

The present application claims the benefit of the priority of Chinese patent application titled "method for grinding manganese dioxide ore" submitted to the State Intellectual Property Office of China in July 15, 2010, whose application number is 201010227998.0, all content of which can be combined into the present application by referencing.

Technical Field

The present invention involves a method for grinding ore, especially involves a method for grinding manganese dioxide ore.

Background

Recently, there are two methods for grinding manganese dioxide ore, i.e. wet grinding method and dry grinding method, in the producing of manganese dioxide. The disadvantages of dry grinding method contain: the necessity of drying the ore containing high content of mud and water (more than 4%-5%) resulting unsuitable application in the south of China; and the dependence of gas transportation, air classification for dry grinding resulting the serious problems to the system in the aspects of abrasion resistance, dust prevention and energy consumption. The advantages of the wet grinding method contain: the usability for the most metal ores, especially the ore with greater density, except for few of hard ores, the lower energy consumption of the wet grinding compared with the dry grinding, relatively simple classification system and the auxiliary facilities, non power generated during the process of wet grinding, lower pollution to the environment and its less investment than the dry grinding. But there are disadvantages of wet grinding method as follows:

low production capacity, large consumption of liner, the necessary of considering the elimination of "rock accumulation" when the harder ore is used, and the difficulty to quantification exists in wet grinding. Therefore it's necessary to make some improvement for the wet grinding method to shorten the process time, reduce the energy consumption, get accurate measurement, improve the grinding efficiency and metal recovery, and reduce the grinding cost of manganese dioxide production.

Summary of the Invention

The technical problem to be solved by the invention is to provide a method for grinding manganese dioxide ore, improving the grinding efficiency and metal recovery, reducing grinding cost of producing manganese dioxide.

The technical program for solving the above technical problem is to provide a wet grinding method for producing manganese dioxide ore, which comprises the sequential steps: (1) feeding manganese dioxide ore into a hopper by a tipper, the hopper is sent to the top of a crusher by feeding belt, mixing the manganese dioxide ore with circulating water above the crusher, and evenly feeding it into the crusher; (2) crushing the manganese dioxide ore into slurry by means of the crusher, and feeding the slurry into a tank of a spiral classifier for classification from the top of front end of the spiral classifier, the rotator is rotating so that small-particle sands whose diameter is less than or equal to 0.13 mm in the slurry is suspended on the surface of the tank, and large-particle sands whose diameter is more than 0.13 mm is deposited at the bottom; (3) the rotating lateral blade of rotator push the large-particle sands to the tail of tank, feeding it into a wet ball mill for milling from discharge port, and feeding the milled slurry into a spiral classifier for further classification through the front side of the spiral classifier; (4) repeating Step; (3), feeding the resulting small-particle sands into a slurry tank from an overflow weir, fully stirring the slurry that enters the slurry tank using a stirrer, and then pumping

the slurry by means of a mortar pump into a compression filter for solid-liquid separation, the liquid obtained after pressure filtration returns to step 1, which is used as a circulating water, and the solid is sent to chemical tank for production instead of mineral powder.

In the above method for grinding manganese dioxide ore, in the step 1, the transport speed of the feeding belt is 0.5 m/s.

In the above method for grinding manganese dioxide ore, in the step 2, the length of the tank of spiral classifier is 9500 mm, the width is 1370 mm, and the angle of slope of the bottom of the tank is 10° .

In the above method for grinding manganese dioxide ore, in the step 3, simultaneously adding a certain amount grinding medium in the ball mill.

In the above method for grinding manganese dioxide ore, in the step 3, ball mill is a wet grid-type ball mill, whose feeding particle diameter is more than 0.13 mm and less than 25 mm.

In the above method for grinding manganese dioxide ore, the grinding medium is steel ball, the total weight of the steel ball is 7 tons, includes 30% bigger, 30% meddler, and 40% smaller by weight.

In the above method for grinding manganese dioxide ore, in the step 2 and 3, the volume ratio of the liquid phase and the solid in the slurry in spiral classifier is 2-3.

In the above method for grinding manganese dioxide ore, in the step 4, the speed of the stirrer in the slurry tank is 10r/s.

Contrast to the existing technology, the present invention has the following beneficial effects: the method of the invention for grinding manganese dioxide ore adds a washing miner step, and adjusts the process, so as to shorten the process time and reduce the energy consumption, improve the grinding efficiency and metal recovery, reduce production cost. In addition, the method of the present invention for grinding manganese dioxide ore further improves the grinding efficiency and metal recovery by controlling the angle of slope of the bottom of the tank of spiral classifier, feeding particle diameter of ball mill, the volume ratio of the liquid phase and the solid phase in the slurry in spiral classifier, and the speed of the stirrer in the slurry tank.

Brief Description of the Drawings

Figure 1 is the schematic diagram of the production process of the invention.

In the figure:

1 hopper	2 feeding belt	3 crusher
4 ball mill	5 spiral classifier	6 slurry tank
7 compression filter	8 small slurry tank	

Detailed Description of the Preferred Embodiment

The following will further describe the invention referring to the drawing and the embodiments.

Embodiment

To achieve the invention, providing 450 tons soft manganese ore, crusher, spiral classifier, ball mill and 30m³ slurry tank, forklift.

Feeding the above 450 tons soft manganese ore into hopper 1 by tipper in 300 times, the interval of the times is about 2 minutes. The hopper is sent to the top of a crusher 3 by feeding belt 2 (speed is 0.5 m/s), evenly mixing the soft manganese ore with circulating water at the opening of the crusher (37 kilowatt), then feeding it into the crusher 3 to form the slurry by the crushing of

the crusher 3; feeding the slurry into the top of the front end of a spiral classifier 5. The model number of the spiral classifier 5 is FIG-12, wherein, the diameter of its screw is 1200mm, motor machine power is 1.5kw, the length of the tank is 9500 mm, the width of the tank is 1370 mm, the angle of slope of the installed bottom is 10° , the volume ratio of the liquid phase and the solid phase in spiral classifier is 2-3. The slurry enters the tank of the spiral classifier 5, which form a deep pool at the front of the tank. At this point, because of the incessantly rotating rotator to impact the slurry, the small-particle whose diameter is less than or equal to 0.13 mm(120 mesh) is suspended on the surface and flow out of the overflow weir, and the large-particle sands whose diameter is more than 0.13 mm is deposited at the bottom of the tank; the rotating lateral blade of rotator push the large-particle sands to the tail of tank, feeding into a wet ball mill 4 for milling from discharge port. The ball mill 4 is a wet grid-type ball mill, whose feeding particle diameter is more than 0.13 mm and less than 25 mm, and whose yield is 4t/h. The model number of the wet ball mill used by the embodiment is $\Phi 1500 \times 3000$, wherein, the vehicle speed is 27.8r/min, the medium loading is 7t, the main motor type is Y315M-6, the power is 90kw, the rotating speed is 960r/min, and the voltage is 380V. At the same time, adding a certain amount grinding medium in the cylindrical ball mill 4, such as steel ball. The total weight of the steel ball is 7 tons, includes 30% bigger, 30% meddler, and 40% smaller by weight. The centrifugal force generates resulting from the rotation of the drum body, to make the ball rise to a certain height. Then it mills the materials by the double driving force of the impaction resulting from the free falling and grinding resulting from the rolling of the balls. It's necessary to control the feeding rate and water in the process, to ensure the production and particle size.

The milled slurry is fed by ball mill 4 into a spiral classifier for further classification through the front side of the spiral classifier 5. So the crusher 3, spiral classifier 5 and ball mill 4 form a closed circuit system. feeding the flurry

which is suitable to the required size by grinding and classification into a slurry tank 6 from an overflow weir, fully stirring the slurry that enters the slurry tank 6 using a stirrer, and then pumping the slurry by means of a mortar pump into a compression filter 7 for solid-liquid separation, the speed of stirrer in the slurry tank 6 is 10 r/s (rev / sec.). The liquid obtained after pressure filtration returns to the wet grinding wash mine system as circulating water.

And the solid is sent to chemical tank for production instead of mineral powder. In this process, the slurry can get the required size by grinding by ball mill and classification by spiral classifier. The process is mature and needing only 3 to 5 people/ per class to complete the work, the energy consumption reduced by 70%~80% compared to dry grinding.

Following is the data obtained by the embodiment of the present invention:

type of grinding ore	amount of ore	Size (200 mesh)	time	people number
wet grinding of washed miner	450 t	90%	10h	3

The quantification is a very important part in the production. If the quantification is not accurate, it will result to the long production cycle, low metal recovery, and increased costs. The grinding method of the present invention can be accurately quantified, and the specific methods are as follows: firstly, taking solid samples after the solid-liquid separation of the compression filter 6, and analyzing its moisture content (b%); secondly, providing a small slurry tank 8 (diameter is 3500mm, height is 3500mm) which is used to load the solid which is separated by the compression filter 7 under the discharge port of the compression filter 7; thirdly, making solid (volume ratio of the solid phase and liquid phase is about 1:5) obtained by compressing filter into slurry, adding

some water before unloading ore cake (the volume of the addition can be decided according to the experience, that will make the ratio of the solid phase and liquid phase is about 1:5.), and recording the volume of water V_1 (L). After recording the volume of water, load the ore cake to make into slurry. At the same time, recording the volume V_2 (L); finally, measuring 1L slurry by a 1L volume container and weighing to obtain weight m_1 , calculating the specific weight A_1 of the slurry. Calculating the weight of ore according to the formula: slurry weight kg (dry weight) = $(V_2 \times A_1 - V_1 \times 1) \times b\%$.

In summary, the present invention is mainly used in the grinding system of the production line of manganese dioxide. Although the price of the soft manganese ore is much lower than placer's, and there are large reserve of manganese ore near Laibin City of Guangxi, but the dry grinding method cannot grind the soft manganese ore (moisture content is 40-55%). And the invention use these features of soft manganese ore as its own merits, and finally the discharging granularity can reach 0.074mm which can fully meet the requirement of production process, and the leaching rate of metal manganese reaches above 75%.

While the present invention has been revealed by the above preferred embodiment, but its not to limit the invention; any technical personnel of the areas, within the spirit and scope of the invention, can make some modifications and improvements, so the protection scope of the invention subject to the defined by the claims.

1. A method for grinding manganese dioxide ore, characterized in that, which sequentially comprises:

(1) feeding manganese dioxide ore into a hopper by a tipper, the hopper is sent to the top of a crusher by feeding belt, mixing the manganese dioxide ore with circulating water above the crusher, and evenly feeding it into the crusher;

(2) crushing the manganese dioxide ore into slurry by means of the crusher, and feeding the slurry into a tank of a spiral classifier for classification from the top of front end of the spiral classifier, the rotator is rotating so that small-particle sands whose diameter is less than or equal to 0.13 mm in the slurry is suspended on the surface of the tank, and large-particle sands whose diameter is more than 0.13 mm is deposited at the bottom;

(3) the rotating lateral blade of rotator push the large-particle sands to the tail of tank, feeding it into a wet ball mill for milling from discharge port, and feeding the milled slurry into a spiral classifier for further classification through the front side of the spiral classifier;

(4) repeating Step (3), feeding the resulting small-particle sands into a slurry tank from an overflow weir, fully stirring the slurry that enters the slurry tank using a stirrer, and then pumping the slurry by means of a mortar pump into a compression filter for solid-liquid separation, the liquid obtained after pressure filtration returns to step 1, which is used as a circulating water, and the solid is sent to chemical tank for production instead of mineral powder.

2. The method for grinding manganese dioxide ore according to claim 1, characterized in that, in the step 1, the transport speed of the feeding belt is 0.5 m/S.

3. The method for grinding manganese dioxide ore according to claim 1, characterized in that, in the step 2, the length of the tank of spiral classifier is

9500 mm, the width is 1370 mm, and the angle of slope of the bottom of the tank is 10° .

4. The method for grinding manganese dioxide ore according to claim 1, characterized in that, in the step 3, simultaneously adding a certain amount of grinding medium in the ball mill.

5. The method for grinding manganese dioxide ore according to claim 1, characterized in that, in the step 3, ball mill is a wet grid-type ball mill, whose feeding particle diameter is more than 0.13 mm and less than 25 mm.

6. The method for grinding manganese dioxide ore according to claim 4, characterized in that, the grinding medium is steel ball, the total weight of the steel ball is 7 tons, include 30% bigger, 30% meddler, and 40% smaller by weight.

7. The method for grinding manganese dioxide ore according to claim 1, characterized in that, in the step 2 and 3, the volume ratio of the liquid phase and solid phase in the slurry in spiral classifier is 2-3.

8. The method for grinding manganese dioxide ore according to claim 1, characterized in that, in the step 4, the speed of the stirrer in the slurry tank is 10r/s.