CUSTOMER CASE STUDY

Pressure Swing Absorber Utilization Improvement

Optimizing control stability and valve reset logic to maximize operational utilization

Solution: Process Control Optimization **Industry:** Petrochemicals **Use Case Focus:** Process Control and Utilization

GOALS

- Increase the overall utilization rate of the pressure swing absorber unit.
- Enhance process control stability during standard and transitional operations.
- Minimize operational limitations that restrict daily absorption capacity.
- Establish a reliable foundation for continuous and stable gas separation.

CHALLENGES

- Control limitations constrained the pressure swing absorber from reaching full operational utilization.
- Suboptimal control behavior caused performance bottlenecks during crucial operating transitions.
- Outdated split-range logic created unnecessary restrictions on system responsiveness and stability.
- Manual or inefficient valve reset procedures delayed recovery during unexpected unit trips.

SOLUTIONS

- Implemented advanced process control improvements to stabilize the absorber unit.
- Adjusted control loop tuning to optimize overall system responsiveness and stability.
- Modified split-range logic to eliminate existing operating constraints during transitions.
- Programmed automatic valve reset logic to streamline recovery during unit trips.

RESULTS

- Achieved higher pressure swing absorber utilization rates across all operational phases.
- Demonstrated significant improvements in loop control stability under diverse conditions.
- Secured more reliable operating performance during critical unit transitions.
- Reduced process variability and unexpected downtime caused by valve reset delays.

EXECUTIVE SUMMARY

This project delivered process control improvements for a pressure swing absorber unit to overcome critical operational limitations and boost utilization. Facing constraints from outdated split-range logic, poor control loop behavior, and manual valve reset procedures during trips, the facility implemented targeted tuning and logic modifications. The integration of automatic valve reset logic and optimized loop parameters successfully stabilized the unit and eliminated performance bottlenecks.

Addressing Operational Constraints in Absorption Processes

Pressure swing absorber units are highly critical operational assets that must function at peak efficiency to maintain downstream product quality and volume. In this facility, the absorber unit suffered from persistent control limitations that restricted daily operating utilization and constrained total output. These performance bottlenecks were particularly severe during unit trips and complex operating transitions, where existing control behaviors could not cope with rapid process changes.

Targeted Process Control and Logic Enhancements

The optimization strategy focused on a multi-layered upgrade of the process control architecture to address specific logic limitations. Engineers executed comprehensive loop tuning to stabilize the pressure swing absorber under varying load conditions and modified the split-range logic to ensure smoother valve handoffs. Crucially, the team programmed and deployed automatic valve reset logic that executes immediately during a unit trip. This automation eliminated the need for manual operator interventions, streamlined the safety shutdown sequence, and prepared the system for a rapid, trouble-free restart.

Stabilized Operations and Enhanced Unit Utilization

Following the deployment of these targeted control modifications, the facility realized immediate and sustained improvements in overall plant performance. The integration of refined tuning parameters and modified split-range logic successfully eliminated historical operational constraints, yielding a significant increase in unit utilization. Process stability improved dramatically during transitions, resulting in more reliable operations and consistent product quality. Furthermore, the automated valve reset sequence minimized downtime during upset conditions, safeguarding upstream processes and proving the high-value impact of software-driven optimization.