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Licensable Technologies

Valveless Laser Processing (VLP) system

Applications:

- Valveless purge, leak, and fill production operations for hermetically sealed containers
- Analysis of volatility behavior in package materials to investigate/identify corrosion and other product failure modes and trends
- Periodic surveillance of hermetically sealed containers

Benefits:

- Portable design
- Improved mission lifetime of sealed devices
- Create varying hole sizes, features, and part marking (serialization) using a single laser
- Mix, penetrate, and reseal using a single laser
- May be used in varying temperature-controlled environments and where traditional access/seal methods have proven unsuccessful
- One VLP station can be used for varying sizes and configurations of containers
- Purge, leak, and fill hermetically sealed containers within a sealed environment
- Containers may be re-drilled and sealed repeatedly

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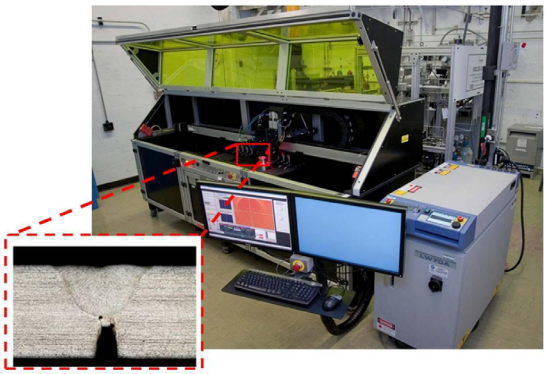
Summary:

Numerous micro- and nanoelectronic, optoelectronic, and medical devices require the protection of a hermetically sealed enclosure; however, volatiles within the enclosure itself can create a particularly harsh internal environment for sealed devices. Harsh external environments—particularly in marine or aerospace applications—can induce or intensify these harsh internal device conditions. Water vapor, oxygen, ammonia, hydrogen, and organic compounds all contribute to condensates and deposits that can degrade data quality and mission lifetime in electronic systems.



A Laser-Enabled Leak Detecting and Gas Sampling VLP six-part workstation with electronics enclosure, gantry laser head, and console user interface; smaller versions are easily achieved. INSET: A hole drilled and resealed on a vessel wall.

To ensure reliable performance, mission-critical electronics enclosures must be accessed and resealed to take samples of the gases inside or apply and measure filler/tracer gases, complicating the quality assurance (QA) process. Less invasive testing techniques, such as "bombing" leak detection, cannot accurately detect leaks with flow rates greater than 10^4 cubic centimeters of gas per second. Moreover, the QA process must be carried out safely if the contents are suspected to be toxic, flammable, combustible, or otherwise hazardous to humans.

Los Alamos National Laboratory (LANL) researchers have developed a laser-enabled Valveless Laser Processing (VLP) system that allows one to safely and remotely access, interrogate, perform leak detection, and reseal an otherwise impenetrable container—all with one convenient and portable instrument. The VLP device works on a variety of materials of varying thicknesses, and can even be applied to containers that were not originally designed for ease of interrogation. There is no need to disconnect or reconnect a valve fitting and no tools are required aside from the VLP device itself, further reducing the risk of device contamination. An additional feature of the system is the ability to engrave information on a surface using the same laser; this capability may be used to memorialize the test results or any other information deemed relevant to the user.

Development Stage:

A production-stage VLP system for use with 304L stainless steel has been built, tested, and applied in an operational environment at LANL, with achieved penetration depths of up to .135 inches and hole sizes of roughly .015 inches. The VLP system in its present embodiment is suitable for use on a variety of container materials besides 304L, depending on the desired applications.

Intellectual Property Status:

LANL is pursuing patent protection on the VLP technology. The software that implements the VLP method is copyright protected.

Licensing Status:

The VLP system is available for exclusive or non-exclusive licensing. Development of the VLP device for use with specific materials may be achieved by means of a Cooperative Research and Development Agreement (CRADA).

www.lanl.gov/partnerships/license/technologies/

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