

**MINERALS
PROCESSING**



IMPROVE MINERAL RECOVERY

Mineral processing plants have some of the most severe and demanding installation environments. These harsh environments are extremely challenging for equipment within critical plant process control applications. Controlling flashing liquids or slurries requires an actuator capable of producing large output forces and torques with accurate and repeatable positioning.

REXA Electraulic Actuation™ provides the unique combination of performance, reliability and durability crucial to the efficient operation and longevity of plant systems and equipment. The rugged, self-contained design delivers a long service life with minimal maintenance. Manufactured in the USA, REXA actuators have a well-established global installed base and are engineered to fit the demands of any mining application.

ELECTRAULIC™ ACTUATION

Mining Market

Industry Demands

The mining industry consists of the search for, extraction, beneficiation and processing of naturally occurring solid minerals from the earth. These mined minerals include precious metals such as copper, gold, nickel, and platinum. Metals and other minerals are an essential source of raw materials for the world's construction, chemical industries and production of consumer products. The production of electronics, jewelry or specialty steel requires quality metals. Minimizing variation in each processing step results in higher quality finished goods.



Feedwater Pressure and Flow to the Concentrator

Feedwater is an essential part to mining operations. Pressure and flow to the concentrator must be delivered reliably without interruption. Limiting water to the concentrator delays the process and reduces plant efficiency. Any interruption in feedwater can result in unplanned downtime, negatively impacting the bottom line.

REXA Electraulic Actuation™ provides the accurate and reliable control necessary to ensure the concentrator stays online. Is your process at risk of water hammer damage due to an underperforming actuator? Can your current feedwater control actuators overcome the process forces? Or do they stall against the high thrusts and static friction?

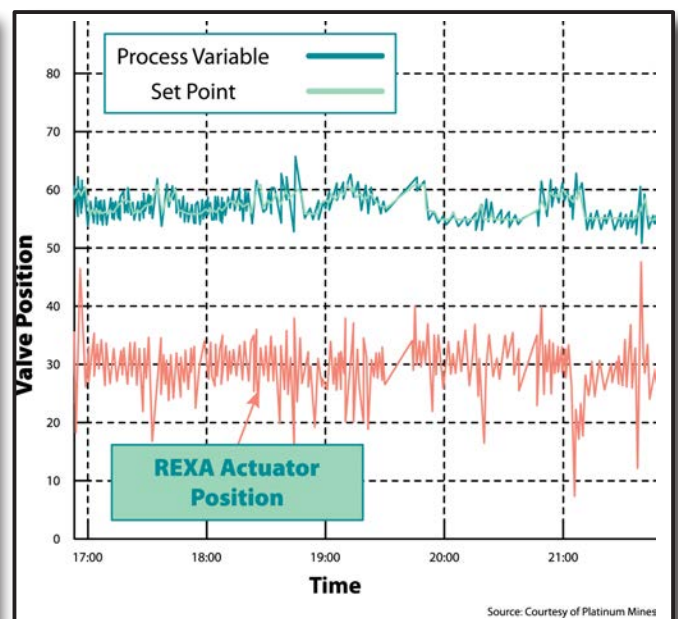
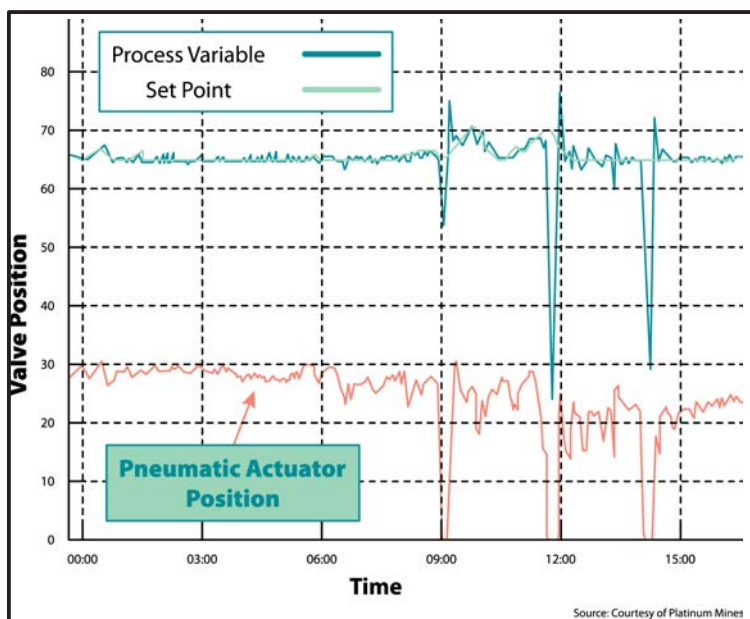
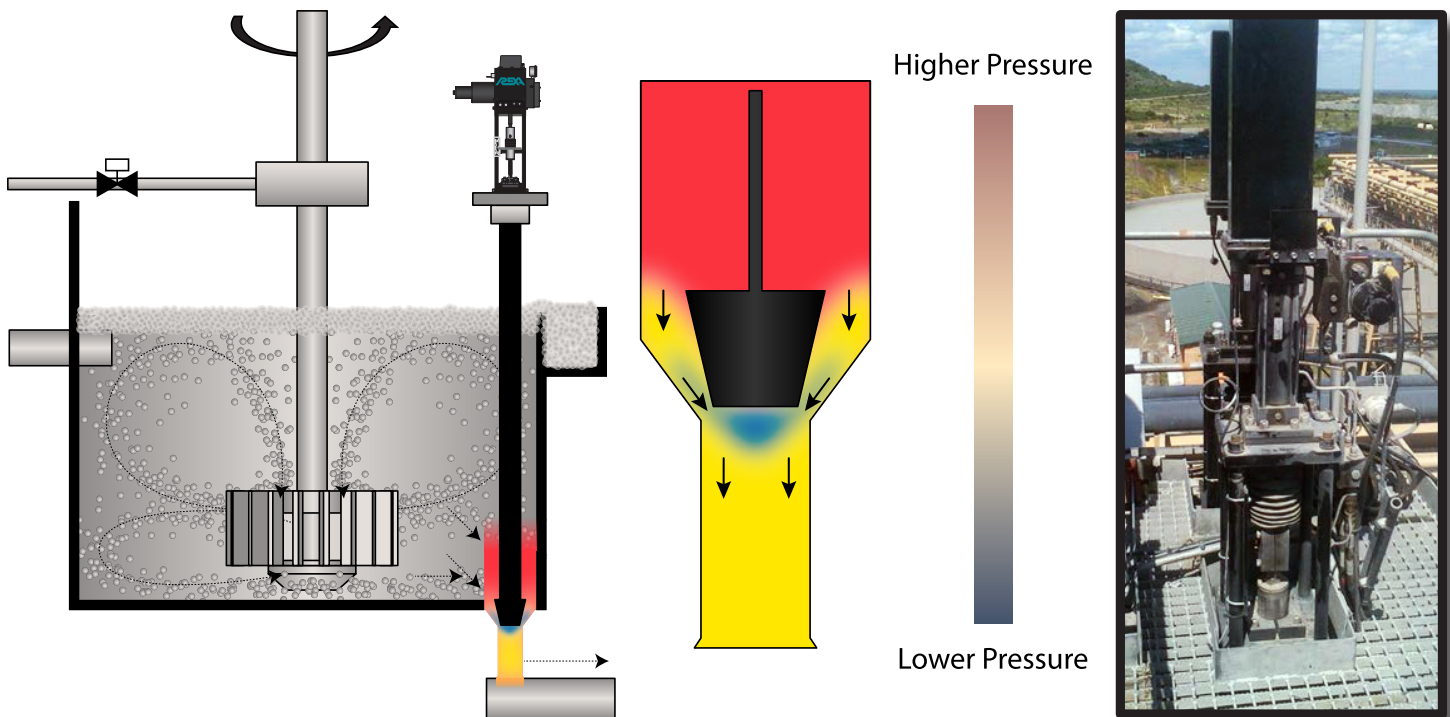
REXA actuators provide the power, accuracy and quick response of hydraulics without needing routine maintenance. With advanced diagnostics via HART or Foundation Fieldbus, REXA actuators provide real-time data to help optimize process efficiency and maintain long-term equipment reliability. Keeping critical applications like this online and operating reliably enhances plant profitability.

In the installation photo below, a REXA linear actuator controls the feedwater to the concentrator from a man-made reservoir. In the hot and dry climate of the Chilean desert, water is a precious commodity that must be handled with care. Rely on REXA when it matters most.



Pulp Level Control in Flotation Cells

Flotation is the key separation technique used to recover metal ores such as copper and gold. In copper recovery, maintaining a consistent pulp level enables copper particles in the froth to quickly flow over the lip of the tank into the concentrate launder. Two dart valves are used to modulate the pulp exiting the cell. Hydrostatic and suction forces pull the valve toward the closed position. When using pneumatic actuators in this application, the suction acting on the dart (Bernoulli's principle) can overcome the actuator and pull the valve closed, causing a disruption in pulp flow out of the cell.



REXA Electraulic™ Actuators provide the stiffness of hydraulics and cannot be overcome by these process forces. Key features of the Electraulic™ system include 100% modulating duty cycle rating, high positioning repeatability and closed loop hydraulics without filters or oil change intervals. The combination of performance and long-term reliability provide an ideal actuation package well suited to deliver increased copper recovery, decreased actuator/valve maintenance and lower operating costs.

Actuator Requirements

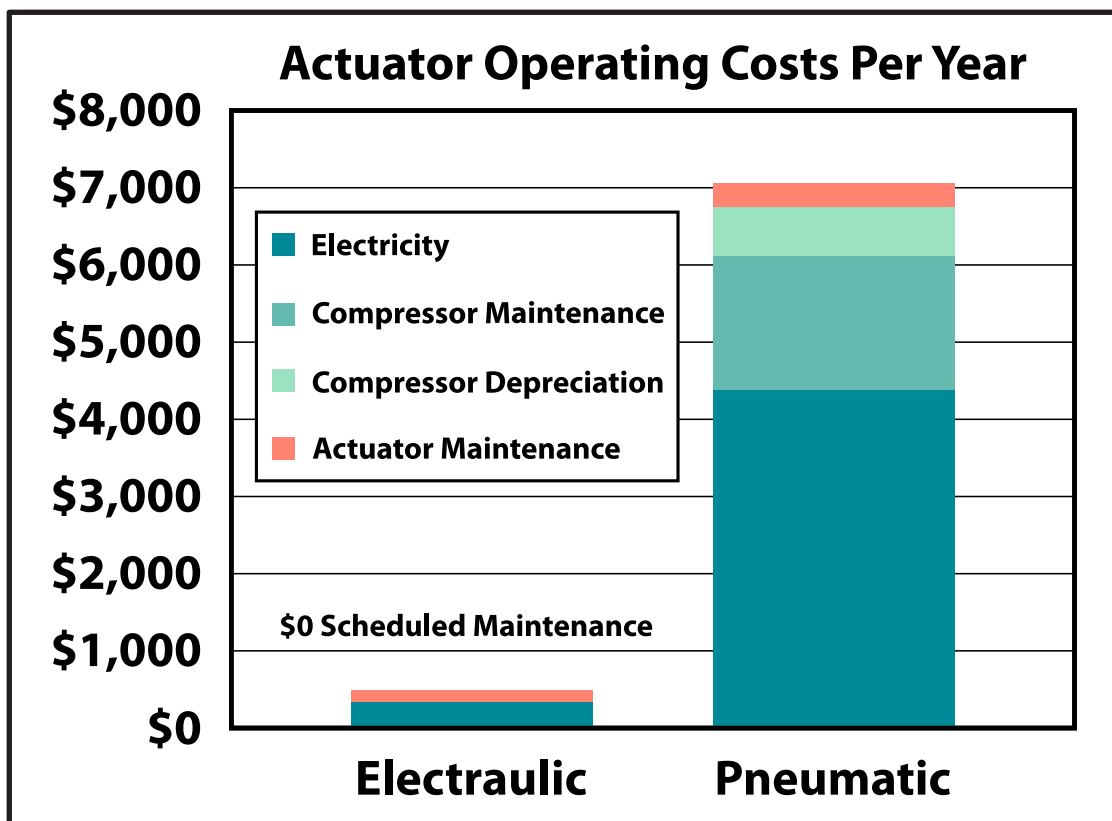
- 100% modulating duty cycle
- High thrust
- Ability to modulate close to the seat
- Overcome suction forces acting on dart
- Minimal deadtime (fast response)
- Small actuator footprint
- Reliable operation (maximum uptime)

Froth Level Control Takeaways

Air compression within a pneumatic system often causes the actuator to hunt for position while making small setpoint changes against large process forces. This results in poor pulp level control. Do your pneumatic actuators maintain stable dart valve position? Do your pneumatic positioners require frequent calibrations? Can your pulp level control be improved? REXA provides reliable and accurate dart valve control without routine maintenance, while maximizing mineral recovery rates.

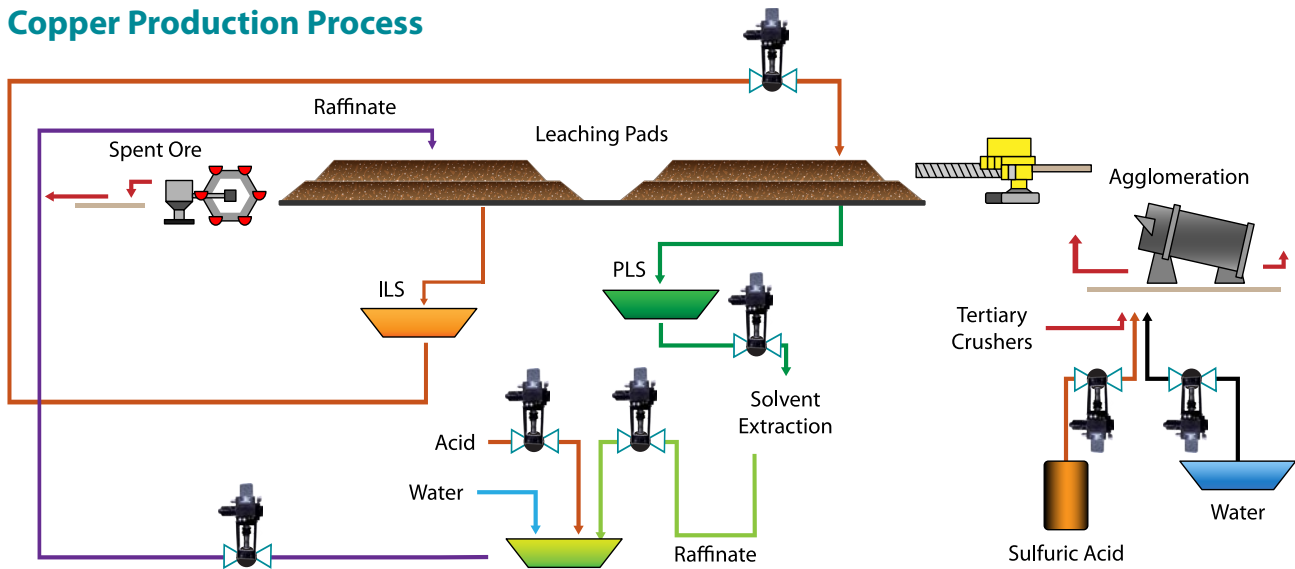
Reduce Operating Costs in Process Variation

When considering compressor operation and maintenance, the true cost of air is significant.



Leaching & Smelting

Copper Production Process



Oxide Heap Leaching

Producing high quality agglomerated ore requires minimal process variation of the feed solutions entering the agglomerator. Tightly-controlled acid feed rates ensure stable and predictable agglomerated spheres, leading to less acid consumption and improved leaching – critical components to the mine’s operational efficiency.

Applications

- Acid Flow Control
- ILS & PLS Pressure Control
- Hydrometallurgical Solutions & Filter Tank Flow Control

Compressor Inlet Guide Vanes

Precise positioning of Inlet Guide Vanes (IGVs) is certainly a balancing act, and much more challenging than it first appears. Do you experience reliability issues with your current IGV actuators? REXA Electraulic™ Actuation offers a responsive and repeatable control solution for IGV applications. Are your actuators able to maintain position changes during startup? Is the actuator’s response fast enough? REXA provides the confidence to precisely position the guide vane during start up and any minor disruptions.

Copper and Nickel Smelters

Traditionally, most sulfide deposits have been processed by concentration through a froth flotation process followed by pyrometallurgical extraction. Flash and matte furnaces require accurate and repeatable fan and compressor positioning.

Applications

- Oxygen Compressor Inlet Guide Vanes
- Furnace Flue Gas Pressure
- SO2 Fan Inlet Guide Vane



Advanced Autoclave POX/HPAL Processing

Acid Slurry Isolation

Over the last decade, oxidation (or leaching) in autoclaves has become the preferred method for processing gold and nickel present in sulfide minerals. As an industry-leading product, REXA actuators provide advanced diagnostics and application-specific features like partial stroke testing and systems free of routine maintenance. Supporting proper valve operation and extending its service life requires reliable actuation. Fail-safe requirements are met with nitrogen-charged accumulator systems to ensure proper shutoff and plant safety. REXA's advanced control system can soft-seat the valve to maximize the actuator cylinder and valve trim life. All components within the system adhere to REXA's closed-loop, non-vented technology principle to ensure long-term reliability without the need for fluid maintenance, condensate heaters or filters of any kind.



Actuator Requirements

- High torques (200,000 to 1.1 Million in lbs) with small footprint
- Fast closing speeds of 5-10 seconds per 90-degree rotation
- Reliable performance to minimize stalls

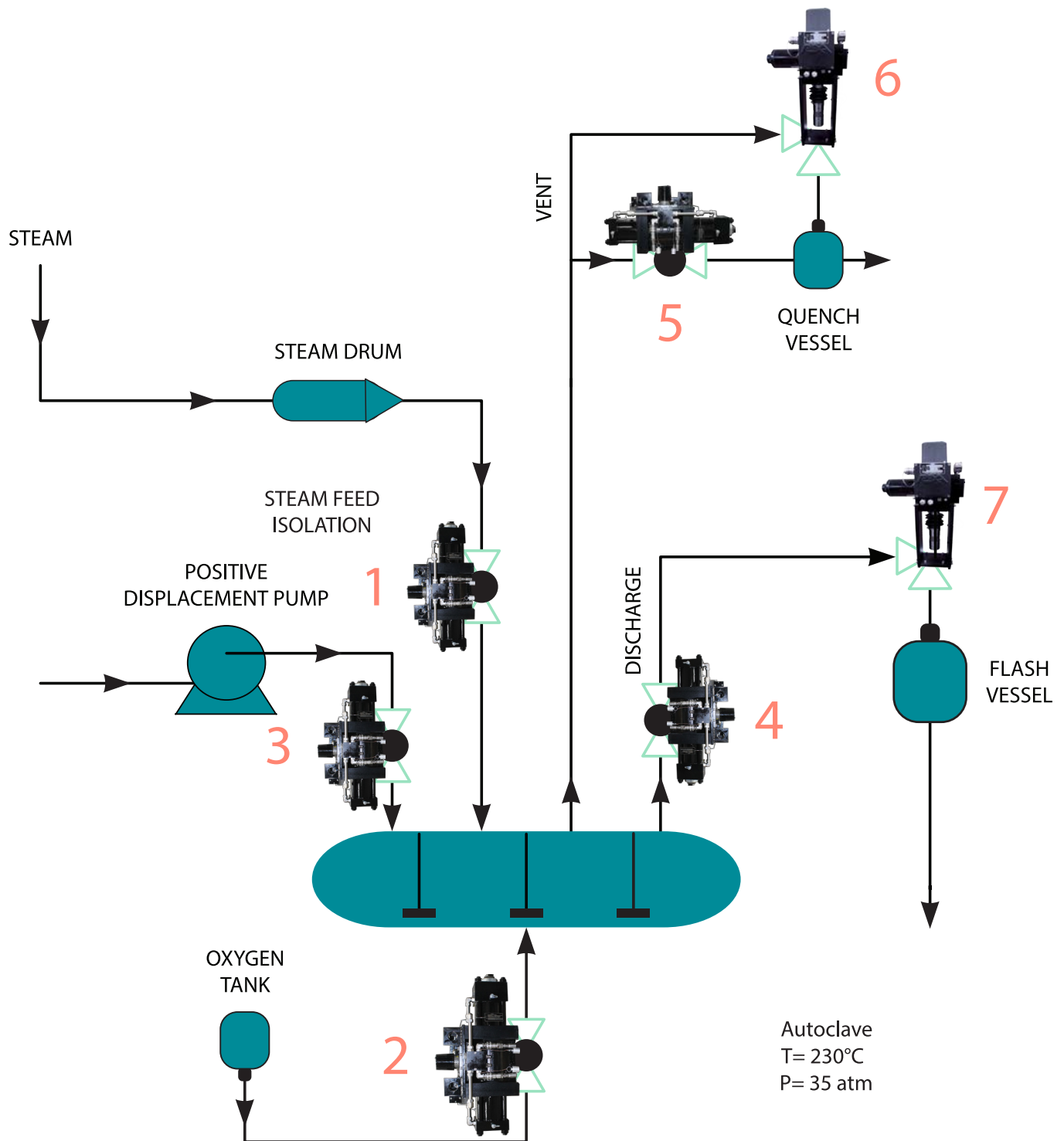
Autoclave Level Control

Autoclave tank level control and closure of letdown valves requires high-performing and reliable actuation. To maintain proper level and pressure within the autoclave, the actuator must be capable of 100% modulating duty cycle along with highly accurate and repeatable positioning around a setpoint. Many mines commonly utilize pneumatics because of their low initial purchase price and well-known maintenance procedures. However, the performance limitations associated with pneumatic systems outweigh any perceived benefits. Air compressibility results in spongy, unreliable actuator behavior. Overshoot and hunting for position can be common, especially when positioning around the valve seat. Some systems use smart positioners to tune out the hunting/overshoot effect. However, these devices typically introduce an increase in actuator deadtime resulting in a slower response to signal change.

Actuator Requirements

- Accurate positioning (0.1% repeatability)
- 100% duty cycling
- Able to operate effectively at lower valve position ranges (5-20%) because of hydraulic stiffness that provides excellent positioning

Typical POX Process Flow



Applications

- | | |
|----------------------------------|---------------------------------------|
| 1. Steam Feed Isolation | 5. Rapid Depressurization |
| 2. Oxygen Feed Isolation | 6. Autoclave Pressure Control |
| 3. Slurry Feed Isolation | 7. Pressure Letdown Autoclave Control |
| 4. Autoclave Discharge Isolation | |



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