Klima-Therm installs world's first HFO-based Turbocor chillers

Klima-Therm has installed the world's first Turbomiser chillers equipped with Turbocor compressor running on low global warming potential HFO refrigerant. The Wimbledon-based company has installed two of the new ultra green HFO Turbomisers in a department store in Milton Keynes, as part of the end user's ongoing trials of promising environmentally friendlier technology. It has also received a second order for an installation of HFO Turbomiser machines for a major retail development in the South West of England.

Tim Mitchell, Klima-Therm Sales Director, says: "The HFO Turbomiser is a very attractive combination. In its favour is the exceptional and proven energy performance of Turbomiser, which can cut energy use by up to 60 per cent, coupled with the very low global warming potential of HFO1234ze."

He added: "This has a GWP of just 6 compared with 1300 for HFC134a. This is a huge difference in terms of environmental acceptability. End users have to take notice - and they are."

A better performance than R134a

The first HFO Turbomiser project involves the installation of two chillers as part of a store refurbishment. Each of the chillers is rated at 230kW, making a combined cooling capacity of 460kW.

The HFO Turbomisers will supply all the cooling needs for the store, delivering comfort cooling via the store's chilled-water-based air conditioning system.

Tests carried out by manufacturer Geoclima at its new testing facility in Italy have demonstrated that the HFO Turbocor-based Turbomisers operate with an excellent full-load COP of around 4.

It is known that use of HFO R1234ze results in a loss of cooling capacity of around 24 percent compared with R134a across various application conditions. However, mean power absorbed is around 27 percent less, giving an overall COP for the HFO actually better than R134a.

"The design of the new HFO Turbomiser compensates for the reduction in capacity, by employing slightly larger heat exchanger surfaces, clever design and component lay-out," says Tim Mitchell.

There will be a slight cost premium as a result over the standard Turbomiser chiller running on R134a. However, Klima-Therm believes cost comparisons per kW of cooling compared to other low GWP solutions will be highly attractive, given the dramatic environmental benefits of using low GWP HFOs instead of very high GWP HFC refrigerants.

A further important benefit of the HFO solution is that it may overcome the equipment siting and charge capacity restrictions that accompany the use of other refrigerants, such as hydrocarbons.

End users looking for an in-kind alternative to R134a that is safe, efficient and available at reasonable cost are certainly following with interest the growing use of HFO refrigerants in retail refrigeration.

HFOs are successfully replacing HFCs

A spokesman for the project partners, Honeywell, Geoclima and Klima-Therm, confirmed that Honeywell had carried out extensive stability testing with Solstice ze (HFO-1234ze) in the presence of both air, water and common metals. Tests were also conducted with both PAG and POE lubricants, and at high temperatures (175°C). They report no significant issues and an AHRI study, just completed by independent laboratory Spauchus Association, has confirmed these findings.

Under European regulations, HFO-1234ze is deemed to be non-flammable, as it has no flame limits at temperatures below 30°C. Regarding HFO1234yf, extensive trials carried out by SAE and major car manufacturers have demonstrated that it can be safely used in vehicle air conditioning systems.

"Given that some end users have been using highly flammable hydrocarbons and high pressure CO_2 in place of HFCs, the safety profile of HFOs looks impeccable," the spokesman observed.

Honeywell has confirmed that Solstice ze (HFO1234ze) is available now in commercial quantities. The company tripled production capacity last year and a new world-class plant will be in production in 2013.

"We believe the main work in proving the viability of HFOs has been done. We are now looking to use the results from field trials to optimise software, controls and fine-tune the machines."

Future plans

Having tested HFO1234ze with reciprocating, screw and oil-free compressors, Geoclima believes that HFOs can be used in practically all applications where HFCs are used today.

In terms of capacity, today's Turbomiser chillers running on R134a can cover capacities up to the MegaWatt range. "We see no reason similar capacities cannot be achieved using HFO1234ze," the spokesman added.

Could refrigeration condensing units for high, medium or low temperature refrigeration applications also be designed using this Turbocor + HFO 1234ze combination?

"Yes, we think this is entirely possible. Given the properties of the refrigerant, we believe high condensing pressures or low evaporation pressures could be achieved with relatively minor adjustments to the compressor design. Initial experiments in this area have been very encouraging. More work would be needed to confirm viability, and obviously require full R&D proving and validation by the manufacturer."

World's first HFO Turbocor chiller