

Setting a new standard for reversible heat pumps

The series of Element ZT/ZS horizontal heat pumps won the Gold Medal in the NEWS Dealer Design Award in 2016. This was the final confirmation to the team at Enertech Global LLC that they had succeeded with their development project that had been initiated 18 months previously. By combining the expertise of three independent companies, Enertech managed to develop a heat pump that is not only smaller and lighter, but also more efficient and reliable than previous generations.

Enertech Global LLC and SWEP in cooperation

In the summer of 2014, Enertech reached out to SWEP to investigate the possibility of using brazed plate technology for their novel range of horizontal reversible heat pumps, the Element ZS/ZT. Their aim was to increase system efficiency and reduce both footprint and weight to make the unit easier to produce, install and service. Customers put great trust in the Enertech brand and their heat pumps have long life-time expectancy. The reliability of the components was therefore of great importance.

"EPA's ENERGY STAR efficiency requirements for heat pumps that were launched in 2009 were further tightened in 2012. These demands

in performance resulted in more and more over-dimensioning of the coaxial coils, increasing size and weight of the system. The previous heat pump system was too big and heavy and the new design had to be more compact and lighter," says Jessica Strand, Product Manager at Enertech.

BPHE and microchannel technology

The engineering team from Enertech invited SWEP to evaluate different solutions at an early stage of the project. It soon became clear that SWEP's asymmetric brazed plate heat exchanger (BPHE) technology was the perfect choice as Enertech had also decided to use microchannel technology for the air heat exchanger. These two heat exchanger technologies share the advantage of

being efficient, light, compact and having a substantially reduced inner volume compared to traditional heat exchangers.

Asymmetric BPHEs

The SWEP unit used in the Element ZT/ZS heat pump was the V26F, which, with a height of 376 mm (15") is smaller than the compressor. The asymmetric BPHEs have wide water channels that decrease pressure ▶▶



►► losses while retaining turbulence. The SWEP distribution technology, developed for reversible duty with R410A, improves evaporator efficiency. Compact, lightweight and with the refrigerant charge balanced with microchannel air coil, the system delivers premium performance throughout the operation envelope of the heat pump. Jessica was very satisfied with the SWEP collaboration. "The interaction with SWEP was very streamlined, speeding up the design process. The selection of heat exchangers made by SWEP met the performance of the selection program [SSP G7] and no iteration of test units had to be made. This really saved time in the development."

Focusing on reliability

When about half of the project goals had been met, among them increased efficiency with a lower size and weight, it was time to look into the reliability of the brazed plate compared to the coaxial heat exchanger. Stories from the past, when BPHEs had started to leak due to freezing, emerged from the memories of seasoned co-workers. However, in parallel with the Enertech project, SWEP was engaged in an internal R&D initiative evaluating freeze prevention and protection in BPHEs. The findings from the development project were implemented in the Enertech models. "Making sure that the system was safe and protected against freezing was really the number one focus once we had reached the performance goals," says Dr Lingjun Meng, Refrigeration Engineer.

Knowing the flow with SIKA flow switches

The cooperation with the flow specialist company SIKA Dr. Siebert &

Key success factors

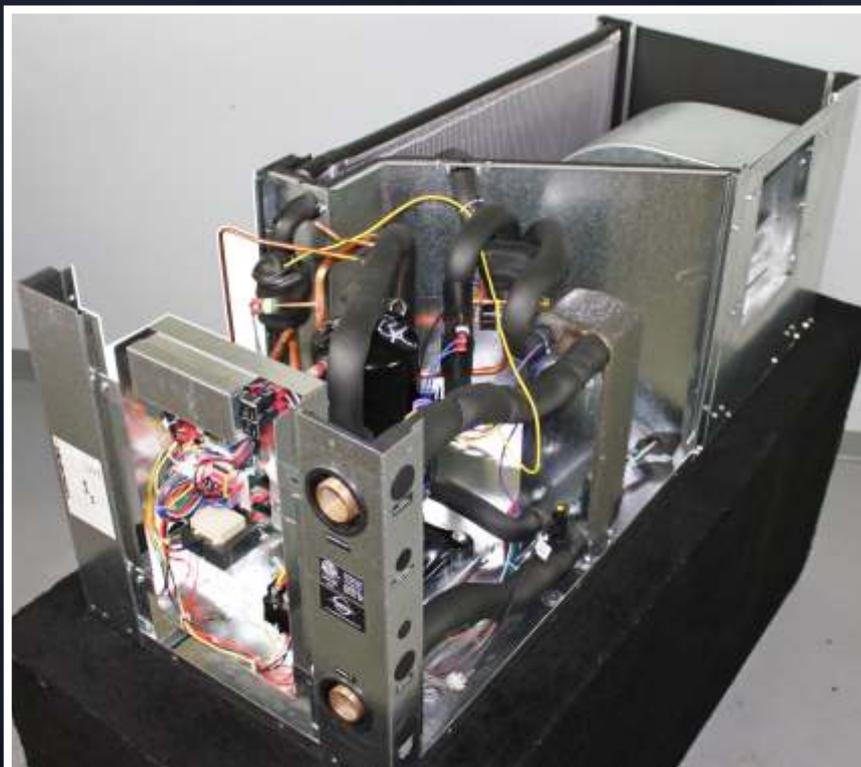
- Improving efficiency while reducing size and weight of the system
- Combining expertise from different companies to address problems and create value
- Cost effective and reliable anti-freeze solution for reversible heat pumps, developed in cooperation with SWEP and SIKA

Kühn (SIKA) proved to be the last piece of the puzzle. Founded in Germany in 1901, the family-run company is specialized in flow measurement equipment. With input from SWEP, they used the latest technology within their field to develop a flow switch range with set points optimized on the mapped boundary conditions for the heat exchangers. The flow switches were specifically developed for SWEP for use in heat pumps in the capacity range 2-6RT. The flow paddle, reinforced with glass fiber, provides maximum resilience

and longevity. With a double magnet switch instead of a mechanical spring, chattering is reduced and the fact that it doesn't have any moving parts eliminates fatigue over time. SIKA launched the OEM optimized flow switch range in time for implementation into the Enertech systems.

Anti-freezing solution

Freezing tests carried out in the SWEP laboratory were able to map out the boundary conditions for basic parameters such as flow and temperature to avoid freezing risk in the system. Based on this, Enertech was able to define a safe operating zone for the heat pump using the SIKA flow switch to assure the critical flow levels. By integrating temperature sensors and flow switch into the logic of the system already when assembled in the factory, the heat pump becomes immune to the most common reason for malfunction, including the lack of water flow at start up, sudden loss of the water flow and sudden temperature changes. ►►



▶▶ The flow switches from SIKA, optimized to work together the SWEP product range for heat pumps, are color-coded, making them easy to install correctly. They assure that the flow inside the heat exchanger is turbulent, reaching best performance and avoiding freezing, even at pump outage or any other serious flow disruption.

“Both SWEP and SIKA were very responsive in their support and whenever we had an issue or a problem in the project, we could count on them to help us out. We shared information with each other - test results, considerations and problems - and that built trust,” says Jessica. “This was the first time we have worked in a development project where component manufacturers are cooperating to create a solution together with us, and I am sure that we would not have reached the same results without this cooperation.”

Heat pump technology has evolved
Together, the three companies managed to create a highly efficient, compact and reliable system with a multipoint and redundant anti-freeze protection. The combined experience of SWEP, SIKA and Enertech has made possible a reliable and cost-effective heat pump that is so much more than just smaller and more efficient. With the new system, heat pump technology has evolved.

“I think that we will increase our use of brazed plates where we today use coaxials,” says Jessica. “They perform very well and we trust that we have the best solution in protecting the system, using the SIKA flow switches.” Lingjun agrees: “We have actually decided to revamp an older heat pump range to use SWEP brazed plates and the anti-freezing solution developed during the project.” ■

