Application Case Study: Compressed Air Monitoring for Food-Grade Glass Inspection

In 2020, the world saw the production of nearly 700 billion glass containers, the vast majority of which were used to package food and beverage products for human enjoyment. Even at such staggering volumes, refillable glass containers have plummeted in popularity over the last 50 years as convenience-oriented disposable containers have taken over, a trend that is now showing signs of reversal as environmental and sustainability concerns grip younger generations.

Motivations aside, glass containers have a proven place in the food and beverage industry that is only going to grow. This perspective urged a globally recognized glass bottle inspection equipment company to contact Whitman to discuss a critical process control application. This OEM's inspection systems utilize compressed air to actuate glass bottle handling and reject components, and recent reliability concerns led them to search out options that would ensure a 100% inspection accuracy rate.

About Us

As a veteran-owned small business, Whitman Controls is dedicated to supplying premium quality, reliable, technologically advanced instrumentation for use in nearly any application. Our Bristol, CT manufacturing facility embodies over 40 years of engineering, fabrication, and customer service expertise, serving both end-user and manufacturing customers nationwide through direct and distribution channels.

Application Summary

When it comes to food packaging materials, glass has unignorable benefits: it's 100% recyclable with no loss in purity or quality, nonporous, impermeable, inert, and effectively non-reactive (meaning it will not affect a product's flavor, color, strength, or aroma). Consumers overwhelmingly view glass as synonymous with premium-grade products, especially in beer, wine, spirits, dairy, and condiment market segments. For this reason, glass container quality has to meet rigorous standards in order to both satisfy consumer expectations as well as ensure food and consumer safety. To avoid such issues, extreme measures are taken to inspect glass bottles and jars as they're manufactured, using some of the most sophisticated quality control technologies in modern manufacturing. Such inspection equipment can only be as good as the utility services that energize it, which brings us to the importance of reliable compressed air in glass inspection systems – even a few seconds of air interruption could mean that unacceptable containers do not get caught, passed forward to consumers where real harm may occur.

Challenge

At an inspection rate of 300 glass bottles per minute, our customer's continuous inline inspection platform carries responsibility for making a instantaneous pass-or-fail decision on a single bottle every two-tenths of one second. When a 'fail' decision is computed, a series of

pneumatic cylinders and positioners isolate the suspect bottle, move it to a reject conveyor outfeed, and hold spacing on the remaining bottles so that inspections continue seamlessly.

Our client began to see an uptick in reported missed rejections from one of their end users, and leapt into action. Luckily, the missed rejects were caught by secondary onboard safeties that would E-Stop the line, but the resulting downtime and abrupt glass stoppage was just as problematic. After a thorough onsite assessment, the issue was traced back to inconsistent compressed air from the plant's central compressor, causing the pneumatic components to fail in firing. In other words, the inspection system was working perfectly, but the problematic control air supply was causing a knockdown effect on the reject mechanisms that needed an immediate remedy.

"After the site visit, we were of course relieved to confirm that our [inspection system] was not reading false-positives. Now that we had seen first-hand how much low air pressure risked missing rejects, we knew that adding master pressure controls was the only option." - *Application Engineer, Confidential Inspection System OEM*

Solution

To be fair, the solution to the overall problem experienced at this plant was that the end user needed to install a second air compressor, larger air dryer, and larger dry air receiver in order to keep up with increasing air demands. While that solution was implemented, we went to work with our customer on improving their control air safeties for this system, with the intention to standardize the resulting improvements for all of their future systems as well. How would we protect the system from control air supply upsets? Four ways:

- We specified a Whitman P117LG NEMA 4 Pressure Switch to install on the incoming air connection within the system's main control air panel, which would monitor for pressure conditions that fell below a non-adjustable 85 PSIg (5 PSIg higher than the pneumatic cylinders' minimum operating pressure specification).
- Due to the criticality of the application, we recommended a redundant switch be installed, achieving 1oo2 (one-out-of-two) safety protection in which one sensor can completely fail while the other remains active to protect the system.
- A soft shut-down sequence was programmed into the system, triggered by the pressure switches' low limit signal. Compared to the previous hard E-Stop shutdown when

compressed air faltered, this soft shut-down saves many broken bottles and mechanical wear-and-tear.
- We helped develop a standardized Test and Calibration procedure that end-users would perform on a regular basis, assuring that the installed safeties performed reliably well into the future.

With the plan established, our joint Whitman-Client team deployed the changes to the field, tested through multiple intentional air upsets, recommissioned the system, and retrained the plant's production and maintenance staff.

Results

Building out new equipment and plants is certainly rewarding, but playing a role in making an existing system safer, more reliable, and extended in anticipated lifespan is in many ways even more fulfilling. On this project, we were lucky enough to get a bit of both. The end-user has seen a near complete decline of missed rejects and hard-stop related breakage (thanks to both our project and their new compressor kit). Meanwhile, our customer has standardized on our P117LG redundant sensor design for all of their inspection systems moving forward. While there's always more work to be done, we might take a moment to reflect back on this successful project with a refreshing beverage – in a glass bottle, of course.

Data Bullets

- **100%** redundancy of the low air pressure protection system using Whitman's 1oo2 redundant sensor solution
- **6% increase in uptime after project completion**
- **85%** reduction in line breakages after implementing a soft-stop sequence
- **30%** increasing in Whitman's team purchasing beverages in glass containers after this project!

Here at Whitman Controls, our values drive us to provide the highest level of servant partnership that you can find. To discuss your applications or to learn more about our capabilities, please contact us at (866) 556-5634, via email at info@whitmancontrols.com, or online at www.whitmancontrols.com.