Ball Mill Design-Optimization Of Feeding Device

Design of Ball Mill Feeding Method

Whether the design of the feeding device is reasonable or not, determines the normal operation of the ball mill feeding system, which directly affects the actual output of the ball mill. There are generally two types of feeds designed for traditional ball mills:

1. Truncated Cone Funnel Feeding Design

The feeding steps of this ball mill design feed are as follows. The

material enters the ball mill through the cast iron feeding slide, and the slide is made on the support. The material enters the conical funnel from the slider, and the funnel is embedded in the inner cavity of the journal. The funnel has a large center angle. This ball mill design can ensure that the feeding is sufficient, and the material in the feeding funnel can quickly move along the axis to the cylinder. When designing the truncated cone for this structure designed ball mill, the inclination angle should be greater than the angle of repose of the material.

2. Ball Mill Feeding Design with Spiral Blades

The material enters the charging pipe from the feeding port. The connecting pipe is made of steel plate, which is equipped with spiral blades and baffles. The connecting pipe is screwed to the end of the hollow shaft diameter and rotates with it. A sleeve is arranged in the hollow shaft diameter, and a spiral blade is welded in the sleeve. When the connecting pipe and sleeve rotate with the ball mill, the material entering the connecting pipe from the feeding port enters the diaphragm under the push of the rotating blade and then flows into the sleeve with the diaphragm. The material entering the sleeve is pushed into the grinding cylinder of the ball mill under the action of the rotating blade.

Improved Ball Mill Design for Feeding Device

In recent years, with the continuous improvement of new technology and new process, the various parts of grinding mill design optimization have made a great change in the unit time output of the grinding mill, and the output of the same specifications of raw material open circuit running in the closed-circuit grinding table is more than twice the same. The optimized grinding mill design of the internal ventilation system in the ball mill has played a key role in improving the output and quality of the ball mill. In order to increase the feed rate of the ball mill and further increase the production capacity, technical experts have made the latest improvements to the ball mill design calculation.

Problems Existing in the Ball Mill Design of Feed Inlet

The hourly output of the ball mill is greatly affected by the feed rate. According to a large number of reference data, the main reason that affects the feed rate and ventilation of the ball mill is whether the grinding mill feed inlet design is reasonable.

The feed inlet in the design of the old-style ball mill is usually installed horizontally, and the materials form a natural accumulation at a 45-degree angle on the bottom of the feed outlet. In this way, the effective ventilation area of the feed opening is about 0.065m, which is

equivalent to 1/3 of the designed ventilation cross-sectional area. When using a bucket scale for batching and closed-loop load is high, the ventilation area of the feed inlet will be basically blocked by the material. At this time, the material can only flow under pressure in the grinding mill. In the raw mill, due to the large moisture content of the material itself, the evaporated water vapor and fine powder cannot be discharged in time during the heating process of the material in the ball mill. Water vapor and fine powder form a swirling airflow in front of the ball mill, which increases the over-crushing phenomenon of the ball mill. At the same time, it also brings a buffering effect, which weakens the impact force of the grinding media such as steel balls, causing the fine powder castings in the corner part of the front cylinder to bond and form a paste phenomenon. This phenomenon occurs more frequently in winter. Due to the high fineness requirement of cement ball mill, the materials need to stay in the mill for a long time. Due to the poor ventilation of the grinding mill, the increase in temperature makes the surface of the cement powder particles charged, which causes electrostatic adsorption on the surface of the grinding media. In this way, the impact grinding ability of the grinding media is weakened to a great extent, the grinding efficiency of the ball mill is reduced, and the energy consumption is increased.

The Improved Design of Ball Mill Feed Inlet

For the feed port, the ball mill design improvement is mainly to solve the blocking phenomenon of the right angle feed inlet. We replaced the original right-angle feeding slide with a cylindrical inclination feeding slide. The diameter of the cylinder is designed to be ϕ500, so that the clear space of the central control screw ϕ500 is vacated, so that the mill can maintain a ventilation area of 0.1963m under any conditions, creating good ventilation conditions for the grinding mill. Since the ball mill design calculation adds a certain angle to the feed inlet, the material will be fed smoothly under the action of gravity without causing a blockage at the inlet. In winter, a ϕ200 steel pipe can be inserted at the inlet of the feed pipe, and the hot air is appropriately introduced to reduce the temperature difference between the inside and outside of the grinding mill, increase the impact grinding ability of the grinding mill, stabilize the flow rate of the material in the grinding mill, and reduce the condensation of water vapor.

Other grinding mill you may be interested in:

1. Vertical Raw Mill
2. Vertical Cement Mill