Propylene Process Improves Safety & Efficiency with Tri Lok® Triple Offset Valve Solution

Tri Lok triple offset butterfly valve; S98 Scotch yoke pneumatic actuator; hydraulic dampener; declutchable override.

KEY RESULTS

- Tighter sealing and more reliable shutoff prevented backflow damage to compressors.
- Significantly lower pressure drop led to improved process efficiency.
- Field replaceable components and ease of maintenance greatly reduced downtime and repair costs.

APPLICATION

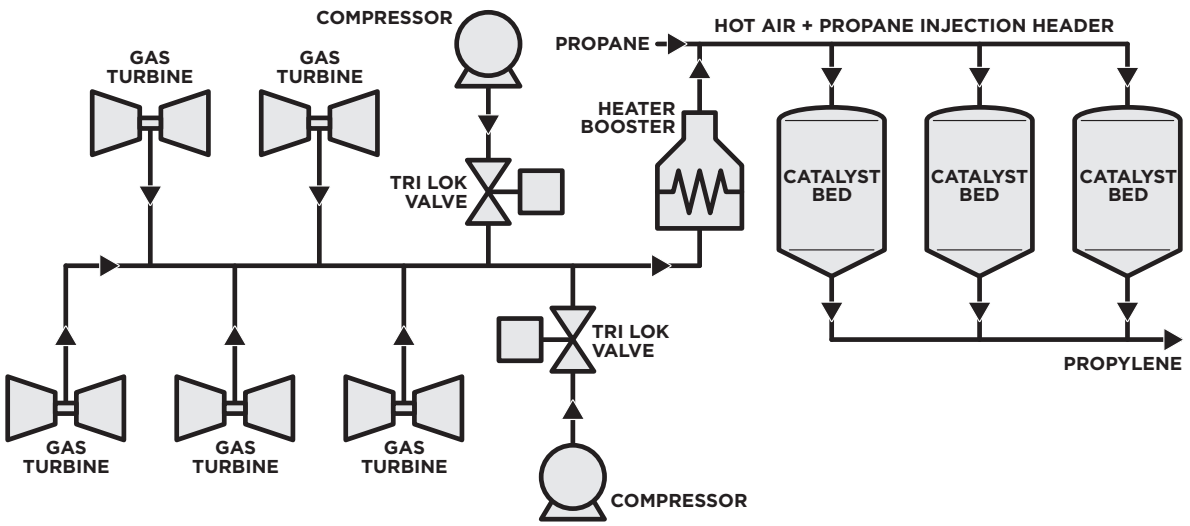
Compressor isolation in the propane dehydrogenation process for a large petrochemical plant in southeast Texas.

During the propylene manufacturing process, hot air and propane are injected into catalyst beds, with a resulting byproduct of propylene. The hot air comes from gas turbines, and is fed into a heater booster to raise the temperature to the required 1100°F (593°C). When one or more gas turbines are offline for maintenance, compressors are used to maintain pressure in the injection header. Compressor isolation valves are a critical element of the process, protecting the compressors from back pressure as the gas turbines are brought online.

PROCESS CONDITIONS

Industry	Petrochemical
Process	Propane dehydrogenation
Application	Compressor isolation
Media	Heated air
Pressure	10 to 13 psi 0.7 to 0.9 bar
Temperature	Up to 1100°F Up to 593°C

PROPYLENE MANUFACTURING PROCESS



CHALLENGE

Check valves were being used in the customer's propane dehydrogenation process, and were not operating as required for the conditions. The check valves were not sealing properly and experiencing large pressure drops. When critical isolation was needed, they were allowing backflow to the compressors — and required manual valve adjustment to prevent backflow.

These problems were causing excessive downtime, negatively impacting process efficiency. In addition, the valves required costly transport to offsite facilities for any repairs. The reduced production and increased operational costs were becoming too expensive for the customer to sustain.

SOLUTION

Bray approached the challenge by speaking directly to the plant operators and process engineering team to fully understand the process and expectations for the valves. Two automated Tri Lok triple offset butterfly valve packages were recommended, with a solid seal ring option for high performance sealing in extreme temperatures.

To further assure customer confidence in the proposed valve packge, Bray's engineering team utilized Failure Modes Effects Analysis (FMEA), Finite Element Analysis (FEA), and Computational Fluid Dynamics (CFD) tools to simulate process conditions and manage risks. The design, materials selection and controls, along with determining possible failure modes, helped plan for proper operation under expected conditions. With an agreement in place, Bray continued to provide sales and engineering support through weekly progress updates and discussions directly with the customer's key stakeholders.

RESULTS

Typical startup requires the five gas turbines to be brought online one at a time, allowing the temperature to stabilize as needed. During this period, the valves must protect the compressors from backflow. Once all engines are online, the valves are then fully closed, and are expected to maintain tight shutoff.

Once installed, the two Tri Lok triple offset butterfly valve packages performed far superior to the existing check valves.

- The compressors were protected from backflow, due to tighter sealing from isolation valves designed for more critical shutoff.
- Process efficiency was improved through much lower pressure drop.
- Downtime and repair costs were greatly reduced due to field replaceable components and ease of maintenance.

BRAY PRODUCT DETAILS

Valve	Tri Lok triple offset butterfly valve
Size	NPS 30 | DN750
Pressure Class	ASME 300 | PN 25, 40
Options	Solid seal ring
Actuator	Series 98 Scotch yoke pneumatic actuator with hydraulic dampener and declutchable override
Controls	Digital positioner

Tri Lok triple offset butterfly valve installed with Series 98 Scotch yoke pneumatic actuator and digital positioner. The two valve packages have greatly increased operational efficiency in the propane dehydrogenation process.

For more information about Tri Lok, contact your local representative or visit Bray.com.