Sensistor Technologies

Application Note

Leak testing

Water boilers

Application

Leak location with hydrogen trace gas on assembled water boilers for pin-pointing leaks in connections, seals etc.

Benefits

- Independent of temperature variations
- Fast pin-pointing of the leak location
- All leaks detected, even in hard to access areas
- Clean and dry test method

Some customers

Bosch Thermotechnik
NIBE
Protherm
Vaillant

Specification

Water boiler assemblies have to be water tight at operational pressure. Below are the typical leak specifications used in the industry expressed in different units.

Leak Specifications (typical)

mbarl/sec	0,01-0,1
cc/sec	0,01-0,1
cm^3/min	0,6-6
Pa m^3/sec	0,000001-0,00001
mm^3/sec	10-100

Current methods and reasons for change

Pressure decay, air flow test and helium mass spectrometry are some of the methods currently used for leak testing. The problems encountered with these methods are:

1) Pressure decay tests are volume dependant and therefore not suitable for testing large vessels (boilers can be several hundred liters in volume).

2) Pressure decay measurements are temperature sensitive and can therefore result in erroneous measurements if the part is hot.

Leak Detection with Hydrogen Trace Gas

3) Helium mass spectrometers are sensitive to external interferences and may require frequent service and subsequent high maintenance costs.

4) If used in high concentrations, helium has the disadvantage of contaminating the test area, making further tests difficult to perform until the background clears.

5) Soap spray works only on medium size leaks. Small leaks give no bubbles and large leaks blow away the soap.

The Sensistor solution

The Hydrogen Method uses diluted hydrogen to pressurize water boilers through one or more of the boilers connectors. The leak test using the Sensistor equipment is sequenced as follows:

A brief evacuation phase will draw air from the water boilers in order to ensure an even distribution of trace gas. A ready made gas mixture consisting of 5% Hydrogen and 95% Nitrogen (Formiergas 95/5) is then used to pressurise the system. This test procedure can be performed automatically by a trace gas filling system. A hand probe connected to the Hydrogen Leak Detector H2000 PLUS / ILS500 Leak Detection System is then used to inspect all suspect leaks (joints, sealing gaskets etc.). Audio and visual alarms are activated indicating the precise location of the leak. All leaking sites can be repaired and eventually tested again. Leak size measurements can be taken at any time.

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Leak Testing with the Hydrogen Method

Facts about Hydrogen as a trace gas

The gas used for testing is a readily available standard mix of 5% hydrogen and 95% nitrogen which is inexpensive, non flammable (see ISO 10156), non toxic and with no environmental issues is the ideal trace gas for leak testing. With the hydrogen's unique dispersion characteristics it will quickly and evenly fill the boiler and also quickly clear the test area allowing boilers to be continuously tested with no wasted time. The diluted hydrogen mixture is the lowest cost trace gas available for high sensitivity leak testing.

Note: some gas suppliers have their own trade name for this gas mixture.

Hydrogen Leak Detector H2000 PLUS

Recommended equipment

Hydrogen Leak Detector H2000 PLUS

The H2000 PLUS is virtually maintenance free (no moving parts) making it the ideal detctor for the production floor. A microelectronic sensor that responds only to the Hydrogen gas ensures that true readings for the leak are obtained each and every time.

Leak Detection System ILS500

Leak Detection System ILS500 (optional)

The Leak Detection System ILS500 is a complete equipment for leak detection based on the Hydrogen Gas Method. It includes three main modules: the Controller Unit, the Detector Unit and the Operator Unit which perform tooling control, trace gas handling, test sequencing and leak testing. The pre-evacuation phase (optional) and the pressurization phase with the trace gas to the water boiler are fully controlled by the touch of a button. Complete confidence that the trace gas has reached all suspect leak areas is assured. The ILS500 also controls the exhaust phase of the gas after the test and the disconnection of the gas connectors used to pressurize the boilers.

Leak Detection System ILS500-V (optional)

The Leak Detection System can also be equipped with an extra, powerful vacuum pump, to be able to evacuate test objects of large volumes in a few seconds.

Reference Leak

Reference Leaks (optional)

Calibrating the H2000 PLUS Hydrogen Leak Detector with a reference leak enables you to set the detector to give off an alarm everytime the located leak is above the leak limit. Reference leaks traceable to NIST, BIPM, NMIJ etc are available for calibrating the H2000 PLUS in flow units and leak sizes of your choice.

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