Manufacturer Reduces Cost and Product Loss with Continuous Leak Detection System for Aerosol Cans

RESULTS
• 100 percent automated inline testing with no need for visual inspection
• Eliminated need for water bath, resulting in saving:
  - Over $200,000 in capital costs
  - Over $35,000/year in energy, consumables, and maintenance costs
  - Valuable space on the plant floor

APPLICATION
Monitoring and identifying leaks in aerosol cans of R134A refrigerant propellant without the use of a water bath.

CUSTOMER
TSI Supercool™
Specialty Lubricant Manufacturer
Lake Worth, Fla., U.S.A.

CHALLENGE
TSI Supercool is a specialty lubricant manufacturer that designs, formulates, tests, blends, packages, and distributes synthetic and semi-synthetic solutions for a variety of industrial and automotive markets worldwide. One of its products for the automotive industry is R134A, a refrigerant propellant charge-packaged in an aerosol can that replaces lost refrigerant in vehicle A/C systems.

The U.S. Department of Transportation (DoT) requires that all aerosol cans be tested for leaks—whether during transport, at the point of sale, or with the consumer—as leakage of a flammable propellant poses a very dangerous hazard. And, leakage of cans increases the risk of product recalls and brand reputation damage.

TSI Supercool was contracted with an aerosol filling company to package the R134A, but the process the supplier used resulted in a 2.5 to 5 percent product loss per load. The company decided to move its filling process in-house in order to eliminate this loss, but doing so required that the company design and install the appropriate equipment.

To become a filler, TSI Supercool would traditionally have been required to use a water bath for leak detection and pressure testing, and the water bath, a large vat of heated water, has several very costly disadvantages:
• Expensive to buy and install: upwards of $200,000
• Requires a large footprint in a space-constrained plant
• Requires a large energy investment to keep the water heated to 50 °C/122 °F continuously
• Maintenance requirements are extremely high as the water bath is prone to rusting so expensive chemicals must be added routinely to keep it clean

“We’re investing in the best performance for our process by installing Emerson’s Cascade aerosol micro leak detection system to help us ensure product safety and quality, meet regulatory requirements, and avoid very high capital and maintenance costs. And, the innovative technology by Emerson helped us meet our company’s sustainability goals by reducing our footprint.”

Mark Eggen
CEO/Founder

PACKAGING AEROSOL MICRO LEAK DETECTION
In evaluating these costs, TSI Supercool considered if there could be a better way that would offer an alternative to the water bath, with improved sustainability efforts.

**SOLUTION**

TSI Supercool worked to determine if a reliable leak detection system, along with other testing processes, could replace the water bath to still meet DoT regulations at a lower cost. TSI Supercool contacted the DoT to determine what methods and technologies would meet the following regulatory requirements:

(D) Leakage test. (1) Pressure and leak testing before filling. Each empty container must be subjected to a pressure equal to or in excess of the maximum expected in the filled containers at 55 °C (131 °F) or 50 °C (122 °F) if the liquid phase does not exceed 95% of the capacity of the container at 50 °C (122 °F). This must be at least two-thirds of the design pressure of the container. If any container shows evidence of leakage at a rate equal to or greater than 3.3 × 10⁻² mbar L/s at the test pressure, distortion or other defect, it must be rejected; and

(2) Testing after filling. The person filling each container must ensure that the crimping equipment is set appropriately and the specified propellant is used before filling a container. Once filled, each container must be weighed and leak tested. The leak detection equipment must be sufficiently sensitive to detect at least a leak rate of 2.0 × 10⁻³ mbar L/s at 20 °C (68 °F). Any filled container which shows evidence of leakage, deformation, or overfilling must be rejected.

For pressure testing, TSI Supercool confirmed that the contracted can manufacturer pressure tests every can unfilled in compliance with the regulation. However, a leak detection system on the filled cans was the key element in making the alternative system work. TSI Supercool selected the Cascade™ CT2211 Aerosol Micro Leak Detection System by Emerson™, a laser spectroscopy system based on Quantum Cascade Laser (QCL) technology. The system can instantly detect, identify, and reject a faulty can at the line speed, which, in TSI Supercool’s case, is 300 cans per minute. When a can passes through the sample arch, the system draws in the air around the can and directs it through the measurement cell. In the measurement cell, the laser beam passes through the sample gas and is ultimately reflected to the detector. Variations in light intensity are measured and the leak rate is calculated using IR spectroscopy.

The micro leak detection systems are designed to test the entire can regardless of shape or size, ensuring all the failure points—valves, crimps, triple points, and seams—are tested. When a leaking can is detected, a signal is activated so the individual can is automatically rejected from the line for containment. Systems can also be configured with an alarm when multiple cans are leaking for advanced analysis.

The Cascade CT2211 aerosol micro leak detection solution allows TSI Supercool to use an alternative to the water bath to meet DoT regulations and ensure the safety and quality of its product.
Resources

Emerson Cascade Technologies CT2211
emerson.com/cascade_technologies_CT2211

1 DoT Regulations
phmsa.dot.gov/regulations