

Bray International Inc. is renowned around the world for its commitment to superior quality products and unmatched customer service. Besides the company's standard product line, Bray prides itself on finding unique ways to expand its range and take on challenges through customer-driven product development. Valve World had the opportunity to learn about a recent customer collaboration which had the company celebrating one million cycle test success.

By Sarah Bradley

Co-founders Craig Brown and Frank Raymond grew the company from the ground up with the goal of establishing Bray as a high-performance company, which quickly developed a reputation for superior quality with personalized customer service. Their entrepreneurial vision which began in the 1980's with their very first valve prototypes, quickly expanded globally and has continued to grow through the acquisition of the Bray/McCannalok product line in 1996, Flow-Tek in 1999 Ritepro in 2000, VAAS in 2014 and Amresist in 2017. Currently, with a global presence in over 60 countries on six continents, Bray states its fully integrated and innovative product portfolio exceeds the expectations of their worldwide customers with products such as standard and severe service ball valves, common control valves, specialty slurry valves, knife gate valves, check valves,

butterfly valves – resilient seated, high performance and triple offset, pneumatic and electric actuators and related accessories. Bray also has more than 300 sales, distribution and service offices around the world, staffed with highly trained flow control experts. This global network means the company can quickly react to the needs of their customers no matter where they are. All Bray factories are ISO certified and products are designed and manufactured as specified to comply to CE/PED, SIL, ANSI, JIS, DIN/PAS 1085, API, NSF, ASME, AWWA and other relevant standards to meet the special requirements for cryogenic, fugitive emissions, water, nuclear, sanitary and many other applications.

Customer-driven

Bray's success is achieved through continued customer satisfaction. The company says it



Bray International - a customer-driven technology partnership



actuator product to be reliable to meet the needs of the customer and prevent maintenance downtime.”

“In the industry, the Hydrogen Separation valve is considered a special product, therefore lead times to get it to the facilities were very long”, Paul V. Lopez II, Vice President - Global Industry Management, Industrial Gas, Semiconductor, adds. “We wanted to make it an available product for the customer and to give them the opportunity to save money by having longer times between maintenance. It is a very difficult application - high-cycle, quick-acting - and there have been challenges with the availability, cost and durability of those products in the market. Hearing these challenges, we could step up and work directly with some major customers and get them together with our engineering team to come up with a solution.”

Customer-based design

For its product development, Bray uses a global model which incorporates their founding principles of customer service, state-of-the-art technology and integrated product development. Bray’s process for providing reliable products that perform to customer expectations begins with correctly identifying

the requirements as defined by the customer’s needs and application.

“We use standard tools that are available to all valve manufacturers in the industry. On top of that, we add our Bray Factor, which is our people and our approach to solving complex problems. We push the limits of our testing ability,” says Partha Chinnasamy, Technical Director - High Performance Butterfly Valves.

“We try to come up with creative ways of making decisions in a very short period of time, because with a million cycle test, we are talking about eight to ten months. Every design decision needs to be made in a timely manner and the engineering team has to be very creative to come towards a solution with confidence.”

Test preparation

Once the customer’s requirements are clearly defined, they must translate into design activities and decisions. Bray teamed with a major industrial gas company to set testing criteria such as the pressures, number of cycles, how the tests would be administered, valve orientation, etc. The criteria were determined with the customer in advance to ensure that the testing resembled actual operation in the field as much as possible.

always prioritizes strong customer relationships and that customer needs drive Bray’s product development. When the company was approached to develop a valve and actuator package for an industrial gas application that could successfully complete one million, fast-acting, continuous cycles, under severe conditions, Bray rose to the challenge.

A common issue faced by industrial gas customers is reliability in high-cycle valves, particularly in hydrogen separation processes. As the valves are used in some of the most critical services, failure to operate can lead to costly plant shutdowns. The customer’s application not only required the successful completion of one million cycles, but also held strict leakage, torque and other performance requirements.

Difficult application

“Pressure swing adsorption is an air separation technology that separates different species of gases from a gaseous mixture”, John Shu, Senior Design Engineer, explains. “Valves and actuators in this particular application are subjected to high-cycles under high differential pressures and fast stroking times. These conditions require a valve and



S41 High Performance McCannalok Butterfly Valve, S98 Scotch-Yoke Pneumatic Actuator and S6A Smart Positioner – A reliable automation package



“The first step in preparing the test for this customer was really understanding the application the customer required and the best way for us to understand the application was to understand PSA,” John Shu said. “Once we developed a good understanding of the application and the boundary conditions listed by the customer, we could start to recreate a validation test to mimic the customer’s actual application.” During the concept development phase, the company began to evaluate its standard Double-Offset Valve – the Series 41 McCannalok valve, Standard S98 Scotch-Yoke actuator (45E2 & 12E2) and S6A Smart Positioner package using failure mode effect analysis for the particular application.

Significant investments

Knowing that the test procedure would be stretched over several months, engineers used finite elemental analysis to pinpoint some of the possible failure points to isolate in accelerated life tests. The accelerated testing allowed Bray to simulate the valve fatigue in a condensed time frame, without having to actually go through the full physical lifetime of the components. Following this they performed verification steps in physical testing to verify against concepts to determine the best route to take in testing. “To meet the requirements of our customer for this test, we made a significant investment not only in equipment, but time and resources as well. To mimic the process

variables, we invested in a large air compressor that supplies air at high volume, high pressures and high flow rates,” reveals Michael Kitchens, R&D Lab Manager. “We needed a dryer to mimic the dew point and a high-pressure, high-volume gas booster to get to the required pressures, as well as high-low pressure volume storage tanks and large diameter piping. Once all that was in place, we could mimic their conditions and actually test the valve. When the valve is testing to a million cycles, it takes roughly seven or eight months, so it was another investment in time, people and resources to test intermittently.”

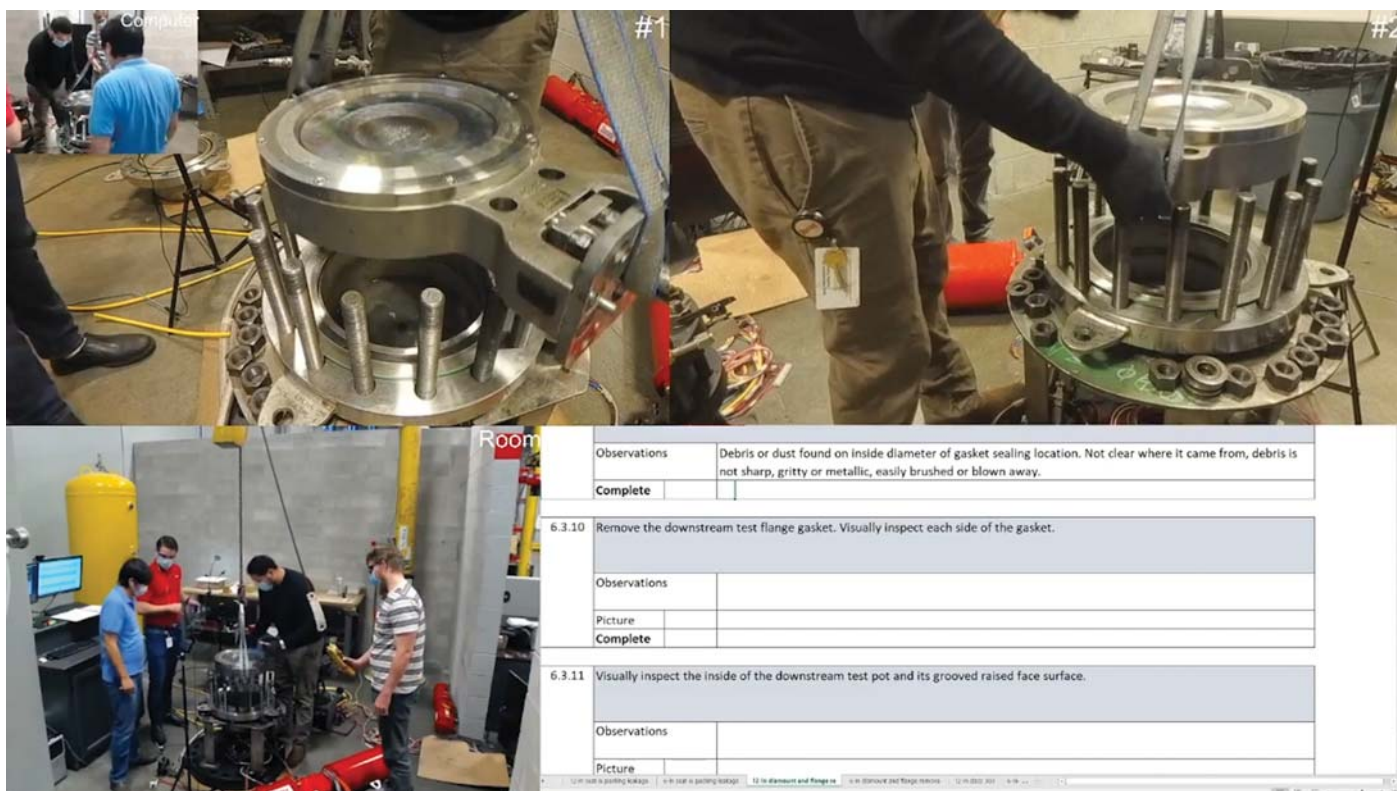
“We do not do trial and error engineering here. We want solid, concrete simulation results to know that when we go into the actual physical test, we are not wasting our customer’s time and we are not wasting our time. It is going to be a good engineered solution,” says Patrick O’Connell, Rapid Response and Sustaining Engineering Manager.

Reliability testing

Several tests were performed to prove the reliability of all components with accelerated life testing. A fatigue strength validation test was completed with pressure cycles conducted at full differential pressure. During the actual 1 million cycle validation test, a seat and packing integrity tests were implemented frequently and periodically; a bidirectional seat leakage and packing test was conducted at full differential pressure



Photo of Validation Testing – Live Video and Live Data were streamed continuously for real-time monitoring of performance of assembly, sub-assembly and components.



Live Streaming of Initial post-test disassembly. Multiple cameras & angles were setup to allow week-long, joint-evaluation with customer.

and bearing evaluation and validation were also performed frequently.

Bray also deployed its IOT-sensors and solution to continuously monitor, in real-time, the performance of valves & actuators at the assembly, subassembly and component level. "Novel integrated measurements provided us continuous monitoring of the performance of the entire valve assembly, including actuator and positioner. We also gained data regarding components to really understand the performance and gradual degradation of these components," Brindesh Dhruva, Chief Marketing & Technology Officer explains.

Spectacular performance

Bray tested the Series 41 McCannalok (12-inch and 6-inch Class 300), S98 Scotch-Yoke (45E2 & 12E2 actuators) and S6A Smart Positioner to successfully complete one million cycles and exceed all performance requirements set out by the customer. The McCannalok Valve has standard RPTFE seats with resilient energizer and graphite-filled PTFE packing. Tested with dry air as the medium at a stroke time of one to two seconds resulted in bidirectional zero leakage after one million cycles.

The S98 Actuator performed spectacularly with zero leakage after one million cycles on the piston seal and piston rod seals, Bray claims. The minimum pressures required for compression of the springs, and full travel stroke were in line with factory assembly requirements after completion of the test.

Upon disassembly, all moving components exhibited excellent functionality with nominal wear. The Series 6A positioner provided reliable control and feedback throughout the million cycles and the components subjected to mechanical wear did not exhibit signs of damage under the most stressful conditions. "This is a very difficult application given the sheer amount of cycles, temperatures, pressures and fast-acting requirements. It is one of the most difficult applications that you will ever run across. We were challenged with this and we went after it," says Bray Chairman & CEO Craig Brown.

"We like to encourage our employees to look at these opportunities as ones to help us showcase our expertise. We are not afraid of taking on challenges because it helps us improve and it means the customer gets a product that is better than what they are using now. They can have confidence in the products' performance and in turn they can share that confidence with other customers."

Post-test livestream

The global pandemic altered the way everyone does business. In 2020, the world found ways to pivot their processes and adapt to new ways of interacting with customers. When the customer was unable to witness the test disassembly in person as planned, Bray performed a post-test livestream analysis with multiple camera angles, uploading live photos and performing instantaneous

Q&A as the customer was able to virtually inquire about every component being shown on the live feed.

"The cameras were rolling from all different angles. We did not have anything to hide and we wanted to show the customer exactly how our products had performed. We took it apart and were able to hold up the components for the customer to examine and the best part was hearing their positive feedback. It almost looked brand-new," says Craig Brown.

Crossing the finishing line together

When the test hit one million cycles, the customer could watch the feat live and cross the finish line together with the Bray team. The ability to share this with their customers and provide complete transparency was the most important part of the process.

"The way the engineering team brought to bear the technical strength and innovation to really build the solutions, verify with accelerated life testing and validate them through the million cycles was quite impressive," says Brindesh Dhruva.

"The partnership and collaboration with our customers and the engineering strength is something that we have learned to appreciate and utilize in a very successful way."

"You have to have a first-class product in the actuator, in your accessories and in the valve itself and they have to work together for one million cycles. That was design engineering at its best," concludes Craig Brown.