



Eaton's new hydraulic inching drive rotates grinding mills slowly for startup and maintenance work

Location:

United States

Segment:

Mineral processing

Challenge:

Supplying a new and improved inching drive for grinding mills that would be easy to disengage and offer variable speed control.

Solution:

Eaton's Application & Commercial Engineering team designed a new system solution around the customer's wish list.

Results:

The new inching drive is easy to use and offers improved reliability, safety and transportability, strengthening Eaton's reputation for solution-based products in the mineral processing industry.

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Eaton's inching drive allows very precise, safe and reliable control of a mill's rotational movement, from an inching pace up to two revolutions per minute.

Background

How can we make it better?

That was Eaton's approach when it set out to design a better hydraulic inching drive system for ball and semi-autogenous grinding mills that are used in mines to finely crush ore material for mineral separation.

A new and improved system was needed by a major manufacturer of grinding mills that was using the only inching drive available in the marketplace to facilitate selective rotation of mill cylinders at reduced speed for startup and maintenance work. The customer had a long list of gripes about the veteran inching drive. Besides the fact that it was pricey with long lead times, the system was difficult to disengage and decouple due to heavy pressure load. Its rudimentary on/off switch design didn't allow for variances in speed, and its shifter handle was not full-bodied enough to

provide the proper leverage for engagement and disengagement.

"The customer had real concerns with the inching drive, putting it in a very tough position since there were no other manufacturers to turn to for help," said Eaton's Lyle Meyer, product manager – industrial drive systems.

"Because they had a long history using Eaton® Airflex® clutches to engage and disengage main mill motors, company personnel came to us and said, 'Eaton is hydraulics, so Eaton can help us, right?'"

"Realizing that Eaton offered all the components needed for an inching drive, we were eager to develop a system solution that would be easy to use and offer improved safety, transportability and reliability."

Challenge

Engineers at the mill producer sat down with Meyer and Eaton's Don



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Keck, Airflex global market development manager, and Fran Kull, Airflex field sales engineer, and addressed features that would make an ideal inching drive for grinding mills.

Their wish list included:

- Comprehensive instruments that would monitor key functions such as pressure, temperature and mill position, giving the operator complete control
- Shiftable coupling sleeve and mating hub that would be easy to engage/disengage by way of a robust handle
- Pendant controller that would allow for remote operation
- Electric joystick controller that would ensure accurate positioning and save time during the coupling engagement process
- Automatic brake that would optimize performance and improve safety

“The customer was really looking for a flexible solution that could be tweaked for specific mining applications,” Meyer said. “We knew Eaton could build a sound solution, but we also knew that we had a tough battle ahead of us. There’s a well-known saying in the mineral processing and mining industries – no one wants to be the first to try something new.”



Eaton's new hydraulic inching drive includes a 75-horsepower hydraulic power unit skid and an Eaton Char-Lynn 6000 Series hydraulic drive motor.

Solution

The Eaton team introduced Eaton's Application & Commercial Engineering group, whose expertise in analyzing system parameters and performance demands enables it to design hydraulic circuitry that is application worthy and fail safe. The team cited numerous examples of ACE-designed systems that are used in numerous processing industry applications around the world.

After closely examining Eaton's product breadth, system savvy and technical expertise, the customer gave Eaton the green light to take the project from concept to reality.

Eaton's Sells LaBean, ACE engineer, began the

project by taking a look at the inching drive output shaft and determining the torque/speed requirement for the tension drive mode on the mill. LaBean then designed a solution with an Eaton Heavy-Duty Series 2 hydrostatic pump and Char-Lynn® 6000 Series motor operating at the required pressure/flow, along with a planetary gearbox with the proper input/output ratio.

An Eaton EFX electronic controller became the main brain of the system by utilizing an operator station joystick to command all hydraulic components. LaBean assigned the controller and joystick lead roles in precisely controlling mill position and braking while the mill is in maintenance mode, permitting the change out of liners that protect the

large steel mill shell from being damaged during normal operation.

Once system drawings were customer certified, Eaton built and delivered the inching drive within six months for an end user in Mexico.

Results

The inching drive has been operational since January 2012 and performed without a hitch on original and re-liner installs.

“The Eaton inching drive allows very precise, safe and reliable control of a mill's rotational movement, from an inching pace up to two revolutions per minute,” Meyer said.

“Particularly appealing to the customer is the inching drive's variable speed control that has the capacity to rotate the mill from zero to .2 rpm while in inching mode, plus its easy disengagement and transportability from one grinding mill to the next.”

The successful introduction of inching drives to Eaton's hydraulic product line has strengthened Eaton's reputation for solution-based products in the mineral processing industry. Eaton's ACE team is currently working on the sixth inching drive project that is destined for a gold mine in Canada.

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