LACO TECHNOLOGIES

APPLICATION NOTE

**NOTE #01-04**

# Helium Leak Testing of Helium Permeable Parts

## SCOPE

This application note covers production helium leak testing of products, typically constructed of plastic and/or plastic films that have relatively high helium permeation rates. Many of these products also have flexible walls or fluid boundaries. Refer to Application Note 01-03 Helium Leak Testing Flexible Wall Parts for additional information.

This application note deals with hard vacuum helium leak testing method, though similar principles may be applied when using the helium accumulation method and LACO's HATS™ test method. Refer to Application Note 01-09 Helium Leak Testing of Heavily Contaminated Products for more information on HATS™.

## BACKGROUND

Helium is a common tracer gas used in production leak testing applications. It an ideal test tracer gas for applications requiring test sensitivity below 1 x $10^{-3}$ atmcc/sec. However, helium has a relatively high permeation rate through many plastics and elastomers. This can make the use of helium difficult or even impractical. Helium permeating through the wall of the test part can interfere with the systems ability to detect helium leaking through a potential leak in the part (i.e. helium permeation can be mistaken for a physical leak).

In some cases an alternate test method can be employed using an alternate tracer gas or using an air testing method. However, when helium is the best tracer gas given the sensitivity required, the proper test design can successfully yield a leak test process capable of detecting leaks accurately.

## DESCRIPTION

An understanding of the time constant for helium permeation as well as the steady state total permeation rate of the test part will determine the ultimate leak test sensitivity that can be achieved. With this information, a test can be designed that will discriminate between permeation and a physical leak resulting in a production capable leak test system.

Two basic approaches can be used. First, if the permeation rate is consistent from part to part, is no greater than the reject limit, and the time constant is relatively short (within the constraints of production leak testing), the helium background due to permeation may be subtracted from the helium signal. If this cannot be achieved, then other techniques the look at the rate of permeation of helium can be employed to identify and distinguish between a physical leak and permeation.

For example, a polymer film storage container may have a total steady state permeation rate of 1 x $10^{-4}$ atmcc/sec helium at a specified fill pressure. Using LACO's proprietary test methods, a leak rate reject limit as low as 1 x $10^{-5}$ atmcc/sec can be achieved.

## SUMMARY

When properly designed, a helium leak test system can discriminate between helium permeation and a physical helium leak. This will allow the user to use helium as a tracer gas to perform high sensitivity helium leak tests on helium permeable parts

## PRODUCTS

LACO Technologies engineers custom equipment to implement all of the above leak test methods, including:

- Turn-key, automated hard vacuum leak testing systems including the fabrication of leak test vacuum chambers.
- Turn-key, automated helium accumulation systems and HATS™ test systems.
- Turn-key, automated SF6 accumulation systems for leak testing of parts with very high helium permeation where the helium tracer gas is not a practical solution.
- Turn-key, automated, non-helium tracer gas, hard vacuum mass spec systems for leak testing of parts with very high helium permeation where the helium tracer gas is not a practical solution

## REFERENCES

- Application Note 01-03 Helium Leak Testing Flexible Wall Parts
- Application Note 01-09 Helium Leak Testing of Heavily Contaminated Products
- Technical Note A: Production Leak Testing: What, Why, and How