Roll Crusher Cylinders for the world’s largest high-pressure grinding roll

Powerful hydraulic equipment designed to deliver and maintain precise force to the Crusher Rolls

Innovative Crusher Cylinders are a critical operational component in Metso Minerals revolutionary HRC-3000 machine, the world’s largest high-pressure grinding roll.
Roll Crusher Cylinders for Metso Minerals

Introduction

In 2012 Metso Minerals was tasked to provide the Freeport-McMoRan Metcalf Mill Expansion in Arizona with what would become the world’s largest machine of its kind, a revolutionary new concept in High-Pressure Grinding Roll (HPGR) technology.

Traditional Roll Crushers utilize a Mechanical adjustment to set a fixed distance between rolls to compensate for product type and size. A spring type mechanism is often included to prevent damage due to oversize or inconsistent ore supply.

With the throughput and product consistency required at the Metcalf Mill Expansion, traditional Roll Crushers were simply not up to the task.

Maritime Hydraulic’s experienced team was called upon and entrusted with the development of a powerful and rugged Hydraulic Cylinder package for the HRC-3000.
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Challenge

Metso’s critical requirements were the development of a custom high performance Hydraulic Cylinder and control package that would ultimately provide:

- 24/7 continuous service with a 20 year design life in a harsh, highly abrasive rock quarry operating environment.

- Develop over 1.6 million pounds of pull force and over 2.1 million pounds push force.

- Ability to sustain dithering (2.5 Hz) without fatigue throughout the design life of the cylinder.

- A control system to deliver precise, remotely adjustable control of roll position and force, while providing failsafe measures to prevent roller to roller contact.

- Absolute position feedback from the cylinder at all times to within .001 of an inch.
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Solution

Our primary role was to work closely with Metso on the cylinder and control system development, including various cylinder iterations / modifications / design changes throughout their crusher design process.

Our design process and collaboration with the client was critical to ensure we were supplying the right equipment for the job.

Once the exhaustive development and review process was complete, the project moved into the manufacturing stage where we implemented numerous specialized cylinder features such as:

1) A one piece high strength forged alloy steel rod with integral rod eye to increase fatigue resistance.

2) Corrosion resistant rod cladding providing exceptional wear resistance and the ability to repair external rod damage in situ.
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Solution

3) A long life, fully redundant cylinder seal system including a separate rod flushing gland that provides continuous contamination control at the critical rod seal interface.

4) A stand alone hydrodynamic rod support system, reducing side load and extending rod/bearing service life.

5) Superior 3 part paint system specially formulated and applied for the harsh operating environment.

6) Optimum position accuracy and feedback by utilizing magnetostrictive technology, totally sealed within the cylinder envelope.

7) Proprietary failsafe stroke limiting system which automatically intervenes and prevents roll to roll contact.
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Results

The revolutionary Metso HRC3000 Crusher was commissioned in 2014 and has exceeded customer expectations in terms of performance, quality and equipment reliability.

Maritime Hydraulic has proved once again its ability to provide innovative, durable, and highly efficient hydraulic equipment to the mining industry.