TESTING WITH TRACER GASES

In recent years, testing with tracer gases has proven to be the most effective method for detecting and measuring leaks.

Helium is the most commonly used tracer gas for leak testing, because it is the lightest of the inert gases and mass spectrometers are extremely sensitive to trace amounts. In helium mass spectrometry, the product is placed inside a vacuum chamber and pressurized with helium. The chamber is then evacuated. If there's a leak, helium will pass from the product into the surrounding vacuum. The mass spectrometer then samples the vacuum chamber, detecting even small amounts of helium. The test can also be run by filling the test chamber with helium and evacuating the product.

This method, too, has drawbacks. A mass spectrometer is a delicate piece of equipment and expensive to maintain. The machine's pumps need to be regularly checked and serviced. In addition, the helium itself can cause problems. Helium is expensive and highly viscous. If it spills, it can be difficult to clear from the testing equipment. It also tends to cling to surfaces.

Now, a leak testing technology has been introduced using an even lighter gas-hydrogen. The lightest and least viscous of all gases, hydrogen spreads quickly throughout the test object. It readily penetrates the smallest leak, and it vents away much easier than other tracer gases. Hydrogen is environmentally friendly and much less expensive than helium.

In the right concentration, hydrogen can be safely used for leak testing. A suitable mixture for leak testing is 5 percent hydrogen and 95 percent nitrogen. This mixture is available from most gas suppliers. According to the ISO 10156 standard, any hydrogen-nitrogen mixture containing less than 5.7 percent hydrogen is nonflammable. In fact, standard hydrogen-nitrogen mixtures are commonly used as shielding gases for welding.

Hydrogen detectors cost much less than most mass spectrometers. Equipped with microelectronic sensors, hydrogen detectors have a high sensitivity and selectivity to hydrogen. They are robust enough for industrial use and can detect leaks as small as 5 x 10-7 cubic centimeters per second, or approximately 1 gram per year.

Hydrogen leak detectors are easy to operate. The test gas is injected into the test object, and a hand probe connected to the hydrogen detector is used to search for leaks. The probe does not use suction, so it can be used without worrying about dust. In addition, the probe can be equipped with a protective cover that allows it to be used on wet objects.

The detector indicates leaks with an audio signal. The signal increases in pitch the closer the probe gets to the leak location. There is no need to create a vacuum, which saves testing time and maintenance costs.