, as compared with the conventional process of making sinters from purely sulfidic raw materials.

The following examples will further illustrate the invention.

The sinter operations described in these examples were carried out on a stationary tray with an effective roasting surface of 0.09 m.² by a pressure sinter process. The thickness of the layer of sinter mixture on the roasting surface was 20 cm., which included an ignition layer of 30 mm. The testing material comprised six different sulfidic, lead, zinc and lead-zinc concentrates as well as limestone, sand, reused materials and lead oxide.

From these components sinter mixtures were set up which had a sulfur or fuel content of about 7% and which, after sintering, resulted in a sinter of the following representative composition:

	Percent (ca.)
Zn -----	42
Pb -----	22
Fe -----	10
SiO ₂ -----	2.8
CaO -----	3.6

When the amount of Waelz oxide was changed, corresponding changes were made regarding the balance of the mixing components in order to retain the above general composition of the sinter product.

The employed Waelz oxide had the following metal content:

	Percent
Zn -----	58-60
Pb -----	10-12

The amount of sinter mixture used in the different tests was about 17 kg. and consisted of concentrates, sand, limestone, coke and Waelz oxide. By adding the reused material to the sinter mixture, the fuel content of the sinter mixture was adjusted to about 7% sulfur. The total weight of the charge was about 45 kg.

As the measure of the physical quality of the sinter product, the so-called "Rattler Index" was used. This test is based on employment of 1 kg. sinter product of a grain size of 25.4-50.8 mm. in a specific drum and testing therein for six minutes at a rotation speed of 72 r.p.m. The drum had a diameter of 165 mm. and a length of 228 mm. It was provided in its interior with two symmetrically arranged impact ledges of 25.4 mm. height and 228 mm. length.

The portion of grain size below 12.7 mm. expressed in percentage of the total amount of sinter material is used as the measure for the abrasion-resistance and is designated as the "Rattler Index."

(1) TESTS ILLUSTRATING THE PRIOR ART

The following tests were carried out without the pretreatment of the Waelz oxide according to the present invention. The tests clearly show the deterioration of the Rattler Index with increasing additions of Waelz oxide (relative to the total sinter mixture):

Waelz oxide addition:	"Rattler Index"
0% -----	76.0
13% -----	63.5
27% -----	58.7
40% -----	53.0

(2) TESTS TO ILLUSTRATE THE INVENTION

(a) Homogenizing, moistening and compacting by means of pelletizing

5 Initial material:	Kg.
Waelz oxide -----	¹ 4.41
Lead concentrate (as fuel carrier material) --	² 1.50
Coke -----	0.06

¹ Corresponds to about 27% of the sinter mixture.
² With 19% S.

The above components were pelletized to a pellet size of 6 mm.

The pellets were then mixed with the remaining components of the sinter mixture consisting of

15 Concentrates -----	Kg.
Sand -----	9.00
Limestone -----	0.39
Reused material -----	1.03
	29.20

20 By H₂O addition a total moisture of the mixture was obtained of about 5%.

The Rattler Index ascertained after sintering was at 81.5.

25 After addition of about 45% Waelz oxide (relative to the total sinter mixture) the Rattler Index was found to be 77.

(b) Homogenizing, moistening and compacting by kneading and aging (so-called "Mauken")

30 The Waelz oxide was moistened and kneaded at a moisture content of about 10% for various times. The kneading was effected by means of a knife-edge screw. The kneaded and aged Waelz oxide and the remaining components of the sinter mixture were mixed in the following amounts during a period of 3 minutes:

35 Concentrate -----	Kg.
Limestone -----	10.08
Sand -----	0.99
40 Waelz oxide -----	0.37
Reused material -----	¹ 4.26
	15.70

¹ Corresponding to about 27% of the total sinter mixture.

45 By addition of water the moisture content of the sinter mixture was in each case adjusted to about 5%. After sintering the following Rattler Index values were obtained:

Kneading and aging time:	Rattler Index
50 15 minutes -----	75.8
15 hours -----	78.2
63 hours -----	78.5
91 hours -----	79.2

55 When an amount of about 38% Waelz oxide (relative to the total sinter mixture) was added and the amount of moisture was 18% and the kneading and aging time 15 minutes, a Rattler Index of 75.1 was obtained.

60 Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

65 What is claimed as new and desired to be protected by Letters Patent is set forth in the appended claims.

70 We claim:

1. The process of making a Waelz oxide containing sinter for use in zinc smelting shaft furnaces comprising subjecting the zinc containing Waelz oxide to a separate homogenizing, moistening and compacting step and then adding it to a zinc containing sinter mixture.

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2. The process of claim 1, wherein the homogenizing moistening and compacting step is effected by pelletizing the Waelz oxide and incorporating the fuel in the pellets.

3. The process of claim 2, wherein the percentage of incorporated fuel is below the percentage of fuel in the sinter. 5

4. The process of claim 2, wherein the incorporated fuel is coke fines, sulfidic concentrates or a mixture of these two materials.

5. The process of claim 2, wherein the pellets have a size up to 10 millimeters. 10

6. The process of claim 2, wherein the pellets have a size from 4 to 8 millimeters.

7. The process of claim 1, wherein the homogenizing moistening and compacting is effected upon intensive kneading and aging of the mass. 15

8. The process of claim 7, wherein the compacting and

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kneading is effected for a time longer than the time of forming the final sinter mixture.

9. The process of claim 7, wherein the moisture content of the homogenized mass is between 3 and 20%.

10. The process of claim 7, wherein the moisture content of the homogenized mass is between 5 and 10%.

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