



Bulk Tank, Inc.

**400 Parkway Drive
Park Hills, MO 63601
1-800-841-5524
(573)-518-0600
Fax (573)-518-0551**

CHECK VALVE OPERATIONAL TESTING:

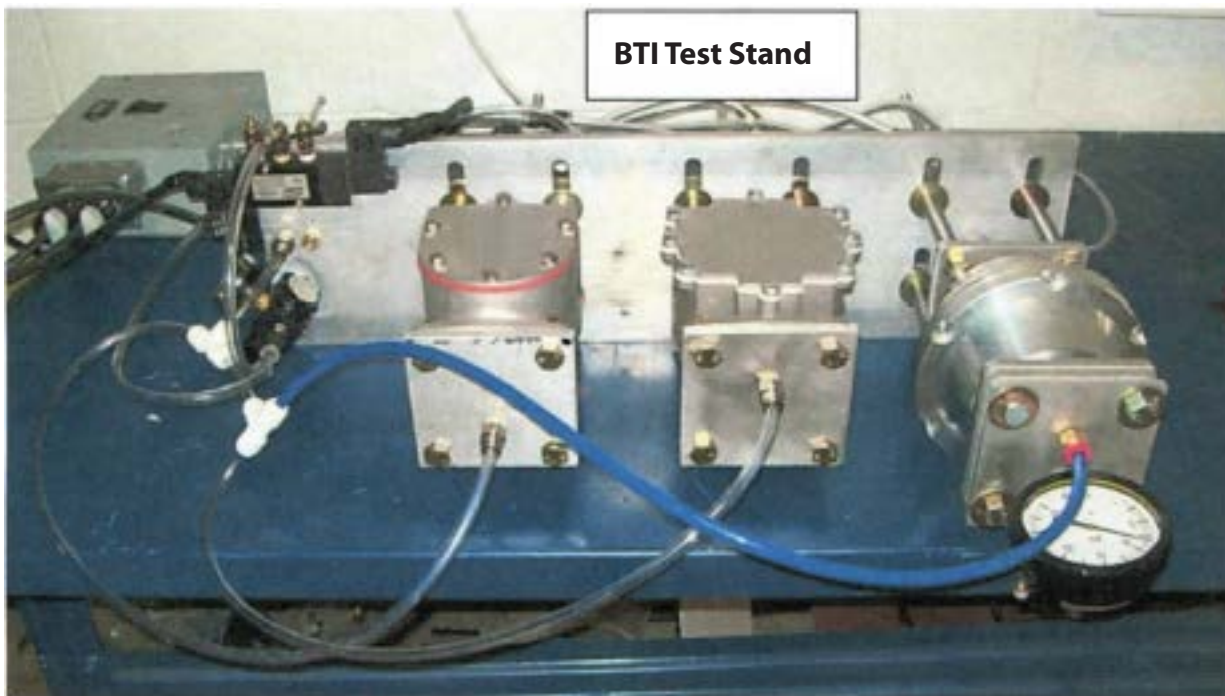
TEST: One each of a BTI, Competitor 1 and Competitor 2 check valves to be mounted in a test stand to be tested simultaneously for operational longevity and reliability.

PROCEDURE: The valves will be slammed shut with 20 psi by applying air pressure to the back of the valve, The valve will then be completely opened with an air cylinder. This will constitute a complete cycle.

Each valve must hold pressure at the end of each cycle. Each valve must be able to open completely on each cycle. Test will be monitored hourly for accuracy.

The valves and counter will be controlled via a PLC controller.

Definitions: Failures will be noted as spring failure and sealing failure.



RESULTS: All valves functioned as designed for the first 15,000 cycles.

3/28/12



At 15,271 the Competitor 2 valve experienced a single spring failure. This slowed the valves ability to close. The valve was allowed to continue the test.

The BTI and Competitor 1 valves continued to function normally.

3/30/12



The Competitor 1 valve experienced a single spring failure at 28,000 cycles and slowed the valves ability to close.

The valve was allowed to continue the test.

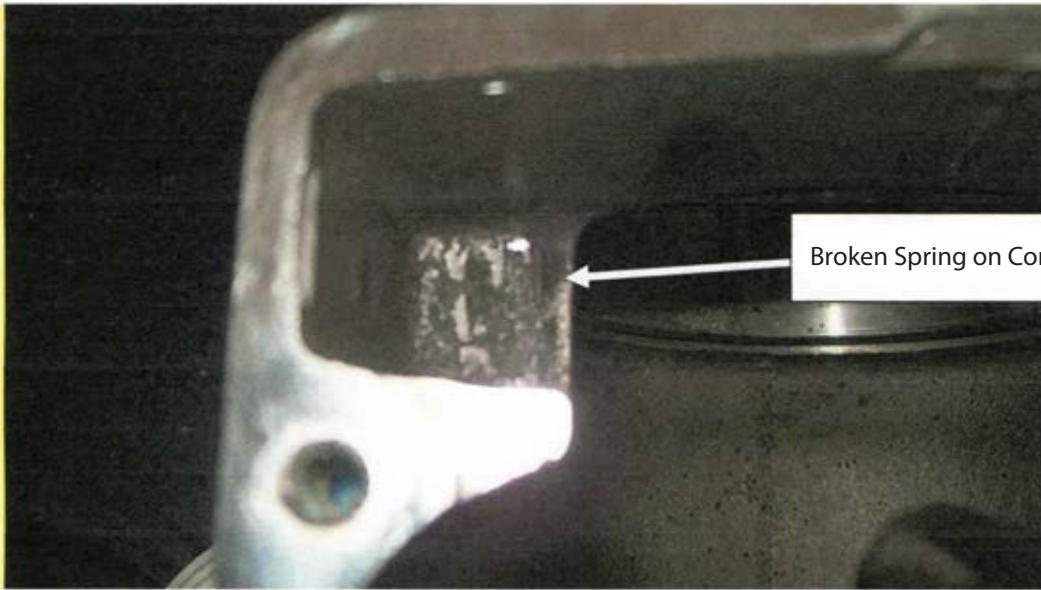
At 32,046 the Competitor 2 valve would no longer hold 20 psi. Both torsion springs in the unit had failed and would not allow the poppet to close.



Competitor 2 valve with both torsion springs broken. Valve would not hold pressure after 32,046 cycles.

AT 32,046 THE COMPETITOR 2 VALVE HAS FAILED.

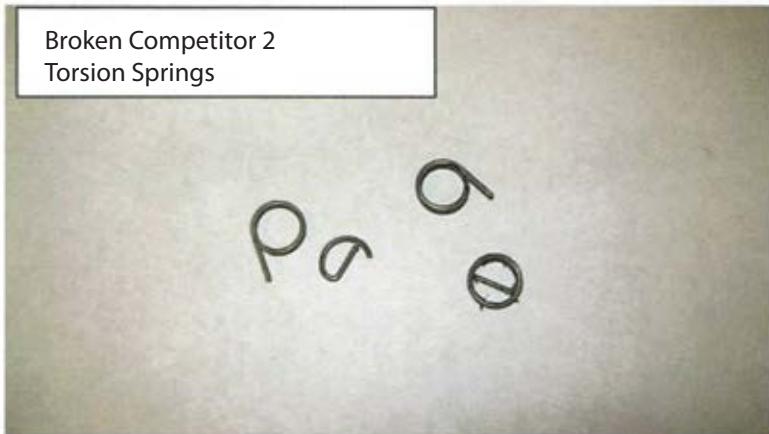
4/2/12



Broken Spring on Competitor 1 Valve

At 45,000 cycles the Competitor 1 valve experienced the second torsion spring failure that left the valve unable to Close

The BTI valve continues to function normally.



Broken Competitor 2 Torsion Springs

4/10/12

BTI valve has 120,000 cycles and continues to function normally.

4/11/12

BTI valve has 135,000 cycles and continues to function normally.



Broken Competitor 1 Torsion Springs

4/12/12

The decision was made to allow the valve to test by itself until some type of failure was detected.

AT 45,000 CYCLES TO THE COMPETITOR 1 VALVE HAS FAILED.



11/19/12

The BTI valve continues to cycle normally and hold pressure as designed.

At the time of this report the valve has 756,465 cycles and continues to function as designed.




1/22/2013

The BTI valve continues to cycle normally and hold pressure as designed. The valve now has 1,194,136 cycles without any service, lubrication or other maintenance. The test will be discontinued and the BTI valve will be disassembled and inspected.

INSPECTION:

		
CHECK VALVE w/1,194,136 CYCLES	OUTLET	INLET
		
HARDWARE	O-RING	FRONT BUSHING AND SPRING
		
BACK SIDE OF POPPET	VALVE SEAT	VALVE STEM
		
FRONT BUSHING	BACK BUSHING	POPPET FACE





		
OLD SPRING VS NEW (New on Top)	PARTICULATE ON BACK SIDE OF POPPET	EXPLODED VIEW

CONCLUSION:

The Competitor 1 and Competitor 2 swing check valves failed to operate as designed at less than 50,000 cycles.

The BTI valve with its innovative design continues to operate as designed over 20 times longer than the competition. Upon termination of the test the valve was still operating as designed, maintaining pressure and sealing immediately upon seat closure. With 1,194,136 cycles the BTI check valve is clearly a more reliable design.

 President, BTI	1-22-13 Date
 Q.C. Manager	1-22-13 Date