

Gappscan

PLUG AND PLAY MICRO CRACK DETECTION SYSTEM

Designed to examine:

- Duo-safety plate heat exchangers, designed to prevent cross contamination.
- Plate heat exchangers containing ammonia and/or hazardous liquids.
- Pressure vessels, coils and jacketed tanks for heating/cooling products, which may leak service liquids into the product and cause contamination.

History

Unlike the common PHE that normally has a finished product on one side of the plates and services on the other side, where from time to time cracks may develop, running the risk of unpasteurised product/coolants, contaminating pasteurised products for example. Duo safety plate heat exchangers were designed to enable the end user to see any cracks that form in the plates by having a cavity between two plates that allows leakages of liquid to become visible as they leak externally. One hazard has been identified as the formation of micro cracks that may leak very small amounts of liquid between the plates, which are not visible. Bacteria, then begins to proliferate and eventually leach back into the finished product.

Normally to locate cracks in jacketed tanks, where the coolant jacket may leak into the finished product and cause cross contamination, the inspector needs to gain entry to the vessel and then carry out crack detection of the vessel wall to try to locate cracks that may leak service liquids into product.

Crack testing heat exchangers that have ammonia or hazardous liquids on one side and services on the adjacent side normally require the liquids to be removed for examination, this could be a very difficult, hazardous and time-consuming task.

Advantages of Gappscan over current technologies

- **Gappscan** on Duo safety heat exchangers – the exchanger is filled with mains water on one side of the section only and lightly pressurised to 3 bar from mains water supply, then ultrasound is emitted, detecting leakage in micro-litres over a 5 minute test period, showing the defect size from outside without dismantling.
- **Gappscan** on jacketed tanks, pressure vessels and heater coils – the coolant jacket or heater oil is filled with mains water, lightly pressurised to 3 bar from mains water supply and then ultrasound is emitted, detecting leakage in micro-litres, showing the defect size from outside without dismantling.
- **Gappscan** on ammonia and other hazardous exchangers – the exchanger is filled with mains water or pressurised ammonia, lightly pressurised to 3 bar and then ultrasound is emitted, detecting leakage in micro-litres, over a 5 minute test period, showing the defect size from outside without dismantling.



EIT International Gappscan system key benefits

GPS records assist traceability is it used?	yes
Can sensitivity be reduced by size of exchanger?	no
Does this test affect the environment?	no
Is mains power necessary?	no
Can this test display defect size?	yes
Can this test display liquid contamination volume?	yes
Would it be easy to test from both sides of exchanger?	yes
Would it be possible to test without draining ammonia?	yes

Validation of Gappscan system

A number of validation tests were carried out using minute pinholes of just a few microns at one side of an industry standard heat exchanger (inlet) and the Gappscan Sensor Transmitter was attached to the other side of the heat exchanger (outlet), creating the worst possible scenario for defect detection and sizing of the pinholes accurately.

Defect sizes were accurately measured using a scanning electron microscope, before and after testing. At 3 bar pressure differential (the recommended minimum in accordance with the Gappscan procedure manual), the 25 micron hole for example showed very accurate measurements obtained by the Gappscan sensor transmitter, which were then uploaded to a computer using software produced for this unit, and later viewed in graph format.

There were a large number of tests carried out to prove to ability of Gappscan to not only detect defects in a heat exchanger, but also to accurately measure the defect size, therefore allowing the technician to monitor defect propagation. This is not possible with any other test equipment. It is widely known that some defects are not detectable with dyes so monitor and watch them grow with the Gappscan system. The Gappscan system is a portable system designed to assess the integrity of food processing plant and consists of two items of equipment. The flow rate-measuring device measures the flow of fluid through the leak from the high-pressure to the low-pressure side. Water from the low-pressure side is fed via a tube into the unit. When the unit is primed with sufficient fluid, the test can proceed. The sensitivity of the measuring system is such that the magnitude of this flow rate can be only a few micro-litres per second and is controlled by ultrasonic sensors internally.

The hand held test process controller and data acquisition unit controls each test. This component also collects the data and calculates the flow rate, from which an estimation of the hole size is also made. The data acquisition unit can store data from up to 80 separate tests before requiring download.

Both items of electronic equipment are linked by wireless communication for data transfer and a GPS unit is also included to provide positional information for each individual test. At the end of a test program the results are uploaded to a computer via a USB link for final processing.

