

Hermetic Seal Leak Detection



Innovators at NASA's Marshall Space Flight Center (MSFC) have developed a unique apparatus ideal for use in nondestructive testing (NDT) of hermetic seals of containers or instrumentation. The device is capable of detecting both large and small leaks and can be calibrated to characterize the relative leak rate. Its simple design does not require specialized gases for pressurization and detection and eliminates the need for expensive instrumentation such as a mass spectrometer to analyze leaks and achieve high sensitivity. Low in cost and simple to manufacture, the patent-pending technology is ideal for use in many industries, from aerospace applications to food packaging and commercial goods.

Benefits

- **Low cost:** Features a design composed of inexpensive parts and requires no specialized equipment or pressurized gas
- **Non-destructive:** Does not require the removal of soft goods or part disassembly for testing
- **Small:** Offers a streamlined method of leak detection with minimal, lightweight components
- **Sensitive:** Detects large, medium, and very small leaks, offering robust operation at 10⁻⁶ cubic centimeters per second (cc/sec) sensitivity
- **Easily automated:** Adapts easily for rapid in-line or batch testing
- **Streamlined:** Operates without the need for a vacuum pump, gas spectrometer, or chemical bath



The Technology

The technology offers a streamlined, cost-effective, sensitive approach to detecting leaks in hermetic seals.

How it works

An hermetically sealed item is placed in the leak detection system chamber and the device is activated while the resulting pressure is monitored by a data collection system. Any large leak present is immediately indicated by the data system pressure response. For very small leaks, the system monitors the leak rate over time and can vary set points to greatly speed the leak rate determination. The system is sensitive enough to detect a container leak of 10⁻⁶ cc/min within 15 minutes. The leak detection system chamber can be of any size or shape to accommodate any type of sealed object.

Why it is better

The technology offers a highly sensitive method of detecting leaks in hermetic seals (i.e., airtight seals) that is more streamlined and lower in cost than other available methods with similar sensitivity. The most accurate traditional method involves pressurizing the hermetic seal device with helium, placing the device in a vacuum bell jar, and using a mass spectrometer to determine if any of the helium leaks from inside the device. This process is expensive, time consuming, and complicated. By contrast, Marshall's innovation uses very few parts and does not require any specialized equipment or pressurized gasses, minimizing the required maintenance and overall cost of operation.

While mass spectrometry offers highly sensitive detection, the technology is relatively expensive. Less expensive methods do not offer the level of sensitivity needed for many applications such as automotive components, pharmaceuticals, or consumer goods packaging. The subject technology provides a solution to this sensitivity/price gap by offering high sensitivity at a significantly lower cost, as demonstrated by testing on the Space Shuttle solid rocket booster pressure sensors.

Patents

Marshall Space Flight Center has applied for patent protection for this technology.

Licensing & Partnering Opportunities

This technology is part of NASA's technology transfer program, which seeks to transfer technology into and out of NASA to benefit the space program and U.S. industry. NASA invites companies to inquire about licensing the Hermetic Seal Leak Detection Technology (MFS-32737-1) for further development and commercial applications.

Potential Applications

- Aerospace (the device was developed to test the pressure sensor of the Space Shuttle solid rocket booster), particularly for sensors and equipment used in harsh environments that require hermetic seals
- Automotive components
- Electronic equipment, such as semiconductors, thermostats, switches, and optical devices
- Consumer goods packaging (food, pharmaceuticals, chemicals, etc.)
- Military (specialized equipment, harsh environments, highly explosive areas)

For More Information

If you would like more information about this technology or about NASA's technology transfer program, please contact:

Sammy A. Nabors
Manager, Technology Commercialization
and Licensing
256-544-5226
sammy.nabors@nasa.gov

Karen Hiser
Senior Consultant
Fuentek, LLC
919-249-0327
nasa.msfc@fuentek.com

www.nasasolutions.com

National Aeronautics and Space Administration
George C. Marshall Space Flight Center
Huntsville, AL 35812
www.nasa.gov/centers/marshall

www.nasa.gov