MINING

HEAP LEACHING
ACID FEED CONTROL

Background: Heap leaching is an industrial mining process that extracts precious metals from ore through a series of acidic chemical reactions. During this process the non-valuable earth materials or gangue are put through a series of acidic chemical reactions that absorb specific minerals and re-separate them. Comparable to in situ mining, heap leach mining differs in that uses a heap pad to separate the ore. The process begins by physically wetting and agitating the milled ore to form small spheres, rather than fine particles that can hinder the acid percolation at the heap pad site. It is then placed on a heap pad while diluted acid is added via a drip system. After the leaching process is completed, the pregnant leached solution is further processed by solvent extraction to further purify the copper solution.

Key to success in producing high quality agglomerated ore is to have minimal process variation of the feed solutions entering the kiln. Tightly controlled acid feed rates can achieve stable and predictable agglomerated spheres. This will in turn lead to less acid consumption and improved leaching, which are critical for successful production at a mine.

Problem: At a large copper mine in Eastern Arizona, a 68,000 tonnes per day crushed-ore leach pad requires agglomeration prior to leaching. The mine has relied on pneumatic actuators (as do many other mines) to actuate a globe or ball valve to control the acid feed flow to the mixer. After monitoring the slurry discharge copper grade, as well as occurrences of pulp surging over the launder lip, the mine operators found the results to be increasingly disappointing. A large part of the problem was traced to the inability of the pneumatic actuators to reliably control the valve to position. Unfortunately,

ELECTRAULIC™ ACTUATION

even with the use of smart positioners, the pneumatic actuators lacked precision due to the compressibility of air.

Solution: Greater process control is a hallmark of REXA's Electraulic™ Actuators, which provide more precise and accurate performance than pneumatic and traditional hydraulic technologies. At the Arizona mine, the pneumatically operated ball valve had variations of up to 2%, causing the process engineers to set a higher feed set-point to account for wide process variation by the actuator.

The plant sought a solution to this problem, and ultimately selected REXA's X2R Rotary Actuator to replace the old pneumatic model. The REXA X2R Rotary Actuator's hydraulic pressure is generated through an internal positive displacement gear pump driven by a stepper or servo motor with no limitations on starts, stops, or reverse cycles. This self-contained Electraulic™ system locks the cylinder in place when no movement is required, minimizing wear-and-tear on moving components and eliminating unnecessary power consumption.

REXA Electraulic™ Actuators have been engineered for use of constant modulating duty cycle and precise positioning independent of load variation. REXA's technology provides the precise modulating control required by using cylinders rated for 2,000,000 full strokes or 20,000,000 dither cycles. REXA's sophisticated electronics allow complex diagnostics and partial stroking to enhance the operation and service life of the gate. Software designed specifically for REXA Actuators allow the user to calibrate and customize the actuator's operation. The actuation package supports both HART (Highway Addressable Remote Transducer) and Foundation Fieldbus control system protocols.

Result

As a result of the design, features and performance of the REXA Actuators, problems with feed rate set-points and variation are essentially eliminated, resulting in a more efficient process and higher yield. Based on the company's proprietary, self-contained Electraulic™ Technology, which combines the simplicity of electric operation and the power of hydraulics, the REXA Rotary Actuator dramatically improved control performance by valve movement to less than 0.5 degrees. Similarly, the REXA Actuator's high stiffness and exact positioning enabled the feed set-point to be lowered, reduced consumption and worker exposure, and improved leaching to having a better quality of ore post agglomeration. Acid consumption savings is estimated to be $312K per year.

REXA, Inc.
Headquarters & Factory
4 Manley Street
West Bridgewater, MA 02379
(508) 584-1199
www.rexa.com

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