Metso Ball Mills

metso
Expect results

Two 24 ft. x 30.5 ft., 14 000 HP ball mills processing copper/gold in Indonesia.

Mill lining installation in a ball mill at Atacama Kozan Mining Company, Copiapo, Chile.

Ball mills designed for long life and minimum maintenance

Metso overflow ball mill sizes range from 5 ft. x 8 ft. with 75 HP to 30' x 41'. and as much as 30,000 HP. Larger ball mills are available with dual pinion or ring motor drives. Our mills incorporate many of the qualities which have made the Marcy name famous since 1913. These heavy-duty machines are designed for long life and minimum maintenance.

Variations of the standard designs are available to suit any appropriate application. These may include but not be limited to: grate discharge, peripheral discharge, dry grinding, special length to diameter ratio, high temperature milling operations, or pebble milling.

Application

A ball mill grinds ores and other materials to a typical product size of 35 mesh or finer.

The feed to a ball mill is prepared by:

- Single or multistage crushing and screening
- Crushing, screening, and/or rod milling
- Primary crushing and autogenous/semiautogenous grinding

Normal feed sizes:

- 80% passing 1/4" (6 mm or finer) for hard ores
- 80% passing 1" (25 mm or finer) for soft ores

(Larger feed sizes can be tolerated depending).

The length to diameter ratio of cylindrical mills range from 1 to 1 through 3 to 1. When the L/D ratio is 2 to 1 or greater, we refer to the mill as a Tube Mill.

Grate or diaphragm discharge

In the discharge end of this mill, a slotted full diameter or partial diameter grate with discharge lifter assembly conveys the material to the discharge trunnion opening. The grate serves to retain balls, tramp, and coarse material. A gradient created between the feed opening and the discharge slots eases the flow of material.

Trunnion overflow discharge

A trunnion overflow mill has an open discharge end. Material flows through the trunnion as a result of the pulp gradient between the feed and discharge openings. A reverse helix in the discharge trunnion liner retains balls in the mill.

Testing of the material

Three types of tests are available for mill power determinations.

In most cases one of two bench scale tests is adequate. First, a Jar Mill grindability test requires a 5 lb. (2 kg) sample and produces a direct measured specific energy (net Hp-hr/t) to grind from the design feed size to the required product size. The second test, a Bond Work Index determination, results in a specific energy value (net Hp-hr/t) from an empirical formula.

If time permits and the user wishes, grinding circuits are set up and continuous tests are run to simulate plant operation. These tests require two or three days for each ore type and approximately 1,000 pounds of material for each day of testing. Variations in ore hardness or circuit design may require larger samples.

Grinding circuit design

Metso process engineers welcome the opportunity to assist you with circuit and circuit control design as well as start-up, operation, and optimization of the milling plant.

Productive grinding systems are the result of the efforts of disciplines ranging from mechanical design and metallurgy of materials to process engineering and instrument application. Desired grinding results are achieved only through careful and skillful attention to detail.

Our engineers can specify or supply computer control systems for the sophisticated circuits. The cost of computer hardware decreases almost daily, making these controls feasible for smaller installations.

Automatic operation saves power, grinding media, and liner wear, while increasing capacity. software can be developed to suit the most complicated circuits and complex ores.

All equipment adheres to the applicable standards set by ASTM, NEMA, AGMA, AWS, and ANSI. Metso mills are equipped with all normally required safety features. Designs to meet other codes and local or state safety regulations will be quoted on request.

Operation

Ball mills operate either in open or closed circuit.

Open circuit operation is best utilized when:

- Another stage of grinding follows the mill
- Reduction ratio is small
- Feed material is already fine and one pass through the mill produces the desired results
- Product size control is not critical and oversize material can be tolerated in the product

Where size control of the final product is important, closed circuit grinding is the most efficient method of operation. The production of a higher quality product at a lower cost justifies the additional capital investment.

Common wet grinding flow sheets include:

- Open circuit
- Closed circuit with hydro cyclones
- Closed circuit with vibrating screens
- Two stage variations of the above utilizing two mills in series

Let our engineers review your specifications and recommend the optimum circuit for your application

The Metso Way –
Making the big difference to our customers

Everything we do is based on deep industry knowledge and expertise that makes the big difference to our customers. Decades of close customer collaboration and adapting to our customers' ever changing needs have transformed us into a knowledge company.

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