Application Note:
Quantified Leak Rate Using Mass Flow

The Problem

"How do I convert bubbles to flow units?"

Production and test engineers often know the leak rate of product in bubbles per minute, but do not have an accurate way to convert bubbles to more universal flow numbers such as cubic centimeters per minute.

Normal leak testers use just a pressure sensor and cannot easily quantify a leak. Users must determine the volume of the products they want to test and then program those numbers into the tester (if possible) to make the tester perform the pressure-to-flow calculations. Not an easy task.

The Solution

The flow model testers incorporate two precision sensors: a pressure transducer and a mass flow transducer.

To quantify a leak, users simply connect a leaking product to the tester, set it to FLOW mode, and the tester measures the leak in flow units. There is no need to enter the product volume. Results are given directly in flow units that are user-selectable.

How It Works

Leak quantification works like this:

- The product is attached to the test port (Figure 1).
- The tester opens valves [V1] and [V3] and closes valve [V2]. Air flows through the flow sensor [FS], into the product, and out into atmosphere.
- The mass flow sensor [FS] measures the air flowing out of the product and reads directly in flow units, such as standardized cubic centimeters per minute (sccm).

The flow sensor is switched out of the circuit by closing valves [V1] and [V3], and opening [V2].

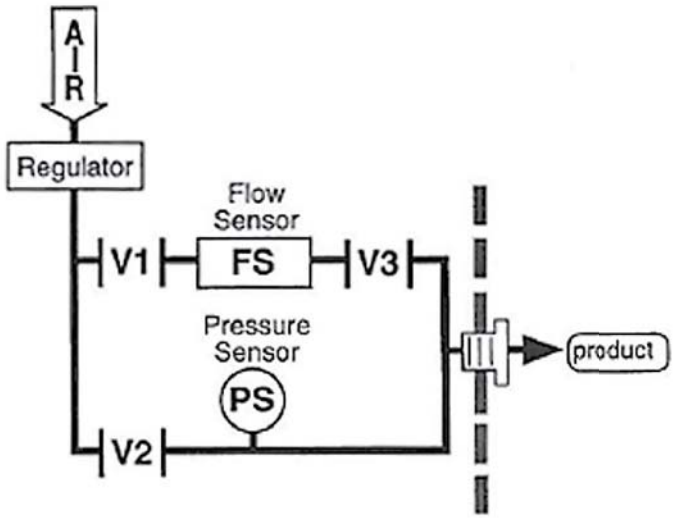

Figure 1
Simplified Pneumatic Diagram

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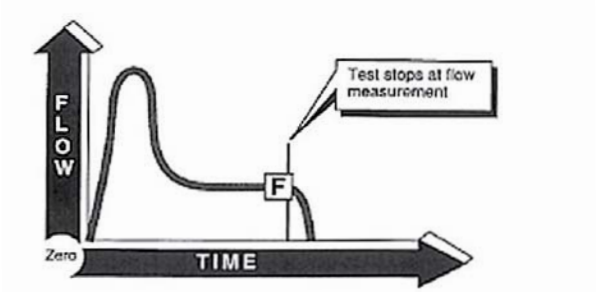

Figure 2
Flow vs. Time in Flow Mode

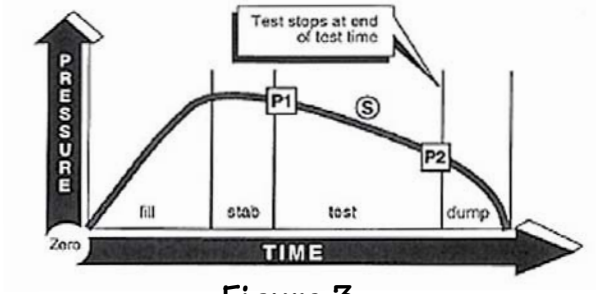

Figure 3
Pressure vs. Time in Pressure Decay Mode

Example: Using a Sprint iQ

Flow Mode

In flow mode, Sprint iQ fills the product and takes on flow measurement [F] at the programmed test time. After Sprint iQ takes the flow measurement, the test ends. (Figure 2)

Pressure Decay Mode

In pressure decay mode, Sprint iQ cycles through fill, stabilization, test and dump phases. It is during the test phase the Sprint takes two pressure measurements: the first reading at [PT1] and the second reading at [PT2]. (Figure 3)

At the end of the test phase, Sprint iQ displays the pressure drop (P1 minus P2) in the pressure units that were selected by the user.

In pressure decay mode, the slope of the pressure curve (S) is related to the flow measurement made at (F) in flow mode.

Applications

The Sprint iQ model PF, with both pressure and mass flow sensors, is an important tool when changing over from bubble testing to electronic pressure decay testing. Often used in Research and Development, the IQ-PF is used to develop leak testing specification for a variety of products.

A broad range of products can be measured in flow units and then switched to pressure decay testing. The tester can also be used to detect gross leaks using mass flow with the advantage of reduced test time.

We invite you to call Uson to see how the Sprint iQ, or any of our other testers, would fit into your product testing applications. For more information about the mechanics of mass flow measurement, please see the separate Application Note titled “Mass Flow Theory.”

Features

- Measure directly in flow units
- No need to determine product volume
- Develop leak specifications using flow
- Perform production pressure decay tests
- Perform production leak tests using mass flow
- Link programs to perform multiple tests
- Small footprint (8.5 by 15 inches)
- Bench Top or rack mount enclosure
- Pressure resolution as high as 1/1000 psi
- Interface for statistical process control

for good measure

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