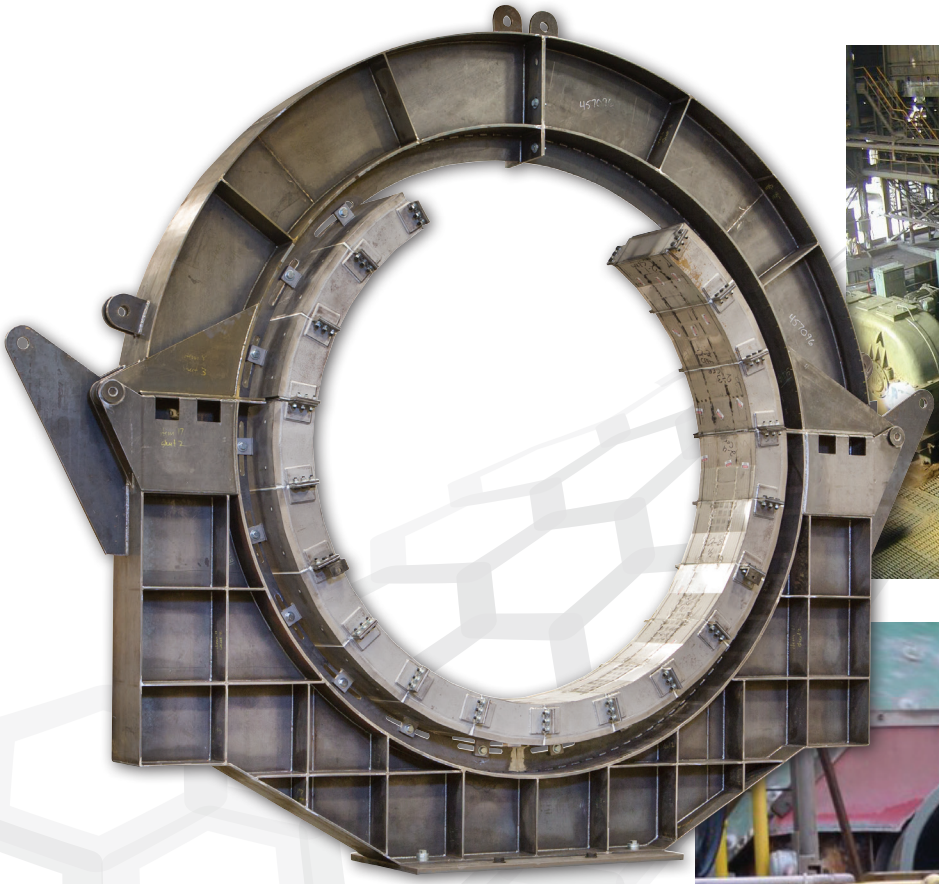
MMPB-748C

Trunnion Magnet System

SAG/BALL MILL MAGNETIC SEPARATOR



PERMANENT MAGNETIC SEPARATION SYSTEM FOR THE AUTOMATIC AND CONTINUOUS REMOVAL OF GRINDING BALL CHIPS/SCATS FROM THE SAG/BALL MILL DISCHARGE

ERIEZ

SAG/BALL MILL MAGNETIC SEPARATOR

Trunnion Magnet System

Milling is critical in mineral processing, as it liberates valuable minerals from gangue ore. Ball mills are widely used to achieve this objective, however, ball breakage as well as wear and tear of balls generate a dead load within the mill. Chips and scats (ball fragments) typically recirculate through the mill until they are finely milled and move on to the next step in the process. Some of the issues associated with this recirculating load include:

- Steel is the hardest material to mill. No ore is as hard as ball chips, and they must be milled finer to report to cyclone overflow.
- Milling ball chips consumes more energy. One trunnion magnet installation indicated an 11% energy reduction after two weeks of operation.
- Chips/scats occupy space in the mill which could otherwise be used for added feed and a fresh charge of balls.
- Grinding ball fragments discharging from ball mills cause extreme wear to downstream processing equipment such as sumps, pumps, hydrocyclones and interconnecting piping.
- Milling ball chips leads to higher consumption of good balls.

Eriez has pioneered magnetic separation techniques to improve grinding circuit efficiency in mineral processing plants as shown in Figure 1.

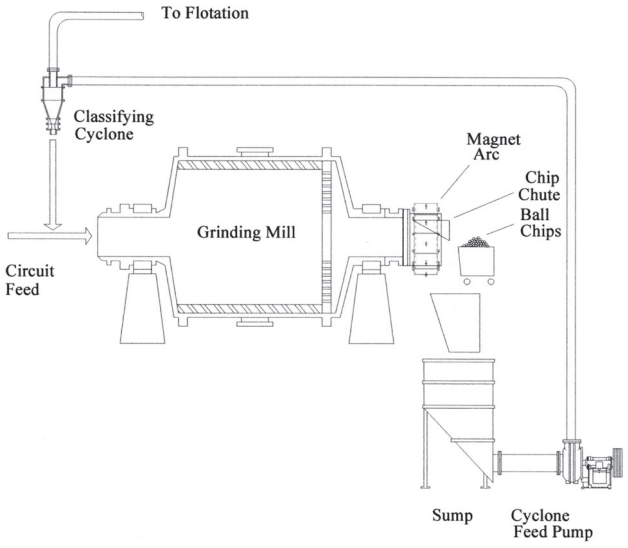
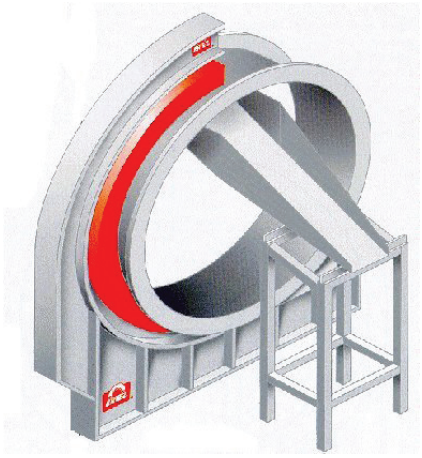


Figure 1

FEATURES

- **Permanent magnetic circuit designed to provide maximum performance**
- **Continuous, automatic process**
- **No energy consumption**
- **Low maintenance**
- **Rugged construction ensures long service life**

The Eriez Trunnion Magnet System bolts directly to the ball mill discharge flange to provide continuous magnetic collection and removal of the grinding ball fragments. A permanent magnetic circuit collects the grinding ball fragments/chips and discharges them to a collection hopper.



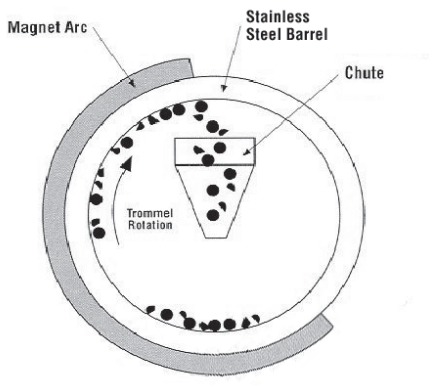


Figure 2

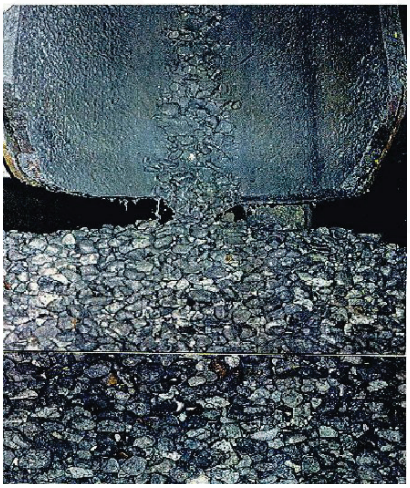
Benefits of removing grinding ball fragments reported from independent sources include:

- Extended pump and hydrocyclone life by 250 percent.
- An increase in mill throughput of a nominal 5 percent.
- A nominal 8 percent reduction in mill power consumption.
- More efficient grinding resulting in a nominal 10 percent reduction in the mill work index.

PRINCIPLE OF OPERATION

The Trunnion Magnet system includes four basic components: a stainless steel barrel, magnet sector, support structure and the discharge hopper as shown in Figure 2. The stainless steel barrel is a short extension with an abrasion resistant wear liner that bolts directly to the discharge flange of the ball mill. The stainless steel barrel transports the mill discharge material through the 200-degree arc of permanent magnets. This magnetic arc is mounted on a steel support pedestal and is positioned around the stainless steel barrel. The permanent magnets are enclosed in stainless steel canisters and incorporate a steel backbar for support and projection of the magnetic field. The discharge hopper is positioned just inside the stainless steel barrel and collects the grinding ball chips as they rotate past the end of the magnetic sector at the top of the stainless steel barrel.

The Trunnion Magnet System effectively captures steel grinding balls/chips directly opposed by the hydraulic drag force of the mill discharge slurry. High-energy rare earth and barium ferrite magnets form a hybrid magnetic circuit to increase the magnetic force to collect ferrous material, including whole grinding balls. The magnetic arc can be extended along the length of the magnet barrel to increase the retention time and mill discharge stream exposure to the magnetic field. Finally, magnetically induced lifters inside the magnet barrel can be used to assist in the collection of ball chips.



Grinding ball chips collected by the Trunnion Magnet System.

STEP 1
Trommel screen removed and bottom magnet sector installed. The magnetic blocks are on a support structure that spans two beams.

STEP 2
Stainless steel barrel installed with clearance to bottom magnet arc. The stainless steel barrel bolts directly to the flange of the ball mill.

STEP 3
Top magnet sector installed. Clearance between the magnet and stainless steel barrel is 1 inch.

STEP 4
Complete Trunnion Magnet System installed with discharge chute and spray hose.

Trunnion Magnet System

Trunnion Variations

Several variations and modifications of the Trunnion Magnet system are available for any application.

- The size of the stainless steel barrel and magnetic circuit can be varied to retrofit an existing SAG/ball mill and available space at the discharge.
- The magnetic circuit is designed to provide maximum strength for high slurry throughputs and up to 4 inch diameter grinding balls.
- The trunnion magnet can be configured for reversing or bi-directional SAG/mills.

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Note: Some safety warning labels or guarding may have been removed before photographing this equipment.