

# 非对称微板换热器在节能减排上的优势

徐凯克  
丹佛斯换热器产品经理  
2018.06.01

### Expansion Devices

ETS Colibri®, ICM



### Sensors

ACB, AKS 32



### Sight Glass

SGP



### Heat Exchanger

MPHE, MCHE



### Superheat Controller

EKE



### System Controller

MCX



### Danfoss VLT®

HVAC Drive



### Filter Drier

DCL



### Check Valve

CHV



### Ball Valve

GBC



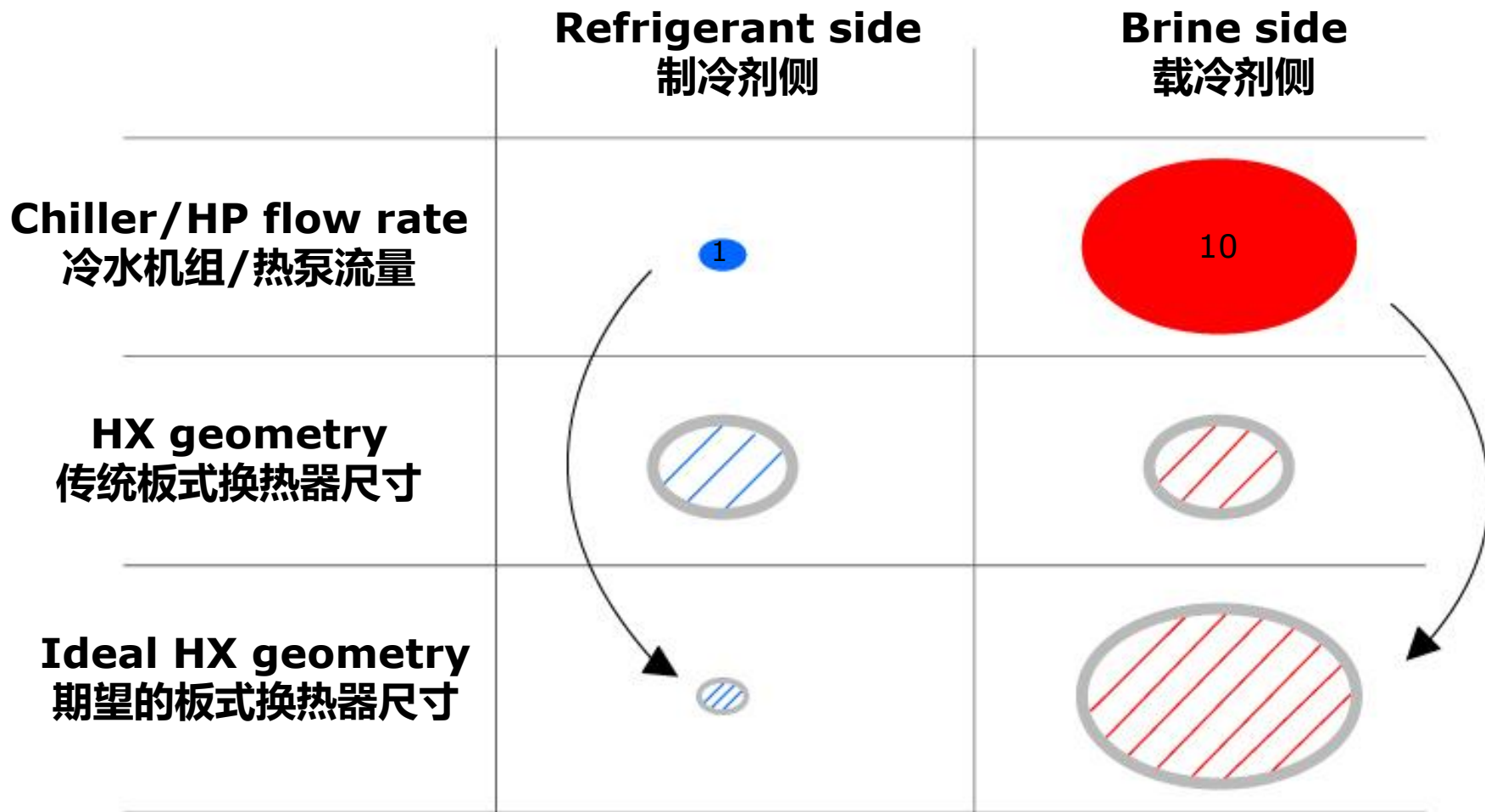
### Danfoss Turbocor® Oil-free Compressors

TT, TG, VTT, TTH



# The asymmetric design principle

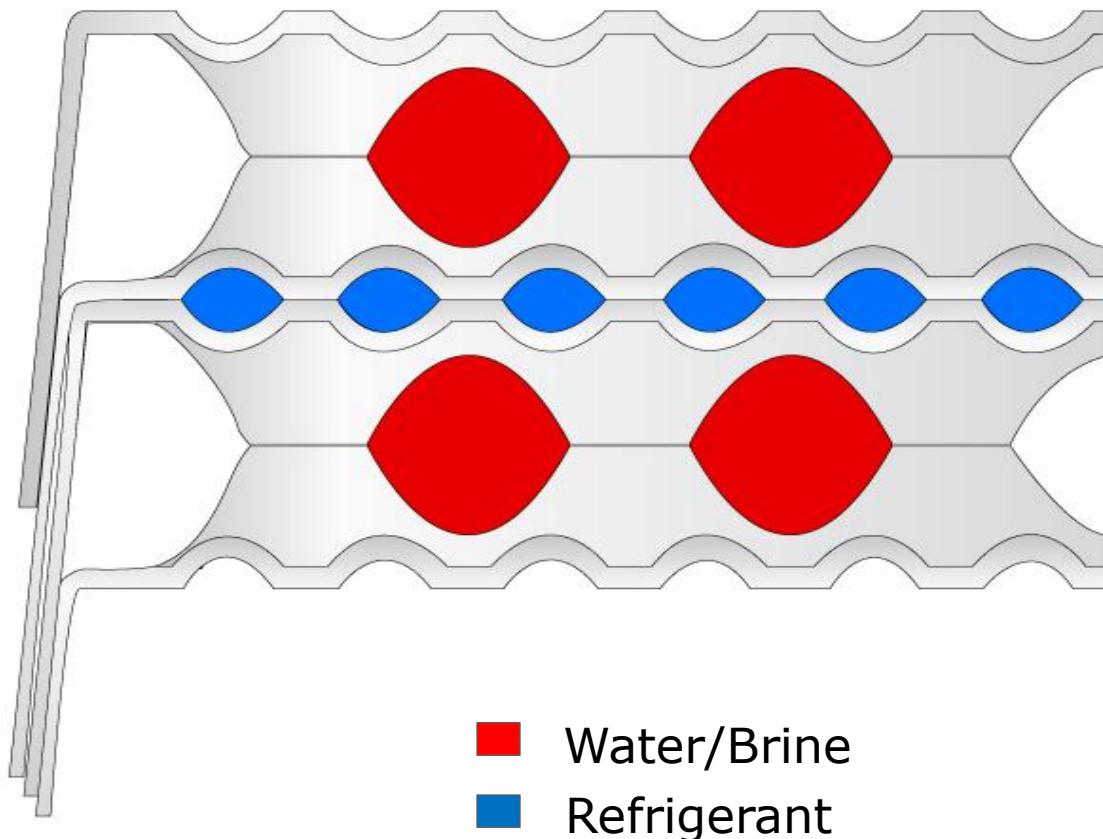
## 为什么需要非对称设计？



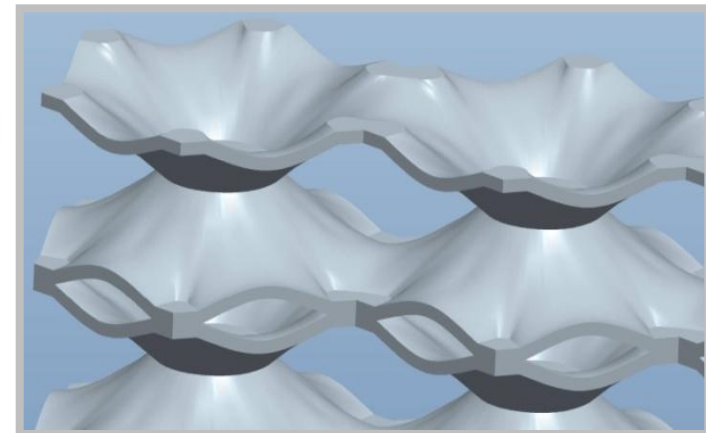
# Asymmetric Heat Transfer Solutions

## 非对称设计解决方案

- Asymmetric MPHEs are already in production at Danfoss with much more development planned  
丹佛斯已经批量投产众多非对称设计的板式换热器并不断加大在此领域的研究与开发。



Flexible envelope asymmetry up to 1:27  
MPHE微板换热器可以达到1:27 的非对称比



## Enhanced heat transfer

### 增强换热效率

---

Enhance mixing of fluid flow with higher turbulence, to achieve better heat transfer performance means more efficient and higher COP.

通过增大制冷剂侧压降来强化换热，提高系统COP，使机组运行更加高效。



## Less Refrigerant Charge

### 更少的制冷剂充注量

Relatively narrow refrigerant channels reduce the amount of refrigerant required. This delivers immediate savings to the manufacturer as well as improving the environmental profile of the product and reducing the cost of ownership for the user.

更小的制冷剂侧通道减少了制冷剂的充注量。这可以帮助机组制造商降低生产成本，并保护我们的全球环境。





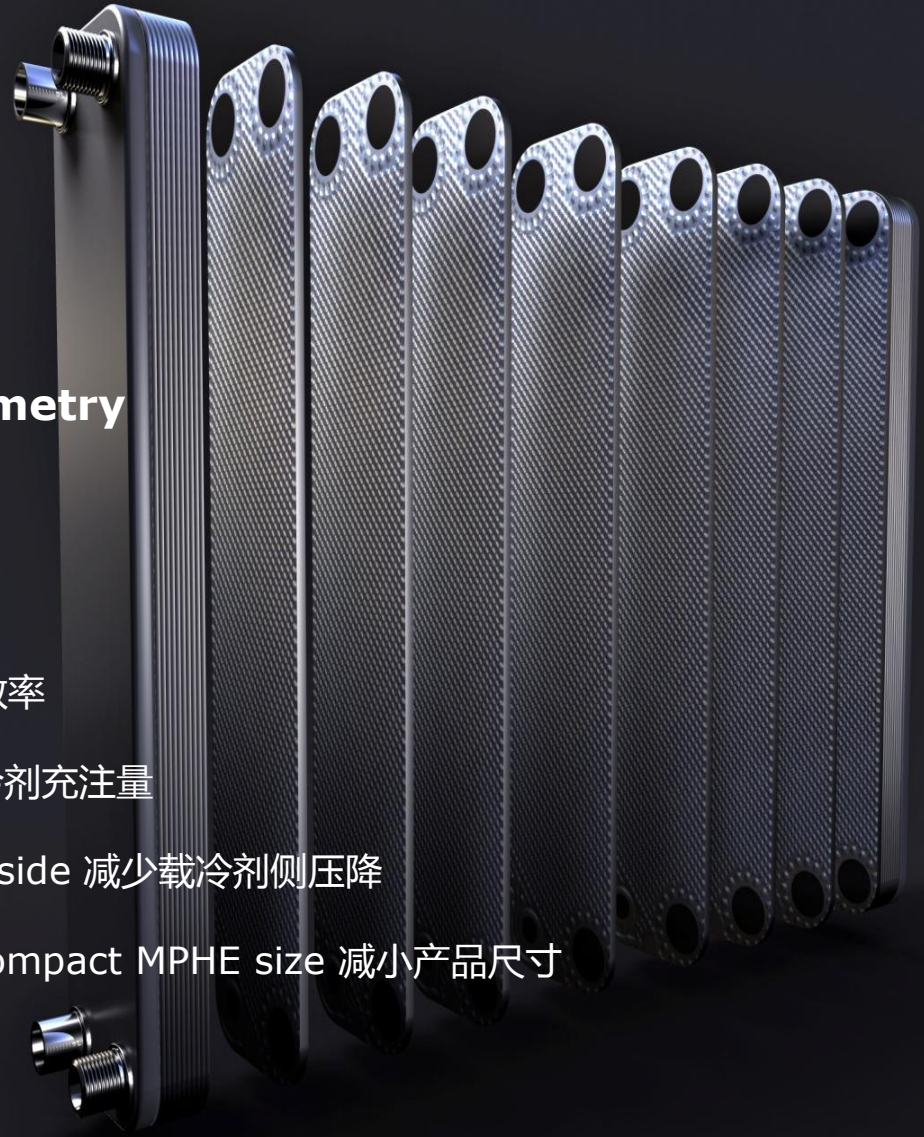
## Minimal pressure losses in water side

### 减少载冷剂侧压降

---

Wider brine channels allow the brine to flow more easily. This reduces the need for pump power, which implies savings for both manufacturers and system owners. Keeping the same pump envelope, the new asymmetric heat exchanger will reduce the power needed, hence contributing to an overall increase of system COP.

减少系统水泵的运行功耗，并且使水泵小型化得以可能。同时小功耗的水泵意味着系统整体COP可以得到提高。



## MPHE technology + Asymmetry

### 微板换热器 + 非对称技术

Enhanced heat transfer 增强换热效率

Less refrigerant charge 更少的制冷剂充注量

Minimal pressure losses in water side 减少载冷剂侧压降

Improved material utilization – compact MPHE size 减小产品尺寸

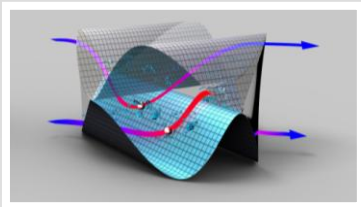
Robust design 更高的强度



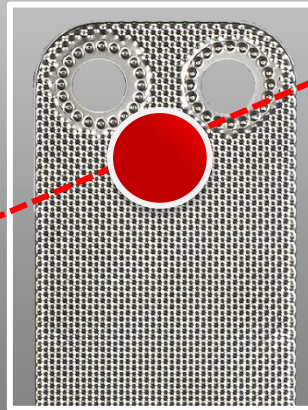
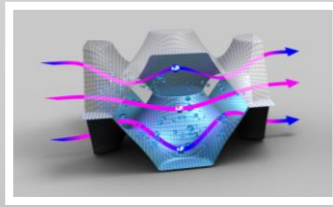
# Danfoss technology roadmap

## 丹佛斯技术路线图

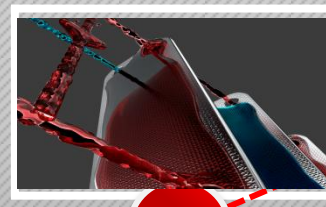
Traditional BPHE



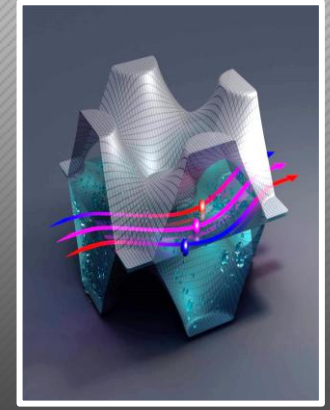
Innovative MPHE



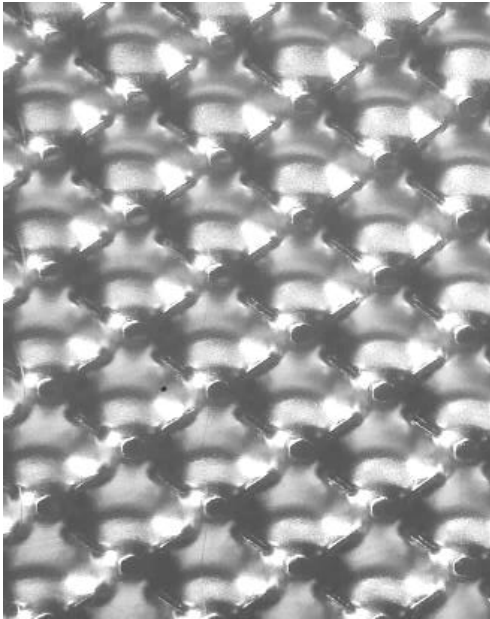
Asymmetric MPHE



Advanced Evaporators

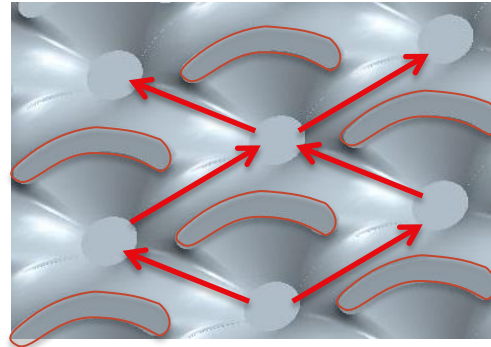


# Novel design principles: Evaporator geometry (Z-design)



## Evaporator plate

- Large concave brazing joints in refrigerant flow
- Small round aligned joints on water side

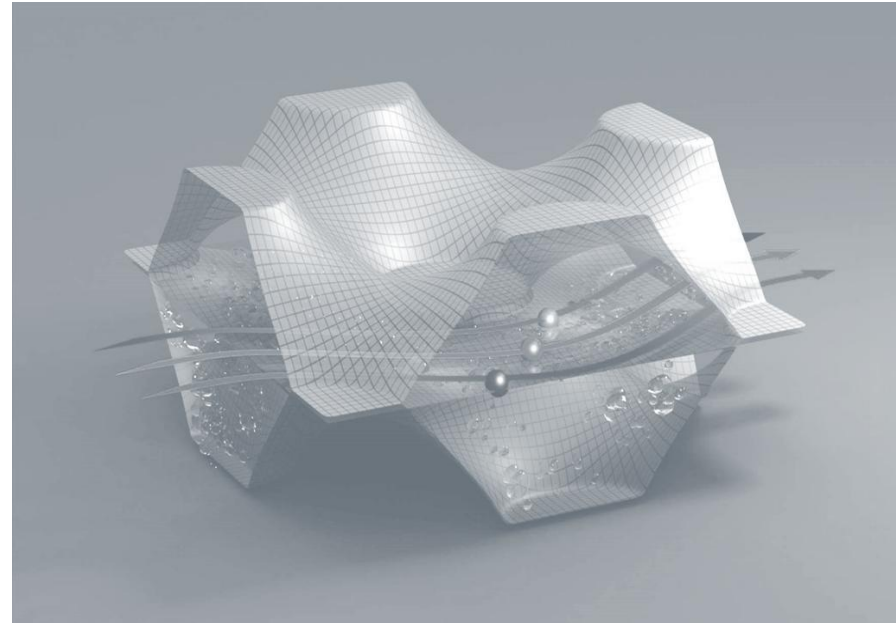


## Refrigerant channel flow

- Enhanced refrigerant side-flow
- Increased efficiency of two-phase heat transfer area
- Increased effective pressure drop
- Improved superheat stability
- Design adaptability to plate envelop
- Smaller CO<sub>2</sub> footprint

# MPHE with Z pattern plates

- Optimized as evaporator for R410A system
- Z-pattern channel plate technology saves 30-35% area of heat transfer at the same evaporating temperature with the same heat transfer capacity
- Stronger design with more brazing joints
- Compact size, lighter & easier to install
- Minimal hold-up volume, less refrigerant charge



**21%**

**Lower hold-up volume**

Enables significant reduction in refrigerant charge.

**32%**

**Lighter**

Lower costs and lower price sensitivity thanks to efficient use of raw materials.

# Product Portfolio – MPHE

## 微板换热器产品列表



	Platform	12	22	30	55	62	118	117	212
	<b>Outline, mm</b>	76 x 154	76 x 312	95 x 320	109 x 525	118 x 525	186 x 613	246 x 486	296 x 706
	<b>Design pressure</b>	45 bar	30 bar 45 bar	30 bar 45 bar	30 bar 45 bar	30 bar 45 bar	30 bar 45 bar	30 bar 45 bar	30 bar 45 bar
<b>Chiller</b>	<b>Evaporator</b>		C22(L)-E		C55(L)-EU	C62(L)-E C62(L)-EZ C62(L)-EZ-B	C118(L)-E C118(L)-EZ	C117(L)-EZD C117(L)-EZD-B	C212(L)-EZD
	<b>Eva. Capacity, kW</b>		3-20		10-65	30-90	70-200	70-250	200-500
	<b>Condenser</b>		C22(L)-C		C55(L)-C	C62(L)-C C62(L)-CX	C118(L)-C		
	<b>Cond. Capacity, kW</b>		3-20		10-65	20-110	80-240		
<b>Heat Pump</b>	<b>Evaporator</b>		H22(L)-E			H62(L)-E H62(L)-EZU	H118(L)-E		
	<b>Eva. Capacity, kW</b>		2-8			5-20	20-120		
	<b>Condenser</b>		H22(L)-C	H30(L)-C	H55(L)-C	H62(L)-C H62(L)-CX	H118(L)-C		
	<b>Cond. Capacity, kW</b>		2-10	3-25	4-40	4-55	24-150		
<b>VRF</b>	<b>Economizer</b>	C12L-EZ							



**ENGINEERING  
TOMORROW**