

Automated pressure testing station launched in Italy

After 20 years and over 500 systems in the market, Agr International embarked on a mission to develop an innovative automated pressure testing station. According to David Dineff, the glass plant at Villa Poma, Italy was chosen as the site for the launch of this product.



Damiele Delfino is Head of New Technology Process Engineering for Verallia plants in Italy.

When the decision was made to develop a tester, Agr was challenged to deliver a product that provided a high value solution to the industry, something a step above what already existed. Before the project got off the ground, Agr customers around the world were interviewed to better understand the needs of the current market and how the product could provide for existing needs, plus offer additional value.

"As we were defining the concept, we evaluated the current state of pressure testing, as well as what was done in the past" Robert Cowden, Agr's Chief Operating Officer explained. "We also looked at the limitations that customers were facing, such as job change issues and throughput. These were all taken into consideration. This was an intense process . . . and when the dust cleared, we learned that customers wanted more versatility, the ability to test to higher pressures and operate faster. That was not all. We also found that there was a major unmet need . . . volume testing."

BUILDING A BETTER TESTER

The real challenge was to design and deliver a high value solution,

that would take advantage of the latest technologies and provide the kind of functionality and value that the glass bottle industry desired in a testing system. Based on the market research, the product needed to incorporate several key features. First, it was imperative that this product had a higher pressure rating, as existing products on the market typically could not fully burst high strength Champagne and similar bottle types. Second, the product needed a high level of universality and versatility, which meant no job changes, not only for different bottle finishes and diameters but also for bottles of different height. Third, faster throughput was desired, to increase productivity and support multiple line applications. And last but not least, the inclusion of an automated volume measurement station. This tedious, labour-intensive task is normally performed in the laboratory but is as essential to managing production as pressure testing.

The final SPT2 product resulted in a two station design that can perform volume measurement and pressure testing concurrently. An upper testing limit was set at 69 bar (one minute equivalent) to facilitate testing to destruction of most high strength bottles in production today. On the technology side, a proprietary FPGA controlled positioning system provides for optimal bottle travel and placement through the system, making it possible to achieve throughputs of 270+ bottles per hour. The SPT2 also incorporates universal bottle holders to automatically adjust for bottles of different sizes and finishes, eliminating job change parts and providing the flexibility to test bottles from multiple lines. The most significant, differentiating factor of this system is the volume measurement station, providing automation for this laborious task.

LAUNCH SITE

When the SPT2 was ready for the market, Agr felt that the Villa Poma plant was a perfect candidate for the product's introduction. The Villa Poma glass plant, part of Verallia Italy, is noted for its advanced technology and production of high quality glass bottles for the food and beverage industry. Gulio Sgarbi is in charge of cold end quality at the Villa Poma plant. "Regardless of what product we are making at any given time, our target is to satisfy our customers . . . and that means paying very close attention to quality" he commented. "Since 90% of our production >



The Villa Poma glass container manufacturing plant is part of Verallia Italy.

is targeted to the beer and wine industry, volume requirements are strict and bottles must be pressure tested as part of the quality verification process."

A high reliance on pressure testing and the fact that just about every product produced at this plant is pressure tested was of keen interest to Agr when it was looking for a site to launch SPT2. This location was ideal for the task at hand. The Villa Poma plant has been using Agr pressure testing equipment from day one. Not only do they understand pressure testing and its importance but volume measurement also figures very high in the factory's quality programme.

According to Daniele Delfino, Head of New Technology Process Engineering for the Verallia plants in Italy, this was an opportunity to test the most advanced technology on the market for managing pressure strength and volume fill levels. "Both of these measurements are critical to our business and of very high interest to us."

Mr Delfino outlined three main objectives for this effort: To get a first shot look at this exciting technology while helping Agr give this system a real-life, in-the-plant workout; to understand how this technology can help improve the Verallia quality management programme, especially with regard to pressure and volume measurement; and to qualify the volume measurement portion of this device for use throughout the Verallia worldwide organisation. On-line volume measurement offers the potential for considerable improvements in operational efficiencies, plus a means to gain additional input for process management purposes. As soon as the SPT2 was installed, it was realised that this device offered potential for improving the quality management programme.

EXPANDED PRESSURE TESTING CAPABILITIES

At times, more than 95% of production at the Villa Poma plant is pressure ware. "Our testing programme mandates that we test every article that must contain pressure" Mr Delfino explained. "We also test some bottles that are destined for still wines, since many of these bottles have specifications that require a minimal pressure test, even though the wine is not carbonated. The pressure test is critical, as it is one of the best methods to find defects and understand the strength of the bottle. We use pressure testing in addition to vertical load testing to assess the quality of all ware."

The SPT2 incorporates a number of features that can help better accomplish this testing strategy. Versatility is key. The Villa Poma plant produces a number of different SKUs on any given day, with a need to be able to test bottles of different sizes, finishes and strengths. The SPT2 simplifies this process greatly, especially since it incorporates a universal gripping system that can accommodate a range of bottle finishes up to 38mm. It can also dynamically adjust for bottles of varying diameter and height. This means that the SPT2 can be used for multiple jobs without the need for job changes, making it possible to test bottles from different manufacturing lines or hand-fed sets of bottles as necessary.

"Our pressure testing programme operates 24/7 and is rigorous" says Giulio Sgarbi. "Beer bottles are tested three times per shift, sparkling wines two times per shift and non-pressure ware once per shift. Each testing set includes a mould round of 32 bottles and if a

problem is identified, the testing is increased significantly. Job changes limit our testing time. The SPT2 provides an opportunity to increase our efficiency by eliminating job changes and because the SPT2 accommodates changes in ware size automatically, anyone, regardless of skill level, can process a set of bottles. Furthermore, using the SPT2 resulted in a 25% improvement in pressure testing throughput. This is a real advantage."

TESTING TO THE LIMITS

When it comes to pressure testing, Champagne and sparkling wines are the most challenging. Compared to beer bottles, the pressure limits are much higher. In the past, the testing of these bottles was limited to 35 bars, mainly because of the limitation of the pressure testers. "We could not really take these bottles to the limits and had to rely mainly on proof tests" Mr Sgarbi explained. "However, this approach does not provide us with the detailed information on the strength of these bottles, as we would get from pressurising them to burst. The SPT2 with its increased pressure capability solved this dilemma. We can now test these bottles up to the limit and actually break the bottles. The SPT2 can get right up to 70 bars. This is enough to break the majority of these bottles. Now we can see how they really perform."

VOLUME MEASUREMENT AS A PROCESS MANAGEMENT TOOL

Next to pressure, volume measurement is the second most important test performed at the Villa Poma plant. Why check for volume? Mr Sgarbi explained that the law requires that the volume, quantity and bottle manufacturer be imprinted on every bottle. Therefore, it is necessary to measure them and provide assurance that they meet volume requirements – as claimed on the bottles. In addition to its value as a quality check and a verification of compliance, volume data also has an even greater purpose in the management of the forming process.

Volume issues are directly related to the bottle type, forming operation, production speed and weight. A sudden change in volume readings is an indication of a problem in the forming process. "If the tests indicate that bottle volume is not within the specified limits, then the

production between measurements must be quarantined until the issue is resolved" Mr Sgarbi commented. "At that point, the work intensifies. It is my job to co-ordinate with the responsible staff to find out what the problem is. If it is the gob weight, a mould problem, timing etc, the issue needs to be addressed, the process put back on track and production brought back into specification. Accurate and timely volume data is critical and figures prominently in this process. The SPT2 will be an important tool in this effort."

At the Villa Poma plant, all containers are tested for volume. Frequency of the volume tests varies depending on the article. Some are only tested to maintain the production process, to verify that moulds are in order and the production process is on track. Others must be tested due to regulations in addition to testing for process feedback. This is typically a minimum of once per shift. There are also differences between beer and wine with regard to volume testing. Limits may change, based on the capacity of the container. A 750ml wine bottle and a 750ml beer bottle have completely different limitations. There is a smaller tolerance on beer bottles and therefore, more diligent monitoring of volume is required.

Non-round bottles are very susceptible to variation in volume and must be tested to a much higher degree. Unlike round containers where the volume is reasonably consistent, non-round volume can vary dramatically as a result of subtle changes in the process. The SPT2's ability to process round and non-round containers will serve the entire production range produced at this plant.

BETTER METHOD TO MEASURE VOLUME

The SPT2 offers the potential for significant improvement of the volume measurement programme. It uses a positive displacement approach that is efficient, very accurate and requires little operator oversight.

The positive displacement method offers a number of advantages. Most significant is the accuracy. This filling technique, in tandem with a high precision fill height sensor, makes it possible to deliver defined volume and fill



Agr's SPT2 automated volume measurement and pressure testing system, introduced at Verallia Italy's Villa Poma plant.

measurements at any point within the process, to an accuracy of $\pm 0.5\text{ml}$. Other advantages of the Agr system include little or no effect on measurement precision due to water density, container shape or rate of fill, regardless of the size and volume of the container. Plus, the volume measurement system on the SPT2 does not employ delicate scales nor is it affected by flow rate, vibrations, excess water droplets or issues that commonly plague other methods.

At the Villa Poma plant, accuracy and repeatability are of paramount importance. Throughput is also a major factor, considering the number of volume tests that must be performed in any given day. The SPT2 can perform volume tests on a mould round in half the time it takes to perform the same measurements in the laboratory. With this speed, more tests can be performed in less time. Having more controls and checks on volume is a big plus. "The SPT2 provides us with much more control of the process" Mr Delfino confirms. "Increased throughput is a bonus - if tests are more often, problems will be found more quickly. This means less storage of product for quarantine and less downtime in the event a problem is discovered."

ON-LINE OR STANDALONE AUTOMATED LABORATORY

The SPT2 offers a lot of potential for streamlining testing operations. Depending on the plant and type of production, the SPT2 can be configured two ways, either as a fully automated testing system installed on a sampling line, or as part of an off-line testing and measurement station.

The sampling line configuration offers the best efficiencies and takes advantage of the SPT2's high

throughput and hands-free operation. In this arrangement, the SPT2 can be connected to a sampling line and receives bottles from an upstream selection system. Volume measurements can be performed simultaneously with pressure tests, making it possible for continuous pressure as well as volume data to be gathered on a regular basis from the production line. When configured as an off-line testing station, the SPT2 in conjunction with the Agr Dimensional Sampling Gauge operates as a fully automated laboratory, the OmniLab. This consolidates a number of tests into one location and provides for a comprehensive test report.

COMPREHENSIVE DATA

In addition to automated pressure testing and regular volume measurement to manage the process at the Villa Poma plant, sample sets are also tested and measured in the laboratory from every bottle line to document the quality of ongoing production. The SPT2 is connected to an Agr Dimensional Sampling Gauge in the OmniLab configuration as a standalone testing and measurement station. With the OmniLab configuration, the plant is able to perform comprehensive dimensional and thickness measurements, as well as volume and pressure testing on a set of bottles. Since dimensional measurements typically take longer than the volume and pressure measurements, there is no net loss in time, as tests are performed within the window of dimensional measurements.

"This is a real advantage. Since we need to perform dimensional measurements, the ability to do volume without any additional time or labour is a real gain" Daniele Delfino confirmed. "Furthermore, while qualified people are required to perform volume tests in the laboratory, the SPT2 does this with the push of a button. Most important, however, is the ability to have all-in-one testing. Now, with the Dimensional Gauge and SPT2 working together, volume and pressure and dimensions - this is all-in-one testing. Bottles can be trolleyed to a single location and all primary tests performed in one operation, with all measurements documented on a single, concise report."

QUEST FOR QUALITY

The Villa Poma plant has built its reputation on quality. According to Mr Delfino, it is his job to identify the right equipment and technologies to keep their operations at this and the other Verallia Italy plants on the leading edge of quality. The decision to work with Agr proved to support this effort quite well.

Regular pressure and volume tests on every line play an essential role in managing the process and maintaining the quality commitment of the Villa Poma plant. The SPT2 offers the potential to help the personnel at Villa Poma take the commitment to quality to another level. All-in-all, the goals that were set out when the programme was initiated were accomplished. The system was given a complete workout, giving Agr the feedback that was needed to fine tune the system. Furthermore, the team at the Villa Poma plant was able to test this technology and validate its performance.

"In short, it was a real success, where the machine performed very well" Daniele Delfino concluded. "As a result, we saw a 25% improvement in pressure testing throughput and a 100% improvement in volume measurement. The system met our expectations. In fact, the SPT2 has become an integral part of the quality programme at Villa Poma and the original trial unit has been replaced by a new unit purchased by our organisation. Of course, the new unit incorporated many of the features that we recommended during the trial. The SPT2 is already fully integrated into this programme. Bottles from every line and from every shift are run through the SPT2 and Dimensional Sampling Gauge. We expect that the SPT2 will figure well in our future quality and process management programme at this and the other Verallia plants in Italy." ■

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