

## VTech MasSpec Case Study:

### Automatic Helium Leak Detection at Kaori Heat Treatment

Kaori Heat treatment Co. Ltd. of Ningbo, China, is a producer of brazed plate heat exchangers, which are composed of multiple, thin, slightly-separated plates that have very large surface areas and allow the transfer of heat between two liquids.



Fundamental to the correct operation of brazed plate heat exchangers is that they must be leak proof, thus not allowing seepage of liquid to the outside (external leakage) as well as preventing internal mixing of the two liquids (internal circuit leakage).

In the past, leak testing of brazed plate heat exchangers involved pressurization with dry air and dipping the unit underwater to inspect for the presence of air bubbles. Using this method, external leaks could be determined very easily. However, the minimum detectable leak was well above the 1g of R134a/year required by Kaori. In fact, this sensitivity would require a testing time of 7 hours and it was almost impossible to detect internal circuit leaks. Furthermore, underwater bubble testing is highly subjective and operators had to be well trained to be able to detect smaller leaks.

When Kaori submitted to us the problem of testing their brazed plate heat exchangers, we identified the internal circuit testing as the key point of the test. By implementing existing methods for this test we could not reach the sensitivity required by Kaori, unless we increased the testing time. Also, due to the high productivity of their top of the line production equipment, the testing time for one unit had to be of maximum 30 seconds.



We conducted the first trials with our VTech MasSpec. This is an automatic helium leak detector, based on outside-in technology. The unit under test is evacuated and exposed to a helium mass spectrometer in a containment chamber filled with a small percentage of helium (between 10 and 20%). In case of leaks or microporosities, helium is pulled into the unit and is detected by the mass spectrometer.

We discovered that after the external leak detection test, by exposing one of the circuits to Helium it was possible to detect internal circuit leaks with the same sensitivity. VTech's technical department developed a simple device to perform this test automatically and we simulated the functionality of this device in our testing lab. The results were positive, as we could easily detect leaks as small as

**VTech MasSpec**

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1 g of R134a/year, and the cycle time of the machine for external and internal testing was around 60 seconds. In order to match the testing time requested by Kaori, we proposed a 2 station machine, capable of testing 2 units at a time and of discriminating between the leaking part from the good one.

However, before Kaori could implement the machine in their production line a second issue had to be solved. The connectors used by Kaori for the underwater bubble testing were not suitable for helium leak detection, as their leak rate was higher than the sensitivity of the VTech MasSpec. Also, with a 2 station machine, it would mean that for each cycle the operator would have to connect and disconnect a total of 8 ports. For this reason, we proposed a “docking” connector; the operator would simply push the heat exchanger onto the connector and with a simple motion, connect it to the machine. This made the process of connecting the units to the machine extremely fast and easy.



#### Docking Connectors



Kaori is currently using the VTech MasSpec for the integral leak detection of their brazed plate heat exchangers. The quality of the leak testing is certified by a calibrated leak and the testing results, thanks to the Data-Logging software accessory, are recorded to a database for data mining and/or print out of testing certificates.

The VTech MasSpec is included in the June 2007 issue of *Appliance Magazine* in their feature on innovations in testing equipment.

For more information, contact us:

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*The VTech (Alpharetta, Georgia, U.S.) MasSpec is an automatic helium leak detector for testing refrigeration components and complete refrigeration units, even in the presence of polyurethane foam. It detects helium leaks as small as 0.1 oz of R-134a per year. It requires just 10% helium concentration at atmospheric pressure. VTech is part of Galileo Vacuum Systems*