



Cool, dependable and **space-saving**

New heat exchangers from Universal Hydraulik

Particularly when it comes to cleaning the water side, tubular heat exchangers have advantages over plate heat exchangers. Universal Hydraulik has now presented two innovations for this tried-and-tested product. One of these was given a closer look by fluid at Kaeser Kompressoren in Coburg.

Sometimes, heat can be troublesome. It is generally created unintentionally, and if it is not wanted for the process, it must be dissipated. Cooling fins, fans and in certain cases appropriate heat exchangers are the tools of choice here. This also applies for compressors, where heat must be conducted away from both the drive train and from the compression process. Coburg-based compressed air specialist Kaeser Kompressoren uses air cooling alone for its screw compressors up to 30 kW, while for larger capacities air or water may be used, depending on the application and space requirements. The less space is available, the more water tends to be used. For units with three-figure kW ratings, water cooling is the option most frequently used.

The problem with water quality

Water – well, that sounds simple enough at first. But the devil is in the detail. Not all water is the same. And unlike in the oil or air side of a heat exchanger, the designer normally has less control over the quality of the water used. Each user deals with this issue differently; some put additives into the cooling circuit, while others have open circuits and highly varying qualities of water. Sometimes river water is used. But rivers can often be cloudy, and industry experts know that water filters are one of the components people economise on. Even where the water quality is tested in advance, a flood can turn a clear-running stream into a torrent of turbulent mud.

Additionally, substances such as chlorides or manganese in the water are invisible at first but can corrode away even the best stainless steel. It's a similar story where seawater is used.

Both tubes and plates – now riding piggyback

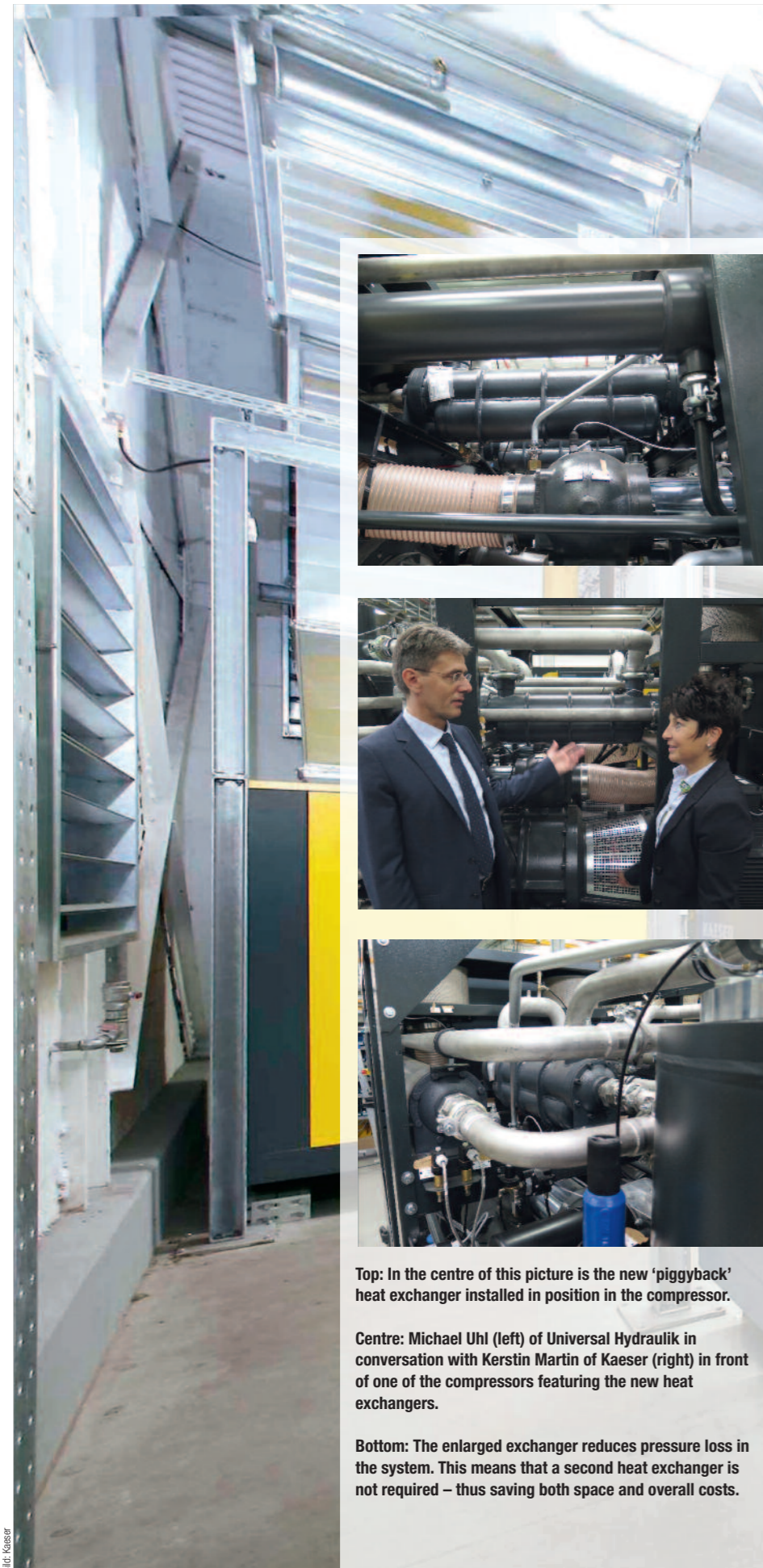
With their finned design, plate heat exchangers contain a number of sharp internal angles, which makes them prone to contamination and becoming blocked. As a rule they are not easy to clean, unless one opts for large and costly models that can be unscrewed. Tubular heat exchangers, on the other

The heat exchanger can be installed in any position. Universal Hydraulik can adjust all the connection points, where required, to the specific requirements of the customer's project.



'In our hybrid design, the tube bundle needs just as little space as does a plate heat exchanger.'

Michael Uhl, Universal Hydraulik



Top: In the centre of this picture is the new 'piggyback' heat exchanger installed in position in the compressor.

Centre: Michael Uhl (left) of Universal Hydraulik in conversation with Kerstin Martin of Kaeser (right) in front of one of the compressors featuring the new heat exchangers.

Bottom: The enlarged exchanger reduces pressure loss in the system. This means that a second heat exchanger is not required – thus saving both space and overall costs.

Sonderdruck
Universal Hydraulik GmbH,
Neu-Anspach

'Robust and easier to clean'

INTERVIEW: Pascal Springer and Michael Uhl, Universal Hydraulik and Kerstin Martin, Kaeser



The fluid discussion round (from left): Pascal Springer, sales engineer for heat exchangers at Universal Hydraulik, Michael Uhl, director of Universal Hydraulik and Kerstin Martin, project engineer at Kaeser Kompressoren.

Ms Martin, what is your area of responsibility at Kaeser?

Kerstin Martin: I work here in the special machines department. We develop screw compressors to customers' individual specifications, both air and water-cooled. These compressors can look very different, depending on their size and where they are to be used. A compressor for a ship, for example, is open – it has no housing – and it has to be as narrow as possible. On a ship like this there's only limited space; that has to be emphasised from the start. We have therefore developed narrow compressors – a type that you won't find in our standard range. Most of the time, our customers ask us for smaller versions than our standard models. It's therefore important for us that everything is as compact as possible, with all the components on the inside. That enables us to offer smaller solutions, which in turn makes us more competitive.

Which type of cooling are you using in your projects?

Kerstin Martin: Air-cooled applications are more common. All the same, above a certain size, if space is limited, we use water cooling. We use plate heat exchangers for low-level applications where the coolant has to meet particular requirements. For high-level applications we use tube heat exchangers, because here in particular – the custom special machines section – we often find ourselves using poor-quality cooling water such as seawater for marine applications. And this is where we make use of the cooler from Universal Hydraulik.

So what are the advantages of tubular heat exchangers?

Michael Uhl: Normally, water cooling allows you a smaller size of unit. In our hybrid design, the tubular exchanger needs as

little space as does a plate heat exchanger. At the same time they're less susceptible to dirt – and yet, if necessary, are easier to clean. Apart from this, because of the steel construction we can be very flexible in designing the connecting points – we can modify these to customer specifications and to suit the installation space quite easily.

Is the matter of dirt and contamination such a big deal?

Pascal Springer: In some ways, yes, it is. Our heat exchangers are in use on ships of all sizes all over the world. Every year we supply thousands to shipbuilding. And we've found everything in them that you could possibly imagine: mussels, wood, sand, rocks. The trouble is that water filters are much more complex and so more expensive than oil filters. As a result, unfortunately, people try to save money by not using them. It can happen quite often that they use the cooler itself as the filter.

Kerstin Martin: Once we received a complaint because a stone had got trapped in the cooler, where it remained for so long that it almost wore through the cover.

Don't you need all sorts of certificates for marine operation?

Kerstin Martin: Absolutely. Heat exchangers are subjected to a pressure test, while motors are given a heat run test. But this also depends on what the intended purpose of the compressor is on the ship and whether it is declared as essential or non-essential service equipment.

Pascal Springer: We have the certificates, of course: Germanischer Lloyd, DNV, Bureau Veritas, American Bureau of Shipment, CCS, China, Japan – you name it.

'We have automated tests to check for quality, independent of any person.'

Michael Uhl, Universal Hydraulik

So how do you assure the high quality of your heat exchangers?

Michael Uhl: We put them through extensive testing. There are several methods, including underwater methods. Those are the best, because you can see from

air bubbles over a prolonged period whether even the smallest leaks are present. We have set up an unmanned, 100-bar automated test station. The exchanger is fitted to this and tested for a full ten minutes before the system gives a green light and places a stamp on the housing of the unit. And only once that stamp is there can the installer use that component. This is an automated test for quality, totally independent of any person.

Pascal Springer: As well as this, we have a very high standard of component cleanliness. We only work with parts that are completely clean. To ensure this, we have two separate manufacturing shops. The dirty parts of the job – all the welding – are done completely separately by welding robots in a different area. The clean, finished parts are then assembled in our assembly shop. This enables us to achieve the level of cleanliness that is required for heat exchangers. *wk*

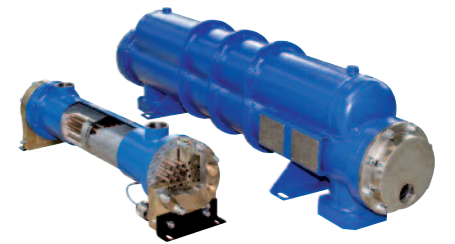


'We have tubes that are smooth inside and are less prone to clogging. This means we can also work with poor-quality water.'

Pascal Springer, Universal Hydraulik



With these two new heat exchanger models, Universal Hydraulik has shown that even in long-established products of this kind there is still room for innovation.



hand, have smooth tubes on the water side that are less likely to attract dirt. If necessary the diameter of the tubes can be increased or the material adapted to the water quality. Various solutions exist, such as copper-nickel alloys (CuNi10 Fe), stainless steel (1.4571) or titanium, to cover most applications. The biggest advantage, however, is that this type of heat exchanger is very simple to clean. Just unscrew it, scrub it out and put it back together, you could say.

On the other hand, however, simple tubular heat exchangers have the disadvantage of requiring more space for a given cooling capacity. This is where Universal Hydraulik brings the hybrid heat exchanger into the game, combining the benefits of both plate and tubular heat exchangers. This design has a greatly enlarged heat exchanging surface on the oil or air side, achieved through the use of lamellae (plates) drawn over the water tubes and linked to them by metal. This allows a unit to be created that is as compact as a plate heat exchanger.

With this hybrid cooler the manufacturer is now particularly represented in many Kaeser compressors used in individual customer solutions in difficult conditions such as marine environments. Another important factor, however, is that the loss of pressure caused by the heat exchanger inserted into the circuit must be as low as possible, particularly in the case of air cooling and typically not more than 0.1 bar, and for this reason Kaeser has often fitted two heat exchangers. This is because where pressure loss is low, the level of compression can also be lower and thus a smaller motor can be used.

For situations where space is very limited and only one unit can be fitted, meanwhile, the technicians of Universal Hydraulik have devised a market innovation – effectively two heat exchangers in one, in which the main tube carries another 'piggyback', as it were. The result: the required cooling capacity and a low loss of pressure, available for use where space is reduced.

Safety heat exchangers in compact format

In some situations, such as where river water or groundwater in an open-loop circuit is used for cooling, it is essential that no fluid from the oil circuit comes into contact with the water. For such purposes, safety heat exchangers are used – that is, plain tube heat exchangers in which each tube is nested inside another tube and an additional fluid is inserted between the tubes to provide thermal conductivity. These exchangers also feature electronic monitoring for leakage that might occur, say, due to pitting corrosion.

Here again, Universal Hydraulik has come up with an innovation. Up to now, safety heat exchangers have not been available in hybrid designs, and as a result they have been about three times larger for the same cooling capacity. With a new manufacturing process, however, it has become possible to make the gap between the tubes so small that the manufacturer can now house the double tube plus electronic monitoring in a hybrid model. This means that an ordinary hybrid cooler can now be replaced by a safety heat exchanger of the same physical size. And while Kaeser is not yet fitting the new safety heat exchangers into its compressors, it is good to know that it is available.

Author Wolfgang Kräusslich, Senior Chief Editor



'We use plate heat exchangers in situations where clean cooling water can be assured. For high levels we use tubular heat exchangers.'

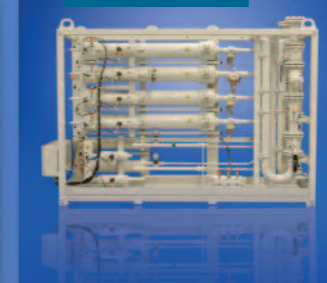
Kerstin Martin, Kaeser Kompressoren



OIL-AIR COOLING



COOLING SYSTEMS



HYBRID COOLING



UNIVERSAL HYDRAULIK
Your Partner for coolers and systems

Universal Hydraulik GmbH
Siemensstraße 33 D-61267 Neu-Anspach
Tel. 0 60 81/94 18 - 0 Fax 0 60 81/96 02 20
eMail info@universalhydraulik.com

www.universalhydraulik.com
www.universalhydraulik-usa.com