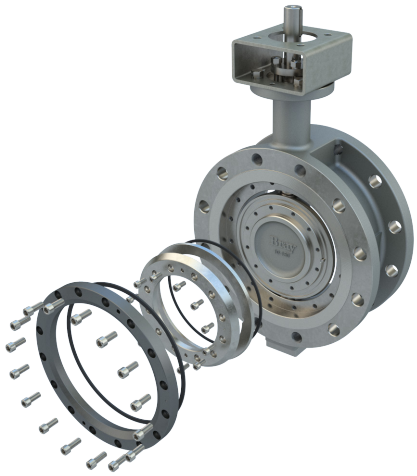


Replaceable Seat & Seal Unaffected By Process Vibration

CHALLENGE

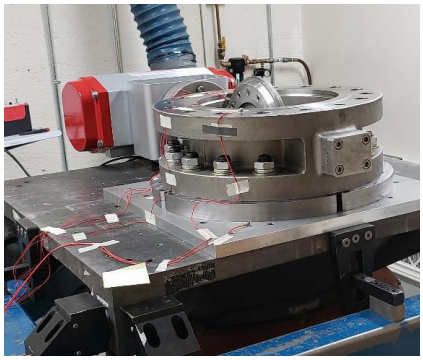
Tri Lok triple offset valves feature independent field replacement of both the seat and the seal ring. This important product feature allows field maintenance — whereas integral seated triple offset valves must return to a repair shop for maintenance, requiring specialty equipment. Triple offset valves with replaceable seat and seal rings greatly reduce maintenance downtime and costs, while extending the overall service life of the valve.

One speculative drawback to a replaceable seat design is the potential for extreme vibrations to loosen the bolted connections securing the seat and/or seal, resulting in poor shutoff performance. While this behavior has not been observed in Tri Lok valves currently in the field, the unsubstantiated notion still exists — and drove Bray to address it in an unbiased manner.

SOLUTION

A standard 12-inch Class 300 Tri Lok triple offset valve was randomly selected from production inventory. In order to directly measure the compression forces in critical fasteners, cylindrical strain gauges were installed in randomly selected cap screws securing both the seat to the body and the seal to the disc. A total of (4) instrumented cap screws were installed in the test valve (according to standard assembly work instructions) near the valve neck and 90 degrees clockwise position. Any loosening of the bolts due to vibration — or any other means — would be detected by the cylindrical strain gauges, and a corresponding loss in compressive force.

A test plan was devised to demonstrate the performance of a Tri Lok valve during and after vibrations and mechanical cycling. Bray contracted a 3rd party laboratory (Austin Reliability Labs) to execute this test plan. Austin Reliability Labs subjected the test valve to vibration and concurrent mechanical cycles, while continuously monitoring the compressive force of the fasteners. Once the valve was mounted to the vibration table, a sinusoidal sweep survey was conducted to determine the valve assembly's resonant frequency. The valve would then be vibrated at the resonant frequency (worst case scenario) for 90 minutes, and mechanically cycled under full torque every 30 seconds. This test would be conducted in (3) mutually perpendicular axes, for a total of 4.5 hours of resonant frequency vibration and 540 mechanical cycles.

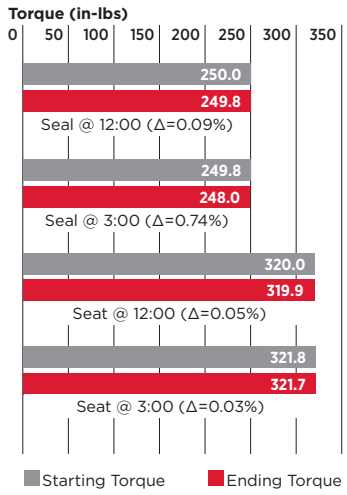


The Tri Lok test valve was subjected to vibrations for 4.5 hours, and mechanically cycled under full torque every 30 seconds for a total of 540 cycles.

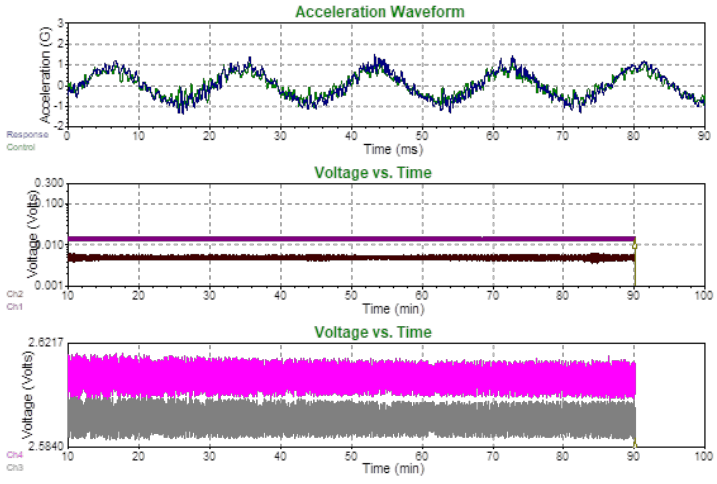
RESULT

Less than 1% decrease in bolting force was observed on all (4) instrumented fasteners, after the conclusion of testing. End users can be assured that vibration and mechanical cycling have **negligible effect** on the fastening of the Tri Lok replaceable seat and seal — and ultimately the shutoff performance of the valve.

FASTENER TORQUE — Before/After



VIBRATION INTENSITY — Z Axis Example



Z Axis Sine Dwell at 53.58Hz Data