



Pipe-bundle heat exchanger with vanes: compact design, high cooling performance, operating pressure up to 35 bar, optionally with integral bypass valve.



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PWT heat exchanger: economical series production, thanks to the soldering of the individual plates by means of a copper or nickel coating.



Approaching the ideal

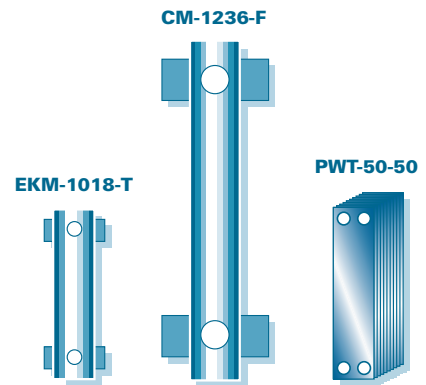
Pipe bundles with vanes increase the heat exchanger surface many times on the oil side

Plate or pipe-bundle heat exchangers - this is a question often decided by designers in favour of the former, due to the compactness that can be achieved. But this supposed advantage no longer comes into the balance, thanks to the development of a pipe-bundle heat exchanger with vanes.

The market offers two heat exchanger designs for the oil/water cooling of hydraulic systems, which have come more and more into competition with one another over recent years. The plate heat exchanger is often considered to afford greater compactness, and therefore to offer space advantages. Although this may be true when com-

pared to a conventional pipe-bundle heat exchanger, it is not the case when compared to a pipe-bundle heat exchanger with vanes, currently being offered by a company from the Frankfurt area. The advantages and disadvantages of both designs are explained in more detail below.

Advantages and disadvantages of different designs			
Pipe-bundle with vanes (EKM)	Conventional pipe-bundle	Soldered plate (PWT)	Screwed plate (TL)
Up to 35 bar operating pressure	Up to 20 bar operating pressure	Up to 30 bar operating pressure	Up to 25 bar operating pressure
Compact construction	Standard construction	Compact construction	Compact construction
High cooling performance with small dimensions	High cooling performance, large space requirement	High cooling performance with small dimensions	High cooling performance, large space requirement
Easy to clean on water side	Easy to clean on water side	Difficult to clean on water side	Easy to clean on water side, although expensive
No soldering points or seals in the pipe	No soldering points or seals in the pipe	Soldered construction	Screwed construction with seals
Optionally with integral bypass valve			



Size comparison: (l. to r.) Pipe-bundle heat exchanger with vanes, standard smooth-pipe heat exchanger, plate heat exchanger.

Design: Standard smooth-pipe heat exchangers

The pipe-bundle heat exchanger (CM, AM series) consists of an outer pipe, through which the hydraulic oil is fed, together with a bundle of thin, smooth pipes, fitted inside the outer pipe. The cooling agent flows through this bundle of pipes. The outer pipe is normally made of steel (or optionally stainless steel), while the pipes in the pipe bundle can be made of Cu, Cu-Ni (90-10) or also of stainless steel 1.4401 (316). Within the outer pipe, the hot oil or other medium is fed past guide plates, in order to improve the heat transfer process. The separating distance of the guide plates can be varied. The result: greater pressure loss at a lower separation distance, while at the same time improving heat transfer efficiency.

In addition, different types of end covers can be used on the cold (water) side. The water flows through either once (in which case in is

strongly recommended that the water flows in the opposite direction to the oil) or two or four times. The last two methods give a clear saving in the amount of water used, and also slightly improve the cooling performance. Fundamentally, pipe-bundle heat exchangers can be much more easily cleaned on the

water side than plate heat exchangers, by removing the end cover. Some manufacturers use so-called ribbed pipes on the cooling side, in order to improve heat transfer efficiency. This design however does not produce the same level of efficiency as the pipe-bundle heat exchanger with vanes.

Practical comparison of different designs			
Basis: Standard hydraulic application			
	EKM	CM	PWT
Design	Pipe-bundle with vanes	Conv. pipe-bundle	Plate
Type	EKM-1018-T	CM-1236-F	PWT-50-50
Cooling performance	60 KW		
Oil throughput	180 l/min		
Water throughput	90 l/min		
Oil inlet temperature	60 °C		
Water inlet temp.	25 °C		
Oil type	ISO VG 46		
Pressure loss, oil side	1,2 bar	0,8 bar	1,5 bar
Pressure loss, water side	0,3 bar	0,2 bar	0,3 bar
Number of plates	/	/	50
Number of channels	2	4	1
Outer pipe diameter	127 mm	153 mm	/
Overall length / height	522 mm	1045 mm	529 mm
Width	/	/	124 mm
Depth	/	/	122 mm



CM heat exchanger: the conventional pipe-bundle version can be cleaned more easily than the plate heat exchanger by removing the end cover.

Design: Pipe-bundle heat exchangers with vanes

The pipe-bundle heat exchangers (EKM) with aluminium vanes on the outer pipe side, as supplied by Universal Hydraulik, work more efficiently than normal pipe-bundle heat exchangers. These heat exchangers have a heat exchange surface many times greater than that of conventional pipe-bundle heat exchangers on the oil side. This in turn allows the more compact design of the heat exchanger (see layout diagram). The aluminium vanes are thereby drawn over the water pipes at a close distance and mechanically expanded. The separators on the vanes also increase the turbulence – thus producing optimum heat transfer cha-

acteristics. The EKM series is therefore just as compact as a plate heat exchanger, although it offers further benefits. For instance, the pressure resistance, at 35 bar, is higher than with plate heat exchangers or conventional pipe-bundle heat exchangers. The result: installation in the return circuit of the hydraulic

narrow flow channels good heat transfer

system is considerably less "dangerous" than with other types of heat exchanger. Since the pipes are welded and the water pipes are rolled in, they demonstrate practically no leakage problems. Furthermore, an optional (patented) internal one-way valve is available for the EKM series. The advantage: this saves a further external valve, together with the relevant piping.

For very high cooling performances and high oil through-flow volumes, the larger ECM series is available, while similar requirements can also be met by the connection of multiple heat exchangers, as also available within the product range. Another space-saving version is the EKTm model, designed for installation within tanks.

Design: Plate heat exchangers

Plate heat exchangers are also more compact in design than conventional pipe-bundle heat exchangers. In this design, the media flow between several stainless steel plates arranged one behind the other. The plates are stamped, so that narrow flow

channels are formed between the plates. This leads to a severely turbulent flow, resulting in good heat transfer efficiency.

Design: Soldered plate heat exchangers

In the case of soldered plate heat exchangers, the plates are soldered together by means of a copper or nickel coating. This enables economical series production. However, the narrow channels between the plates result in a greater loss of pressure



Plate and pipe-bundle heat exchanger with vanes: no more space benefits for the plate version.

than with pipe-bundle heat exchangers. In the case of larger volume throughputs, this often demands a large number of plates, in order to reduce the pressure loss.

In addition, the channels between the plates can easily become blocked in the event of poor preparation or treatment of the cooling water

used. The result: progressively deteriorating performance of the plate heat exchanger. By reason of their design and construction, soldered plate heat exchangers can also only be cleaned with difficulty, and often have to be replaced when they become blocked. The use of plate heat exchangers is always recommended in case of small temperature differences.

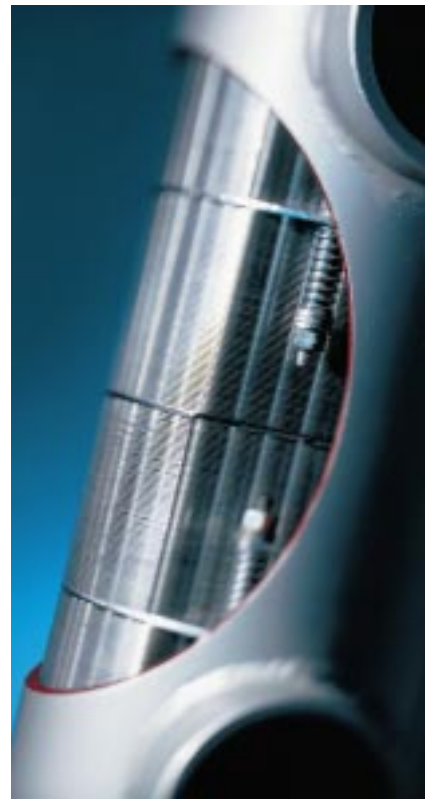
Design: Screwed plate heat exchangers

In the case of screwed plate heat exchangers, the plates are suspended in a frame and connected together by means of two pressure plates. This means that the plates are easy to dismantle, the heat exchanger can be cleaned easily, and can also be extended if required by the installation of further plates.

The performance of screwed plate heat exchangers with respect to pressure loss and heat transfer efficiency can be optimised by means of different stamping patterns. However, screwed plate heat

exchangers only become economically viable in the event of greater cooling performances, due to their higher basic costs (frame and mounting).

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EKM heat exchanger: this design offers a pipe-bundle configuration with vanes, and thereby delivers a high cooling performance in conjunction with a compact design.

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