MINING & METALS

SLURRY FEED AND DISCHARGE **ISOLATION CONTROL**

BACKGROUND: Recovery of gold ore has become increasingly challenging as yield per ton of ore has decreased dramatically. Existing mines grades are decreasing, new viable ore bodies are being discovered in remote locations and certain methods of recovery, such as traditional leaching, have been outmoded. In the last decade, pressure oxidation (POX) in autoclaves has become the technologically preferred method for processing gold present in sulfide minerals. POX autoclaving entails subjecting the milled ore to temperatures up to 230°C with pressures greater than 35 atm (500 psi). Under these conditions, the ore is quickly oxidized and the microscopic gold particulates trapped within the ore are freed and suspended within the slurry. The levels of feed and oxygen are controlled by severe service titanium ball valves. These valves also utilized proprietary coating to resist the abrasiveness of the slurry.

KEY TO SUCCESS is dependent on the block isolation valves and actuators that safely control slurry entering the autoclave. Severe service metal seated ball valves must overcome high friction forces, requiring the actuator to close during normal and emergency shut down situations. The actuator must have sufficient torque to quickly open and close, sometimes in less than 5 seconds per 90 degrees of travel. Serviceability of the unit is important since every 6-12 months the valve and actuator are removed and the valve is sent offsite to be rebuilt due to the corrosion the ball valve encounters. Slurry scale build up around the ball valve and trim increases the breakaway torque. Eventually, this scale may even cause the valve to stall. Should the

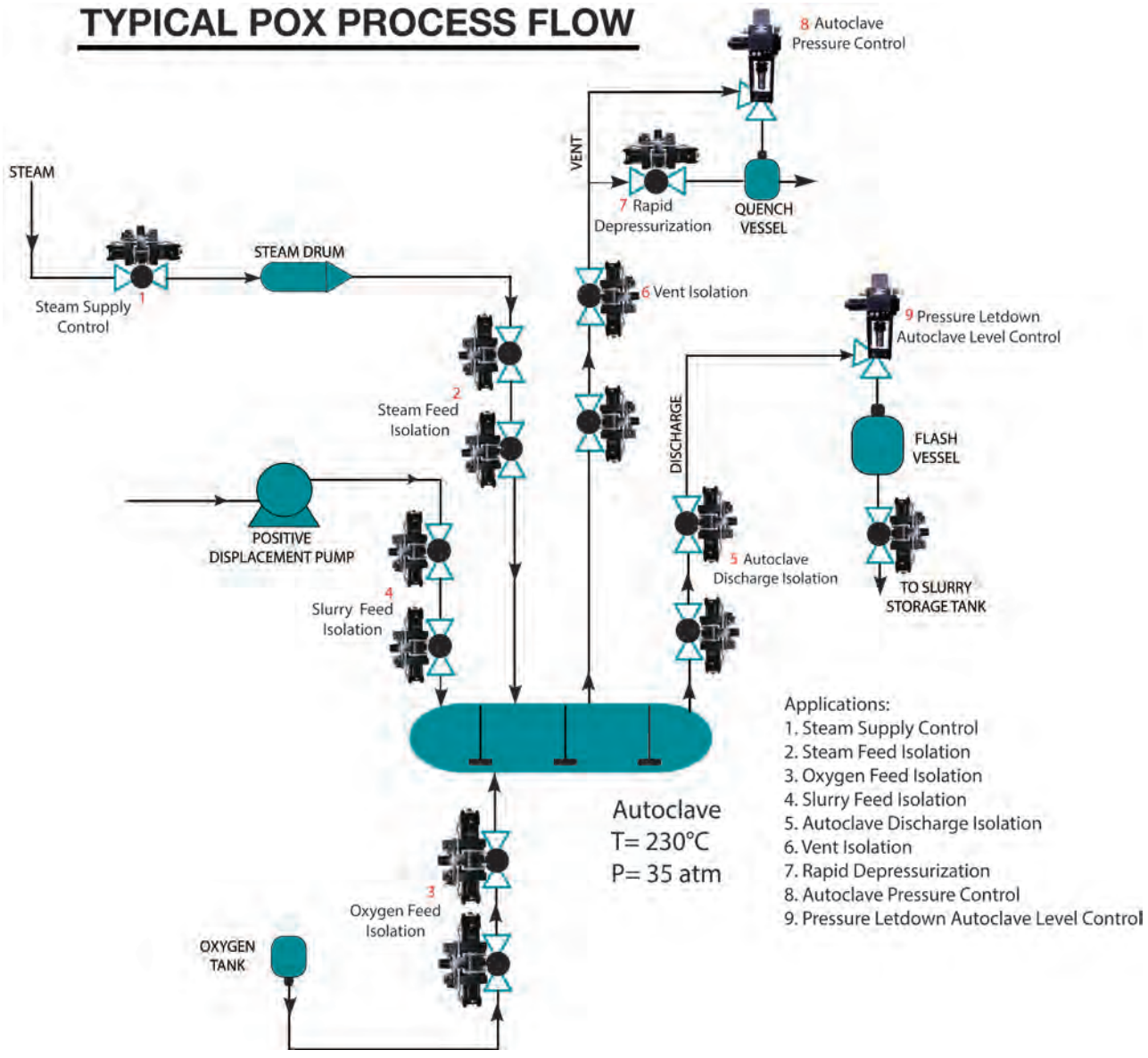
Eroded and Corroded Ball Valve

isolation valves fail to close and stall, the abrasive slurry will quickly erode the ball valve leading edges, such that the valve will be unusable and require expensive repairs that often need to be completed thousands of miles from the mine site. When this happens, the valve is taken off-line which decreases the level of safety in the POX operation.

PROBLEM: Autoclave feed and discharge isolation valves require reliable control of the valve position. Most mines utilize pneumatic actuators for their low capital cost and familiar technology. Unfortunately, they suffer from several issues and are inappropriate for this application. Since air is inherently compressible and causes pressure to build up before valve movement, the initial position movement of the valve at larger slurry line sizes above 6 inches (150 mm) is not realized.

The pneumatic actuator torque is also not constant. In the worst-case scenario, poor actuation can create an unsafe situation such as a requirement to close immediately for a plant ESD request for valve closure. A spring return is often incorporated due to the closure torque. The result however, can delay closing, followed by sudden slamming of the valve shut as soon as scale friction is overcome. The resulting sudden closure can create water hammer that can cause damage the slurry line which is a dangerous safety condition. The large footprint of the pneumatic actuator is problematic due to limited deck area and with a weight of over 7 tons. Since the valve's ball and trim must be removed for maintenance every 6 to 12 months, this increases the risk of worker injury.

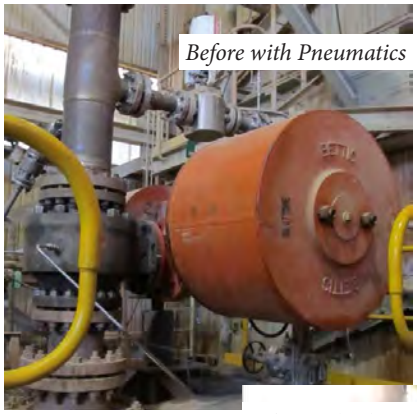
SOLUTION: Operations and engineering at the mine turned to REXA for an answer to the problem. Clearly,



improved block valve positioning reliability were necessary and REXA' s solution was self-contained X3 MEGApac Rotary Actuators based on the company's Electraulic® Technology.

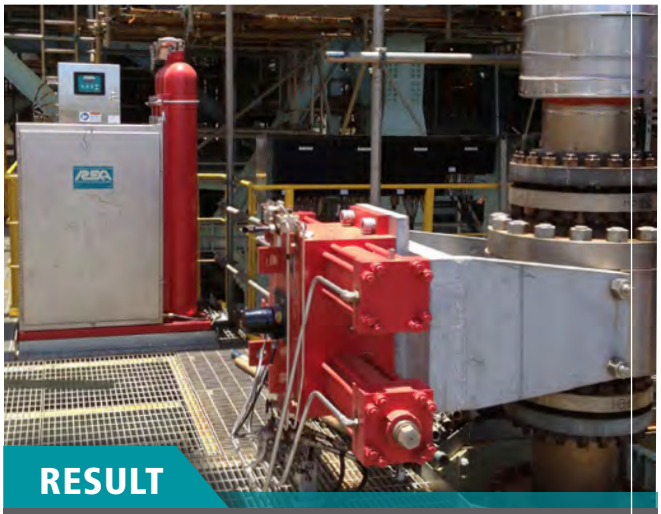
REXA's technology provides for either fail last or fail closed configurations. The fail last configuration incorporates a bi-directional gear pump coupled to an AC servo motor that provides a highly efficient method of pumping hydraulic fluid from one side of a rack and pinion cylinder to the other. Once the required position is reached, the motor shuts off and the Flow Match Valve system hydraulically locks the actuator in place. Power is not required to maintain actuator position.

The fail closed system configuration differs from other Electraulic™ actuators, in that the motor and pump are used to charge the accumulator system. This stored energy is collected in a nitrogen charged accumulator bottle released via electronically controlled solenoids to position the actuator as needed in both control and fail safe operation. With hydraulic cushioning, as the stroke approaches the last 10% of travel, a motor will turn on and gently seat the ball in the open or closed position. This discrete motor operation minimizes power consumption, heat generation and wear and tear on moving components.



Before with Pneumatics

After with Electraulic™



RESULT

The customer received eight fail closed and eight fail last REXA Electraulic™ Actuators. This design allows for a much smaller footprint and lighter weight (11Xs) actuation engineered for use with high torque and fast closing speeds on block valves in POX autoclaves. REXA's sophisticated electronics allow complex diagnostics and partial stroking for enhancing the operation and service life of the valve.

There are no large volume reservoirs, filters, vents or condensate heaters required. The hydraulic fluid never breaks down or comes in contact with atmosphere or potential contaminants. This self contained electro-hydraulic design provides years of high reliability and worry free service with no required oil maintenance. As a result of the design, features and performance of the REXA Actuators, problems with block valve stalling due to slurry scale are overcome with less downtime and more effective recovery of gold and other metals.

ELECTRAULIC™ ACTUATION

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