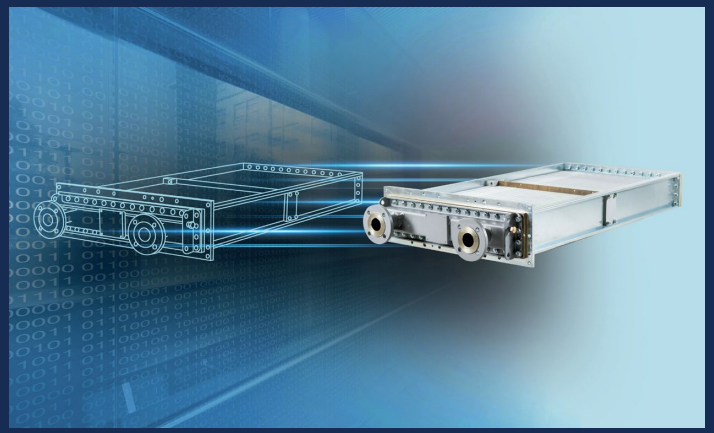
Vestas aircoil group



Tailored solutions

We design, service and replace cooling solutions tailored to the individual needs of our clients.

Trusted partners

We invest in our people and the tech required to be a trusted partner for global clients in need of cooling.

Sustainable actions

We help unlock business potential with sustainable actions across the value chain and product life-cycle.

GENUA

Copenhagen, Denmark

Vestas aircoil DK
R&D Group Center of Excellence

Lem, Denmark

- Technical Department
- Sales
- R&D

Vestas aircoil UK
Aftermarket Group Center of Excellence

- Founded in 2001
- Sales
- Design
- Technical

英国工厂建于2001年

Vestas aircoil CN

- Founded in 2004
- Production site

中国工厂建于2004年

Vestas aircoil RO
Robot & Automation Group Center of Excellence

罗马尼亚工厂建于2009年

- Founded in 2009
- Production site
- Test site

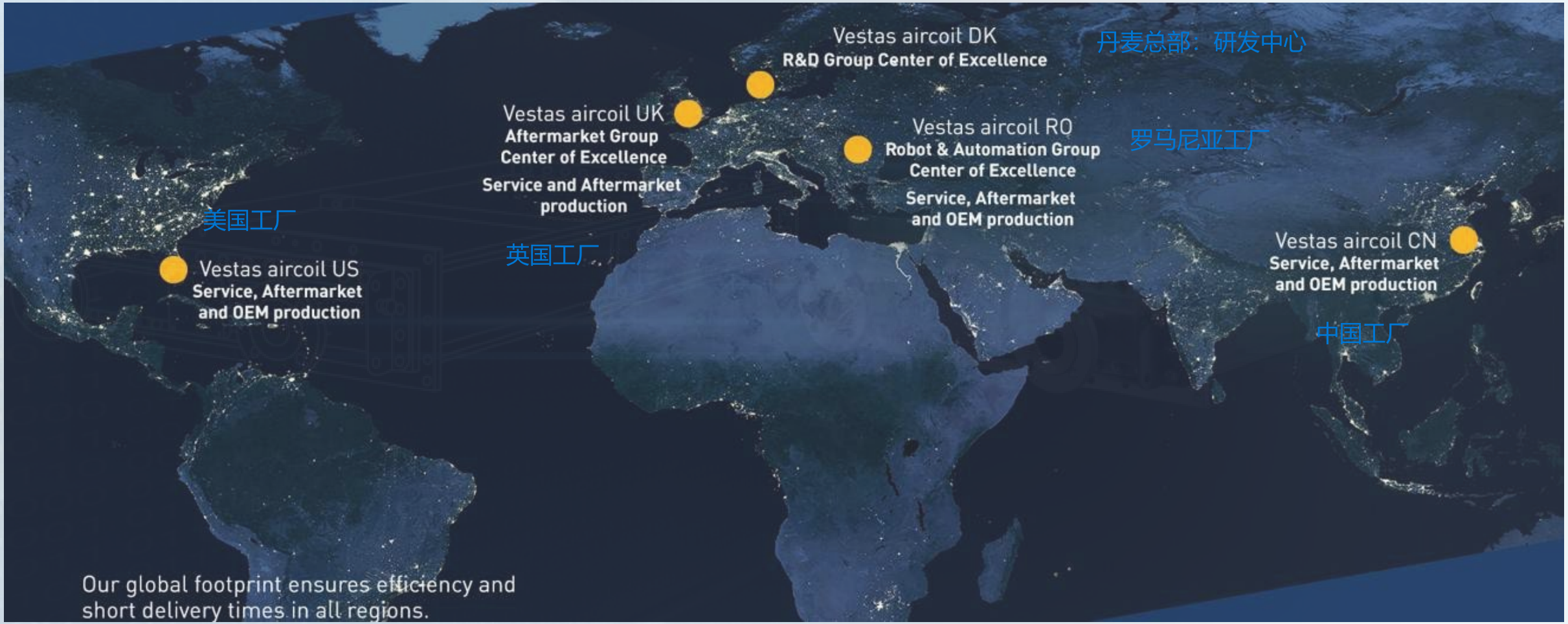
Vestas aircoil US

- Founded in 2022
- Production site

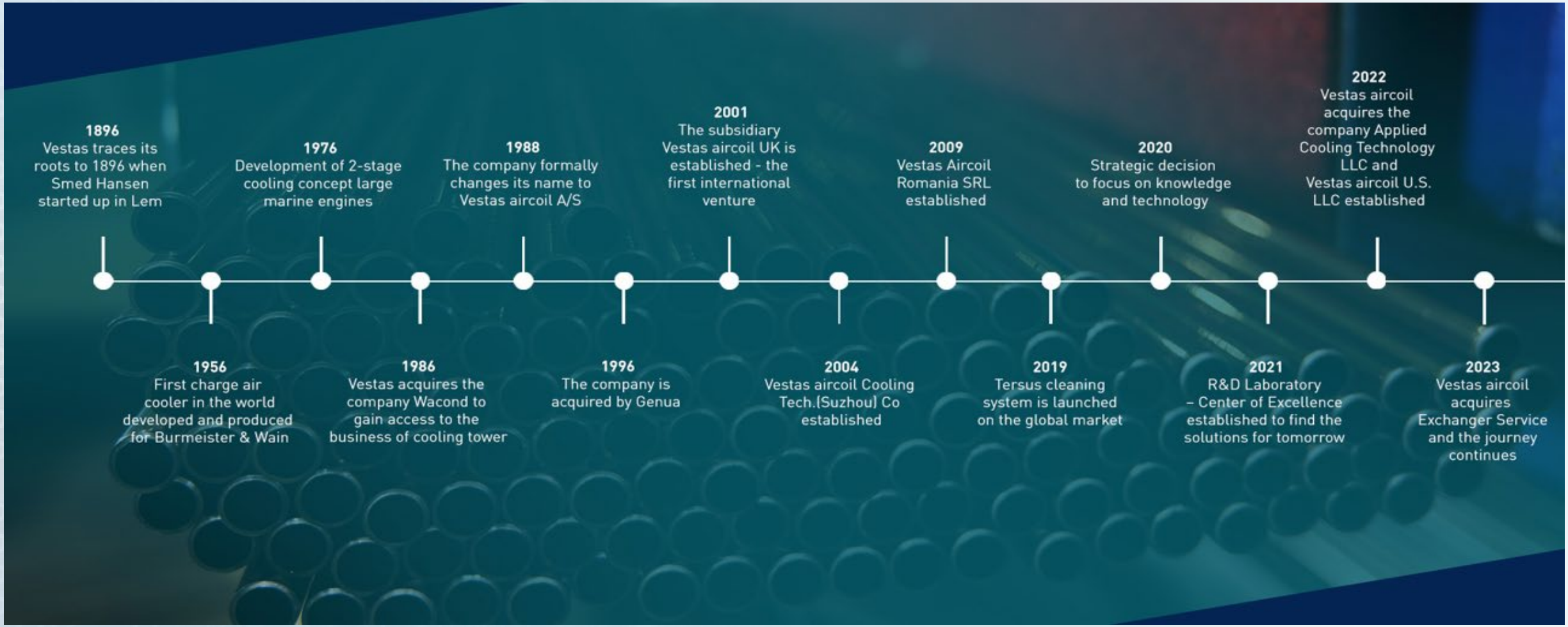
美国工厂建于2022年

集团架构 - 全球覆盖

Group structure – Covering the world



Company history – Timeline



Vestas aircoil Profile Vestas公司简介

- Established In Denmark In 1956, 始建于丹麦1956年
- Global Partner For Development And Manufacturing Of High-end Cooling Solutions.
- Industries Served: Marine, Powerplant, Generators/Alternators, Transformers, Compressors, Oil Coolers, Locomotive And Well Frac. 服务行业：船用，电厂，发电机用，压缩机用，油冷器，机车等
- 70 Years Of Experience In Tube-fins Coolers. 在管翅式冷却器行业有80年的设计生产经验
- Highly Competitive Pricing 250,000 Ft^2 Production Plants 高竞争力和性价比的工厂
- 100% Owned Subsidiaries In Europe, Asia, And US 100%的子公司
- Meets Classification Standards For: BV, GL, LR, DNV, KR, RINA, CCS, KR And ABS.

符合几乎全球的各种认证

CERTIFIED ISO 9001 BUREAU VERITAS

CERTIFIED BY DNV·GL MARITIME

ASME U **Including R – Repair Stamp**

Product Portfolio

增压中冷器

Charge air coolers

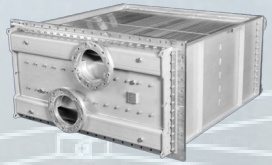
Dry Coolers/Data Centers

干冷机/数据中心用

发动机用冷却器

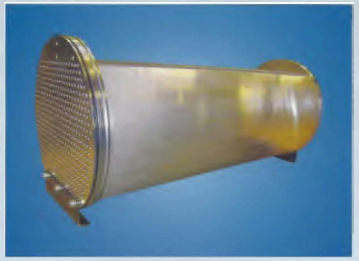
EGR coolers

EGR用冷却器



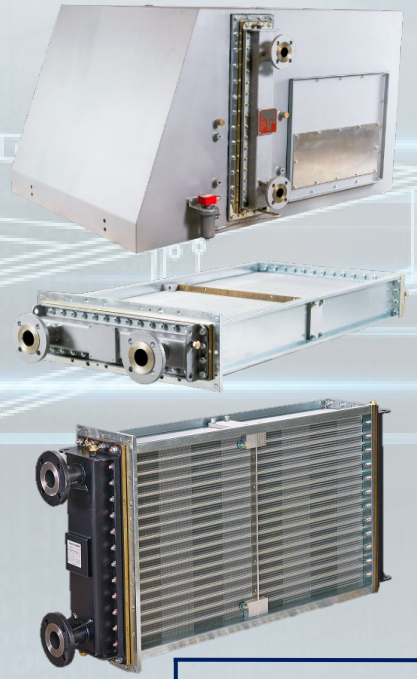
water mist catchers

Lube Oil coolers



润滑油冷器

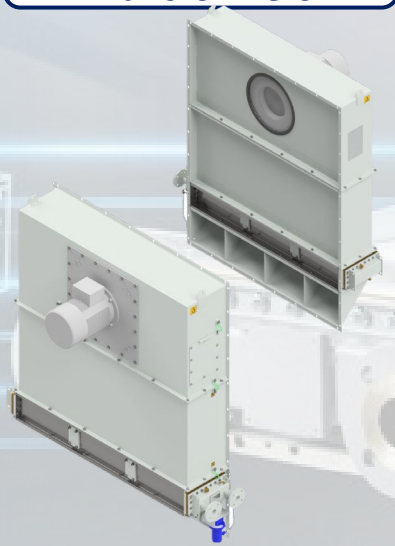
Generator coolers



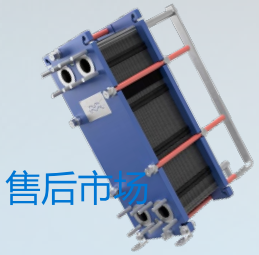
Service & Maintenance

服务和维修

AFWF coolers, Transformers



Aftermarket: OEM quality replacement for all product groups, plate heat exchanger



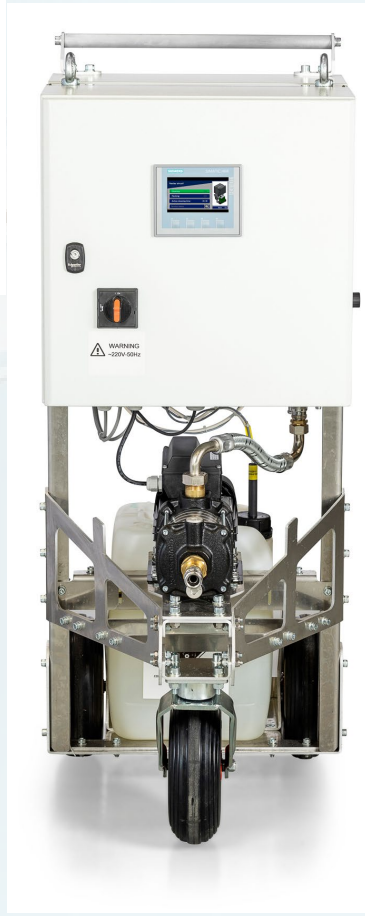
售后市场

压缩机用冷却器

Compressor coolers

TERSUS

a part of vestas aircoil group



The Industries We Serve

产品应用行业

电力行业

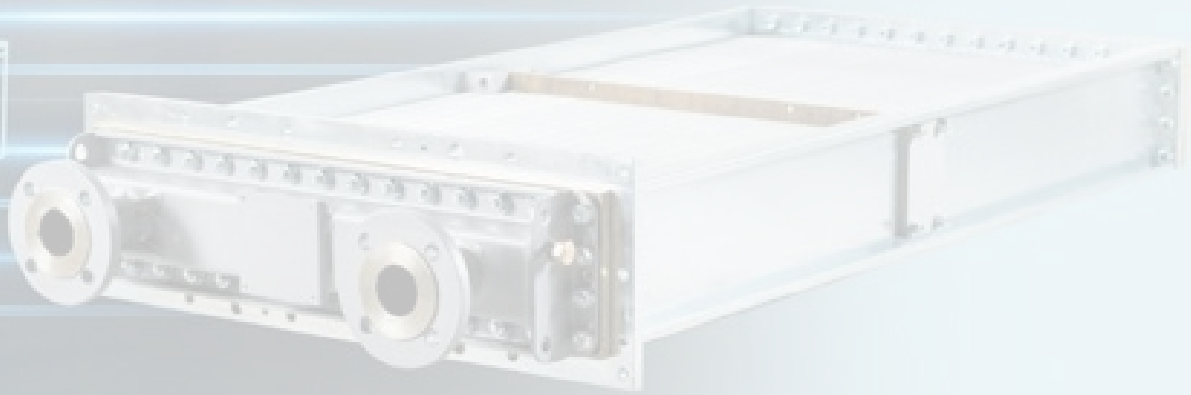
运输行业

油气行业

Applications 应用

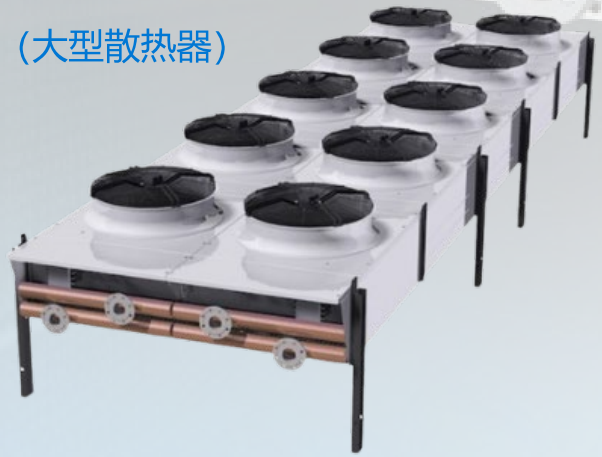
Vestas aircoil Product Portfolio Vestas产品矩阵

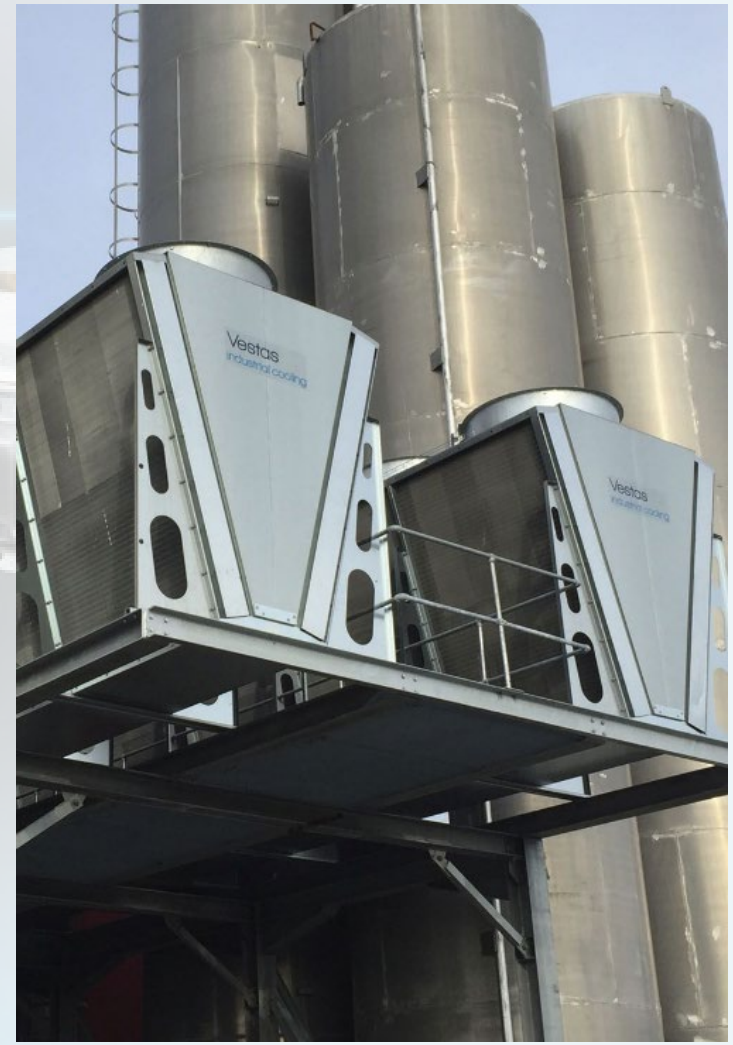
- Dry Type Transformer Coolers 干式变压器冷却器
- Open Cooling Towers & Dry Coolers, Vestas Industrial Cooling 开式冷却塔&干冷机，Vestas工业冷却
- Electrical Motors & Generators 电机及发电机
- Charge Air Coolers 发动机用中冷器
  - Diesel Engine Coolers 柴油机用中冷器
  - Gas Engine Coolers 燃气机用中冷器
- EGR Coolers EGR用冷却器
- Compressor Coolers 压缩机用冷却器
- Condenser Coolers 冷凝器
- Evaporator Coolers (aftermarket workshop 蒸发器（售后车间）
- Tersus cleaning system
- Water Mist Catcher (WMC) 水雾捕集器



Dry Type Coolers 干式冷却器
Open Cooling Towers 开放式冷却塔

- ✓ Induced draft cooling tower with axial fans for open circuit / Wet 带轴流风机的引风冷却塔，适用于开路/湿式
- ✓ Induced draft cooling tower with axial fans for closed circuit / Dry 轴流风机诱导式冷却塔，用于闭式循环/干式
- ✓ Induced draft dry coolers with adiabatic precooling with axial fans /Hybrid 带轴流风机的诱导式干式冷却器，配备绝热预冷/混合型
- ✓ Special designs (Large Radiators) 特殊设计（大型散热器）





Vestas aircoil group

- 70 years of experience in tube-fins coolers.
- Trusted and well performing supplier to Wärtsilä for more than 20 years.
- Highly automated production for tube-fins elements.
- Focus on R&D and continuous mastering the heat transfer performance.

- 30 years of experience in cooling towers and dry coolers.
- Experts in international projects with more than 3000 coolers installed.
- Low energy consumption fans with class-leading noise emission.
- Dedicated project teams for optimizing the coolers for various cost and performance possibilities.
- Products up to 13 meters long with the in-house pressure testing vat.

From 2023:

- Utilizing the existing service representation and the best of our know-hows instead of relying on sub-suppliers and contractors.
- Joined forces for highly competitive pricing and different production sides locations to lower the transport costs as well.
- Extension of the after-sales and service program for even better reliability after investing.
- Combined approach from our R&D Lab in DK.

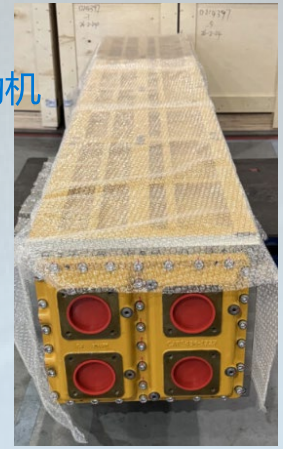
Production sites in:

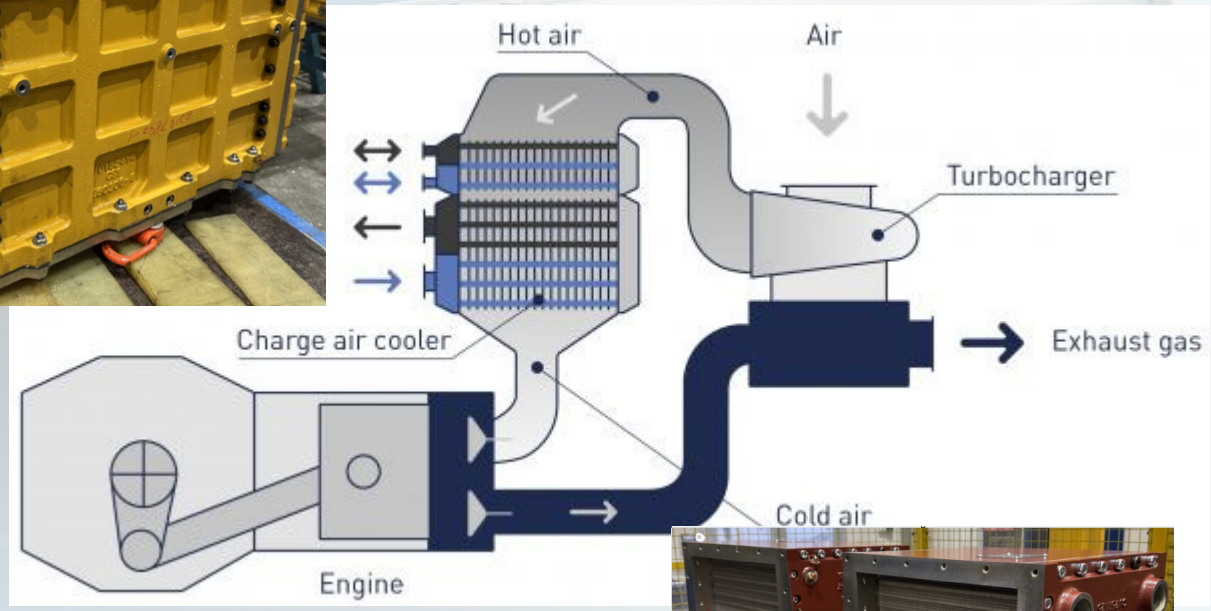
Romania | China | United States | Denmark

Charge Air Cooler CAC 发动机用增压中冷冷却器（中冷器CAC)

A charge air cooler OR Aftercooler (OR Intercooler) is used to cool the intake air after it has passed through turbocharger, but before it enters the engine. 增压空气冷却器OR后冷却器（OR中冷器）用于冷却进气后，它已经通过涡轮增压器，但在它进入发动机之前。

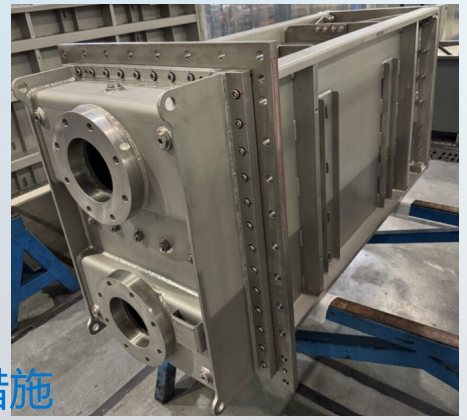
- Ultra Compact CAC 超紧凑型CAC
- Compact CAC 紧凑型CAC
- Aftermarket CAC 后市场CAC
- Fin & Tube Heat Exchangers, 管翅式热交换器
- Integral Support, Air Cooler Selection Guide
- Monoblock CAC 整体式CAC
- 2 and 4 Stroke Engines 2/4冲程发动机
- Marine Application 船用发动机

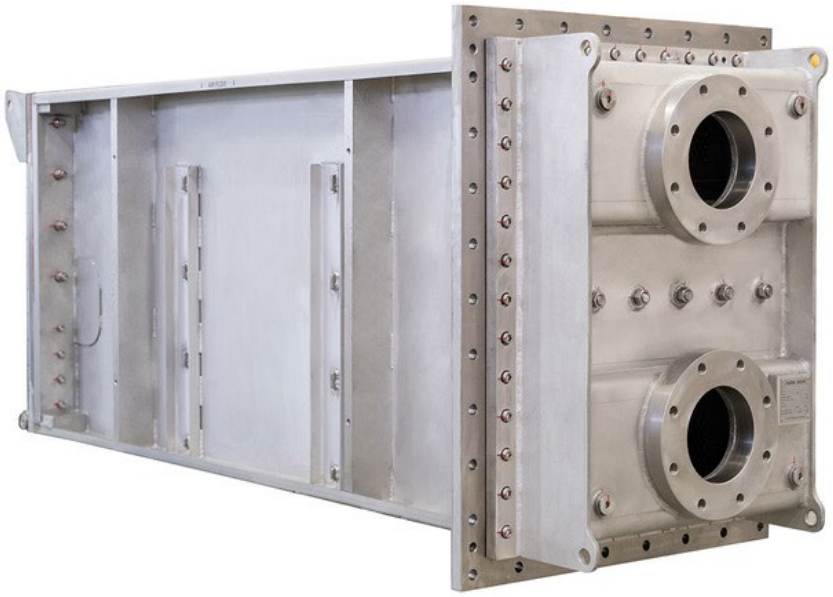


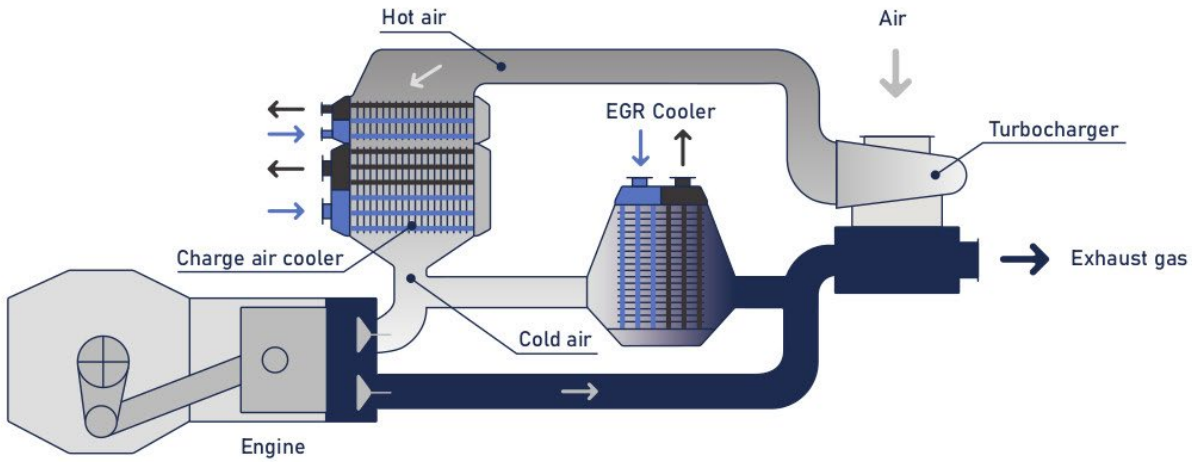


EGR Coolers EGR冷却器

- Internal research facility.
- Optimizing engine performance. 优化发动机性能
- Industry leading corrosion resistance.行业领先的防腐措施
- Flexible materials selection, according to application. 基于应用，灵活的材料选择。
- patented manufacturing technology. 专利的制造技术
- Worldwide Utilization 全球使用





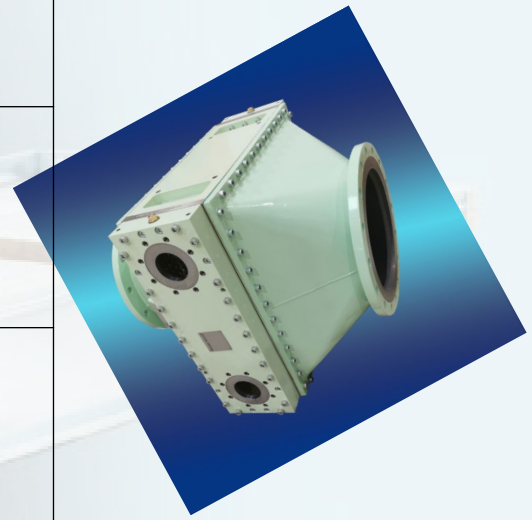


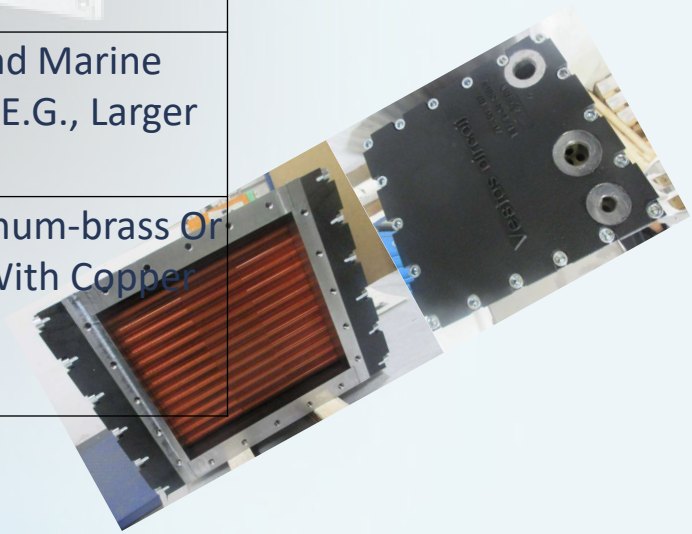
Compressor Coolers 压缩机冷却器

- Specialized Intercoolers & Aftercoolers: Provides AIR-COOLING SOLUTIONS For Industrial Compressors up to 325 kW
- Serving Compressors Used In: The Semiconductor, Pharma, Chemical, Food, Paper, And Automotive Industries.
- Key Features: Designed For Process-reliable Purity And Economic Efficiency.
- Performance: Engineered To Operate Under Severe Conditions.
- Design Features And Technology
  - ✓ Tube & Fin Inter And After Coolers
  - ✓ Water-cooled Technology With Airside Fins, Similar to The Designs Used In Diesel Engine Turbo-charged Air Coolers.
  - ✓ Flexible Delivery Options: Just The Intercooler Element Or The Entire Unit, Including The Outer Casing.
  - ✓ Custom Design: Tailor-made Designs Based On Customers' Specific Performance Data And Dimensions.
- Production And Specialized Services
  - ✓ Scalable Manufacturing: Large-scale Serial Production For Major Compressor OEMs And Specialized Builds For Unique Requirements. i.e.: CompAir; Tamturbo
  - ✓ Small Batch Capability: Provides Solutions For Small Quantities Required For Specific Projects Or Test Rigs.
  - ✓ Aftermarket/Retrofit Compatibility: Supplying Compatible Replacements For Other OME's Air Coolers Using Only The Make, Model, And Nameplate Information.
- Regulatory Compliance
  - ✓ Pressure Equipment Standards: Comply with The European Pressurized Equipment Directive (Ped) 2014/68/Eu, Mandatory For Equipment With A Maximum Allowable Pressure Above 0.5 Bar.
  - ✓ CE Marking: Provides CE Marking As Required By European Legislation To Ensure Products Meet Essential Safety Requirements For Design, Manufacture, And Testing.

Compressor Coolers 压缩机冷却器

Vestas Aircoil Cooler Geometry Comparison			
Feature	Compact	Ultra-compact	Standard
Tube Diameter	10mm	7.5mm	Varies (Larger Than Compact/Ultra-compact)
Efficiency/Performance	Extremely Efficient For Performance Engines	High Performance For High-speed Applications; Designed For Minimal Space	Robust, Proven Performance; Less Compact Than Other Options
Fin Surfaces	Range Of Options, From Low Pressure Drop To Heavily Corrugated For Turbulence/Heat Transfer	High Efficient Fin-and-tube System Designed To Keep Existing Dimensions	Fin Pitch And Design Vary By Cooler Type
Primary Application	4-stroke High-performance Engines	High-speed Engines And Environments Where Space Is At A Premium	General Industrial And Marine Engine Applications (E.G., Larger M/E Engines)
Materials	Can Be Manufactured From A Number Of Materials With Optional Coatings	Often Uses Stainless-steel Fin Tube System For Increased Corrosion Resistance	Typically Uses Aluminum-brass Or Cupro-nickel Tubes With Copper Fins



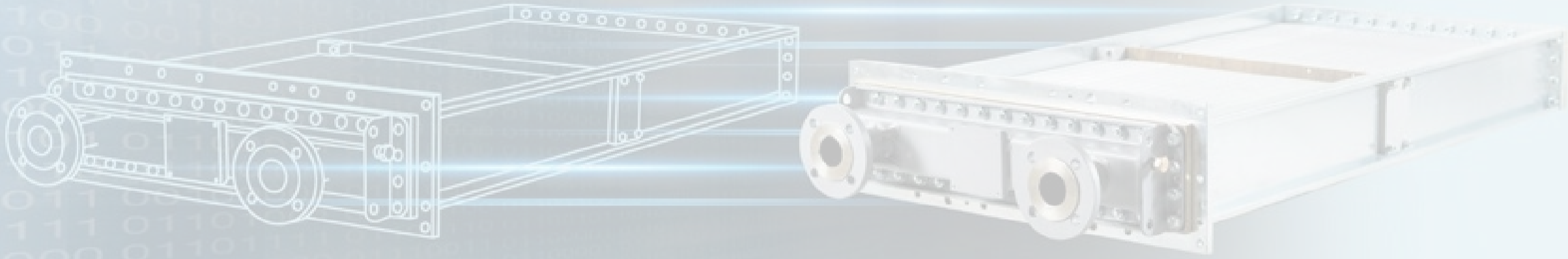


Compressor Coolers: 压缩机冷却器

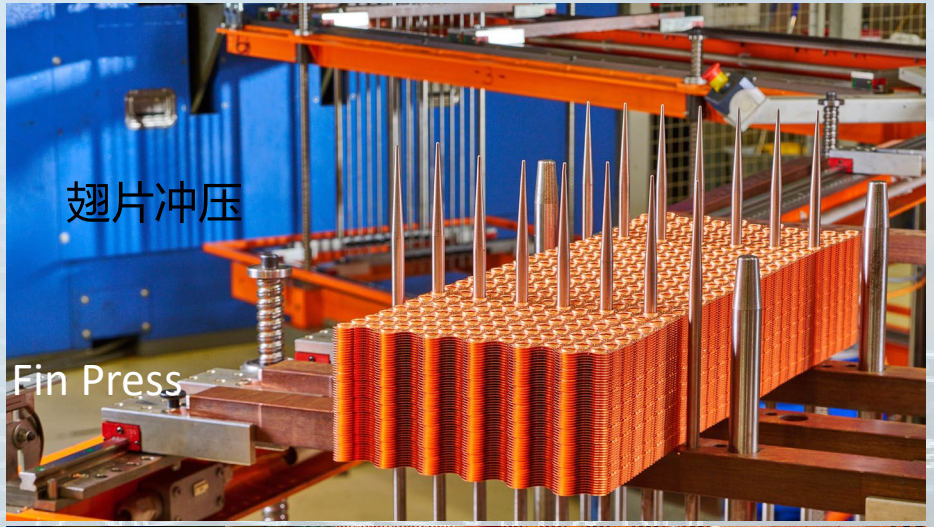
Sample of Aftermarket Delivered Replacement

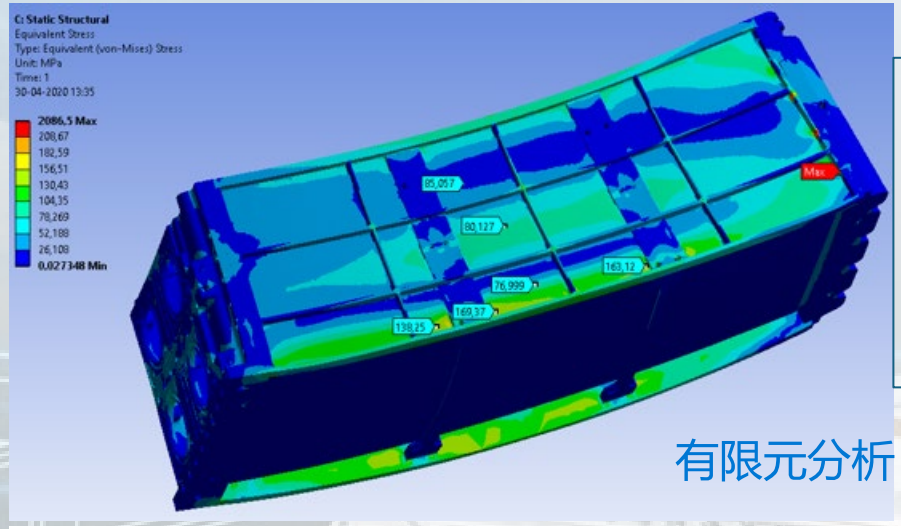
Part Number	Cooler Description	OEM
70309489-A	Compressor cooler RV-AFT-119878-50C + PED & 3.1 cert	Dometic
70323163-A	RV-KA22-3163 Compressor cooler	Alpicool / BougeRV
70323165-A	Compressor cooler insert RV-KA22 w 3.1 cert	Alpicool / BougeRV
70340575-A	Compressor Cooler CA-DRIVE-170516 with casted covers	CA-DRIVE (Specialized)
70364216-A	Compressor cooler RV-SI-0006447-4216	Secop
70385361-A	Compressor cooler RV-051002272-CK-050522	CK (Generic/OEM)
70387067-A	Compressor cooler RV-HD-HTOFNH0044 w 3.1 cert & PED	Everco HD
70388489-A	Compressor cooler RV-KA22 (No CE version)	Alpicool
70388490-A	Compressor cooler insert RV-KA22 (no CE version)	Alpicool
70389083-A	Compressor cooler RV-051003119-CK-160223 FW	CK (Generic/OEM)
70390081-A	Compressor cooler RV-051003119-CK-160223 SW	CK (Generic/OEM)
70390903-A	Compressor cooler RV-051003274-CK-040423 SW	CK (Generic/OEM)
70393778-A	Compressor cooler RV-UDBM-CK-101123 w 3.1 cert & PED	CK (Generic/OEM)
70396861-A	Compressor cooler RV-NZKM-CK-280224-6860 w 3.1 cert & PED	CK (Generic/OEM)
70396882-A	Compressor cooler AL-VM85-CK-040324-SW-M36C	Alpicool (AL)
70397021-A	Compressor cooler AL-VML60-CK-040324-SW-M36C	Alpicool (AL)
70397067-A	Compressor cooler AL-D62SH-CK-040324-SW-M32C	Alpicool (AL)
70397082-A	Compressor cooler AL-VML60-CK-040324-FW-M32C	Alpicool (AL)
70397088-A	Compressor cooler AL-VM85-CK-040324-FW-M32C	Alpicool (AL)
70397096-A	Compressor cooler AL-D62SH-CK-040324-FW-M32C	Alpicool (AL)
70398535-A	Compressor cooler RV-HD-051004248-CK-180324	Everco HD
70399094-A	Compressor cooler RV-AL-2VM85-CK-050524-SW-M36C	Alpicool (AL)
70405732-A	Compressor cooler RV-NZKM-CK-280224-SS-5732 w 3.1 cert & PE	CK (Generic/OEM)

Supplemental/Appendix/Supporting Slides

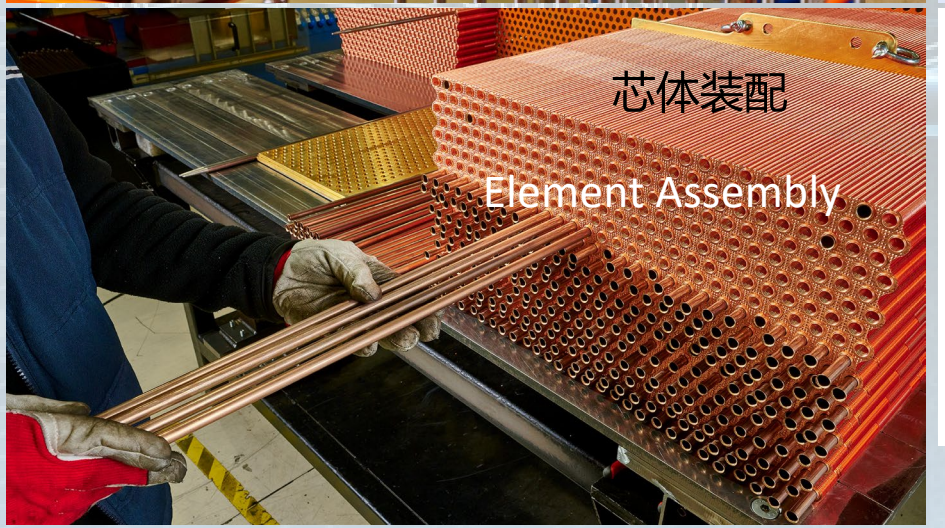


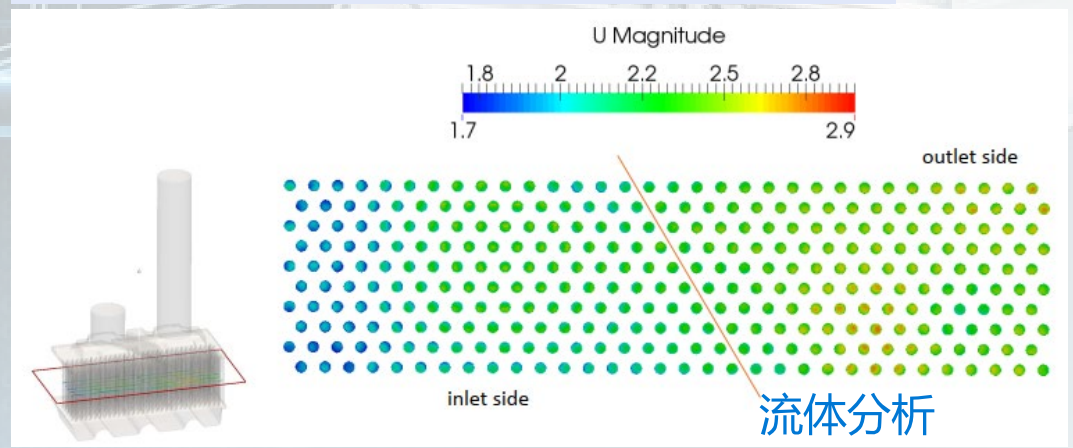
Design and technology 设计和技术

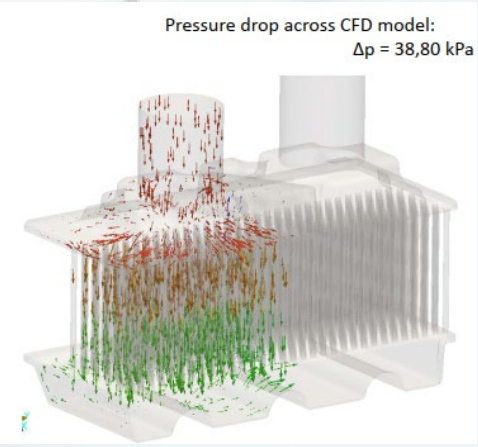




Finite Element Analysis (FEA) Is Utilized To Calculate Stress Levels and Temperature Distribution In Parts Such As End Cover Design, Complete Cooler, ...

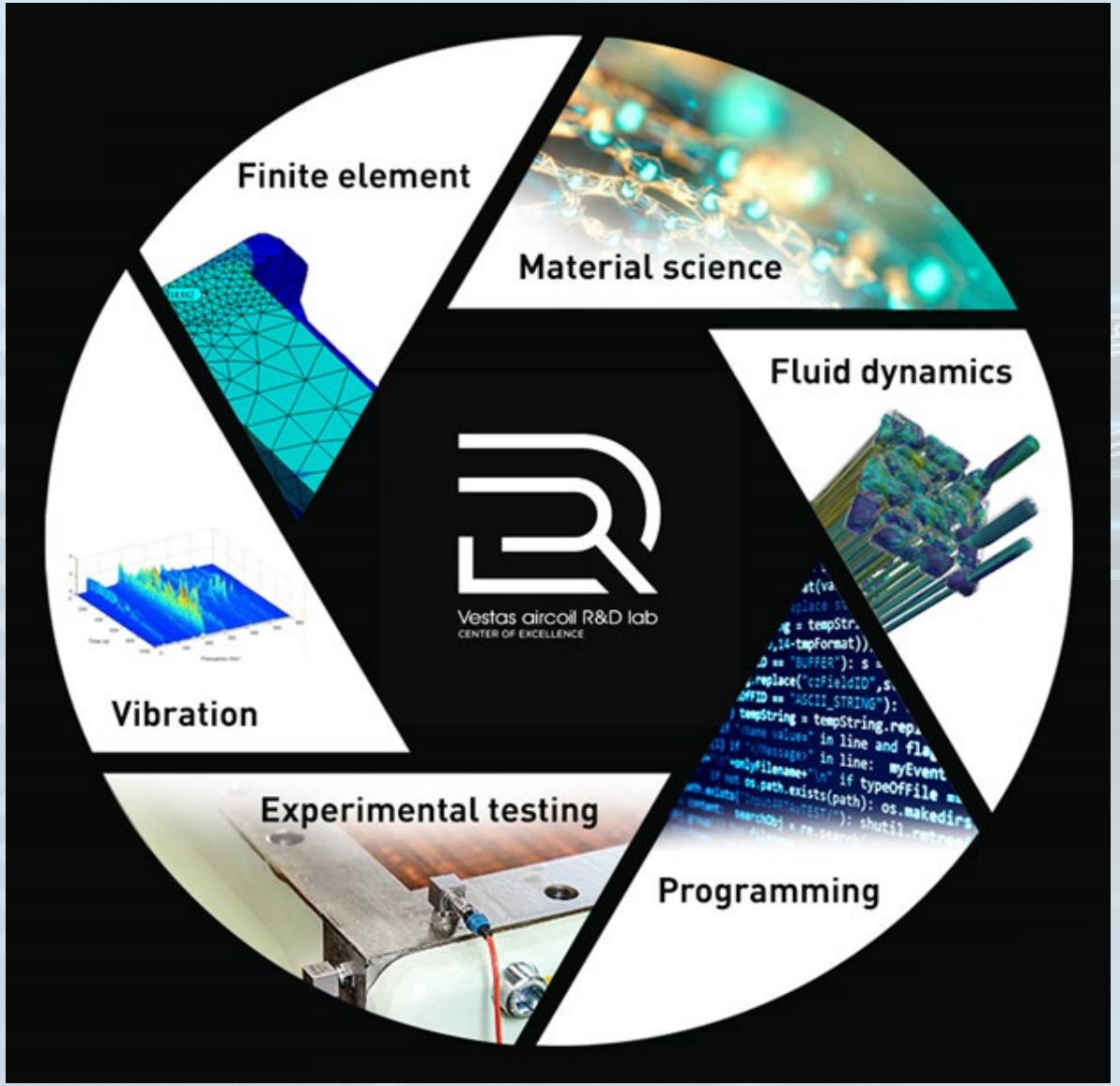


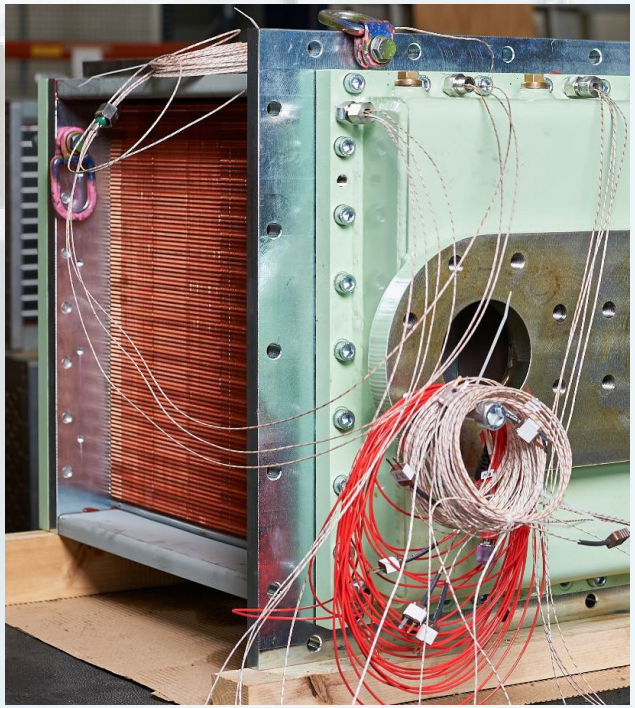




Computational Fluid Dynamics (CFD) Calculates The Water Side Pressure Drop Over The Entire Model As Well As Water Distribution Inside The Cooler In Each Tube.

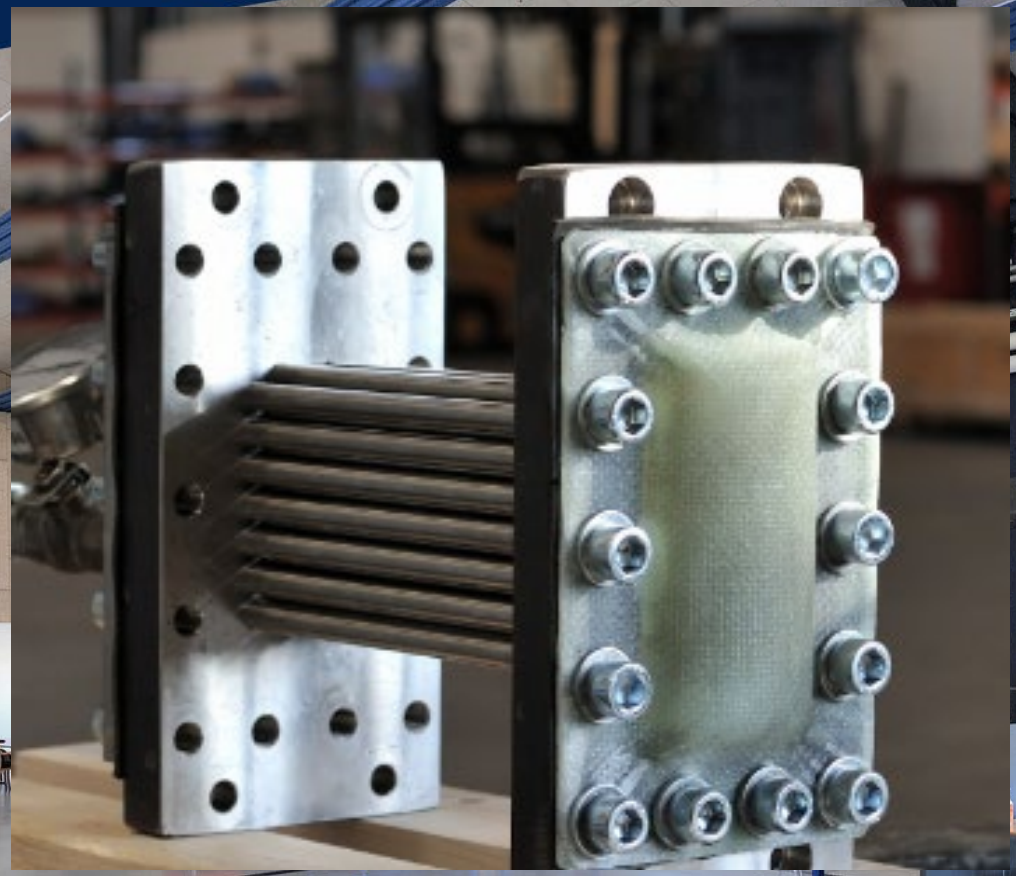
R&D Lab - Centre of Excellence 研发实验室





R&D Laboratory
Center of Excellence

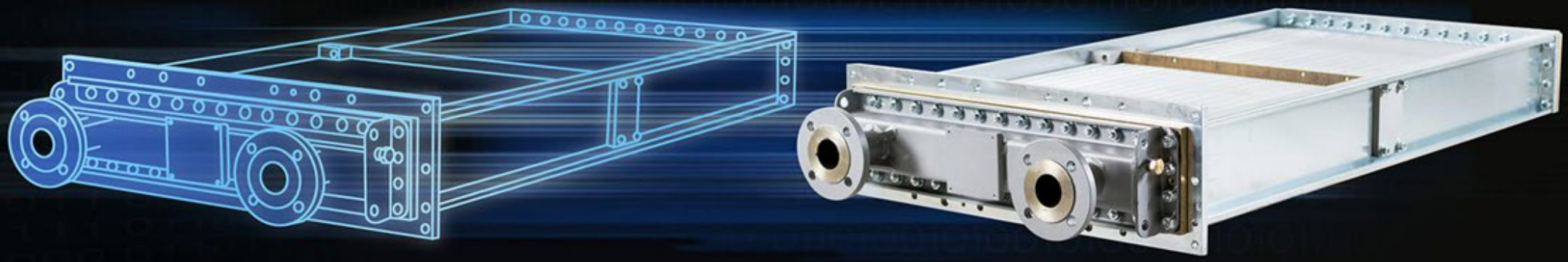
研发实验室



In our R&D Lab – Center of Excellence we find we find the solutions for tomorrow through research. Basing our product development on solid knowledge is key for us. The quality in our product are there as we is focusing on the details which are important. Therefore we cherish our patents and proudly work with story telling. We are a company based on technology.

Vestas aircoil

R&D Lab - Center of Excellence



Digital Twin

A KEY ENABLING TECHNOLOGY
OPTIMISING COOLERS AND LIFETIME ESTIMATES

With the digital twin we help our customers and make use of the knowledge we generate in our R&D lab – center of excellence. Our goal is to continuously improve our knowledge on the stresses that the coolers experience in operation and through that knowledge design coolers which perform.

References: Global Customers

全球客户列表

Future Developments 前期研发

new robot line in VARO

Total planed
Invest €3M

new / upgrade fin press in VARO+VACN

Process Automation In VARO+VACN

We have produced a cooler with quite a few temperature sensors mounted (thermocouples). This is a small but important step in our drive towards digital twins of our coolers.
The sensors are mounted in the vicinity of the walls of the coolers and shall be used for evaluation of our structural model and the local temperature distribution.

We have and will continue to invest heavily in our Center of Excellence in Lem.
This will enable us to continue our focus and development on: Power-2-X, Carbon Capture, Composite materials, High temperature coolers, Digital Twin and Surrogate Modelling.

Design and technology

Thermal calculation

3D

热力学计算，3D型

Vestas aircoil a/s

Calculations
HEEXSO Calculator
HEEXSO Spray Calculator

User: customer@customer.com
Edit profile
Logout

HEEXSO (Heat exchange software)

General

Customer:	Test customer	Revision:	
Engine type:	B33:45L9	Quotation / Order no:	
Cooler type:		Ref./Drawing no:	
No of stages:	2	Design pressure: [bar(g)]	6
No of coolers pr. engine:	1	Test pressure: [bar(g)]	9
Humidity:	Ratio / Relative	Certificate:	<None>
Humidity ratio	ISO, 6 g/Kg	Calc. with condensation:	No
		Share with Customer:	
Finside gas:	Air		
Notes:			

Materials

Tube plate:	<None>	Side plates/covers:	<None>
End cover:	<None>	Gaskets for end cover:	<None>
Reverse cover:	<None>	Gaskets for reverse cover:	<None>
Coat of water covers:	<None>	Anodes:	<None>
Support plate:	<None>	Water mist catcher::	No
Bolts:	<None>		

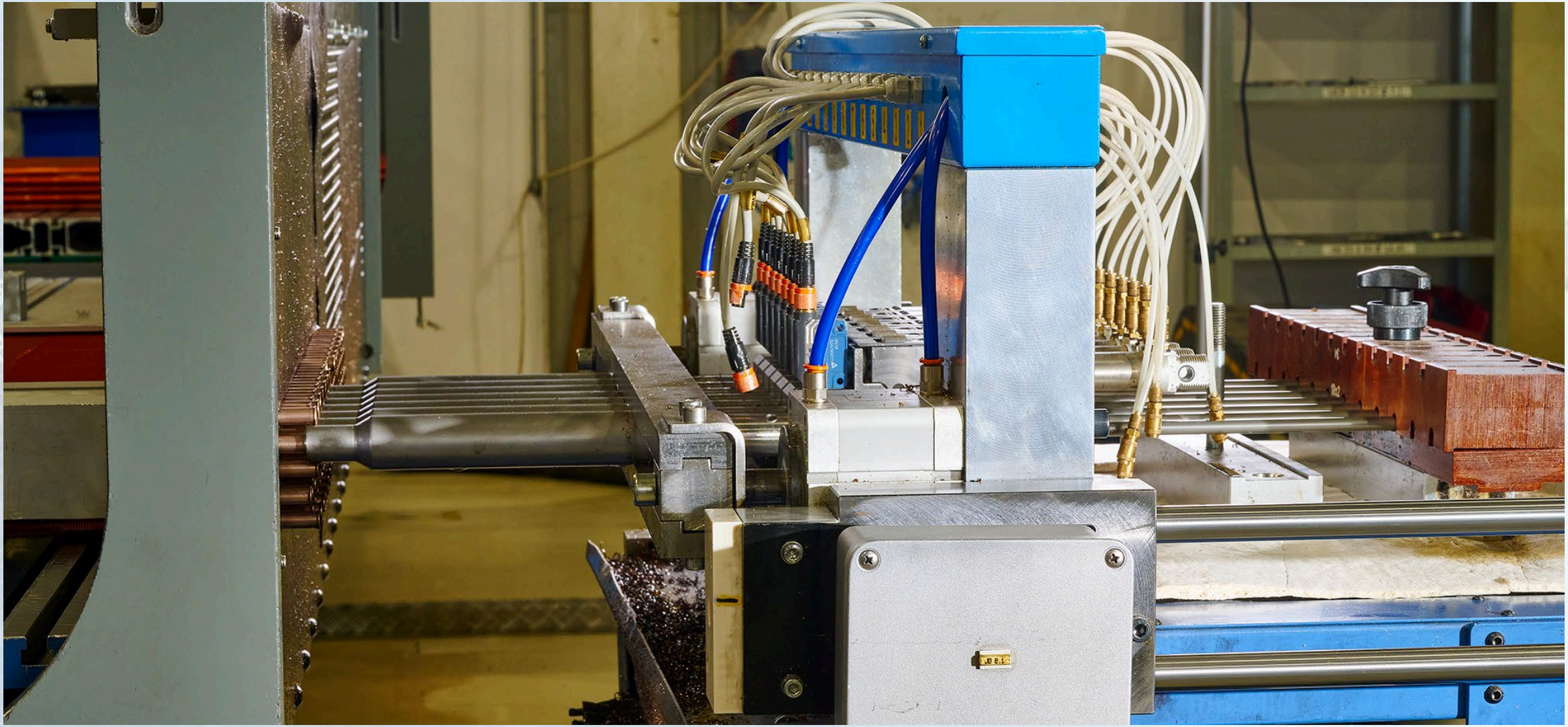
Stages

General:		Stage #1:		Stage #2:	
Fin type		1619TP		1619TP	
Tube material:		CuNi10		CuNi10	
Tube diameter (Inside - outside)	mm	9,35	10,6	9,35	10,6
Distance between fins (ptch - thick)	mm	1,48	(0,87-2,29)	1,48	(0,87-2,29)
Configuration		Cross		Cross	
Water passages	No.	2		2	
Tubes parallel to airflow, np	No.	10		10	
Tubes perpendicular to airflow, nt	No.	25		25	
Tube length, L	mm	1100		1100	
Margin:		Fouling factor		Fouling factor	
	%	10		10	
		Water	Air	Water	Air
Air side:					
Air flow (Heat diss.)	kg/s (kW)	10,2	1562	10,2	468
Temperature In	°C	250		100,26	
Temperature out (max - calc)	°C	110	100,26	55	55,07
Pressure	bar(a)	4,7		4,7	
Condensate	g/s		0		0
Pressure drop (max - calc)	Pa	2500	2161	2500	1729

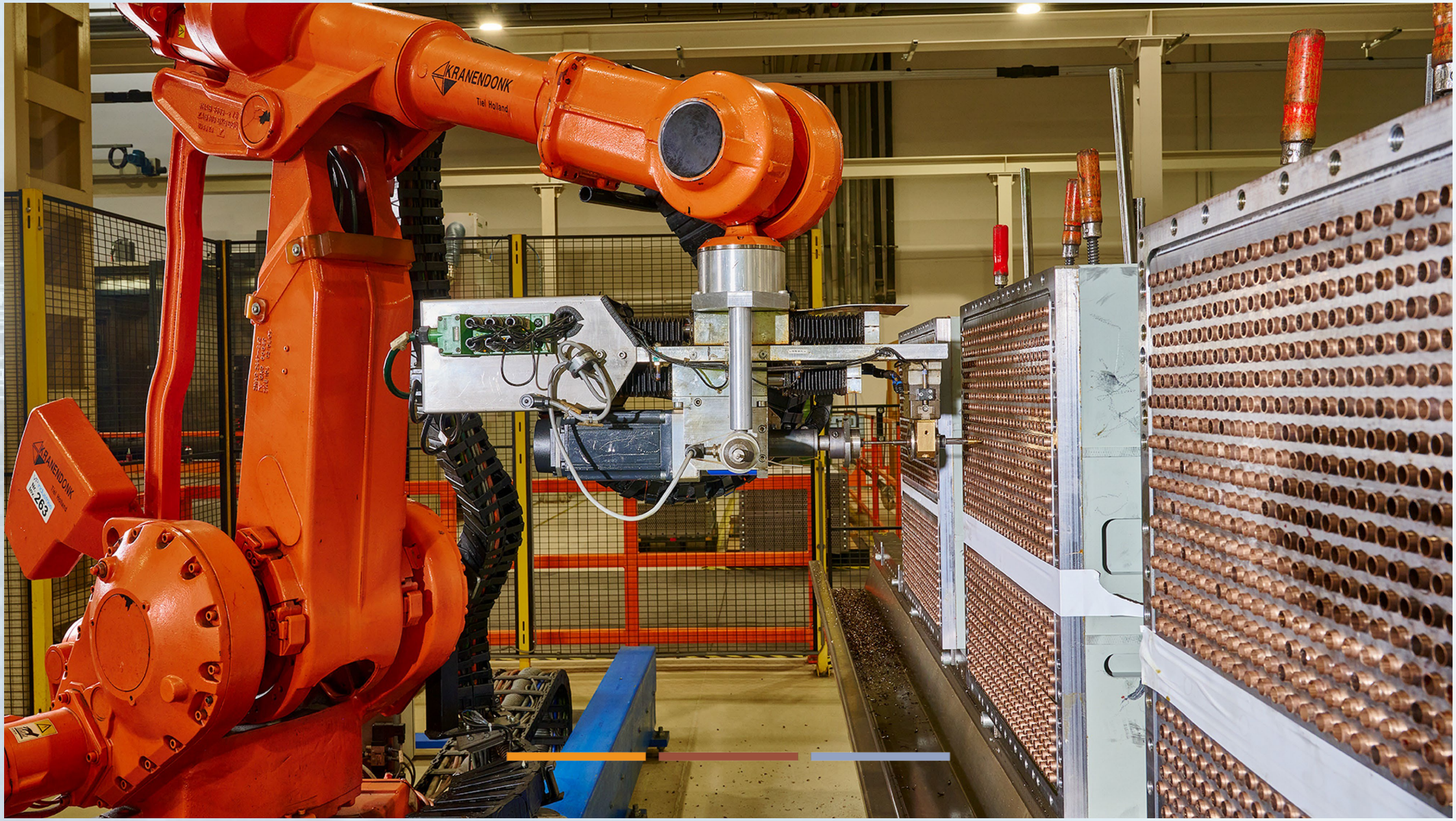
Design and technology - Elements production line 零部件产线

Design and technology – Tubes DeCoiling & straightening 换热管开卷&校直

Design And Technology – Tubes Expanding 换热管胀接



Design And Technology – Rolling & Chamfering 机械臂滚压&倒角



Production Process – Block Machining 安装面机加工

Design And Technology – Cooler Assembly 组装

va | Vestas aircoil group

Vestas aircoil A/S
Smed Hansens Vej 13, 6940 Lem St,
Denmark

Vestas aircoil US LLC
28261 Woodlawn Dr,
Punta Gorda, FL 33982
USA

Vestas aircoil Cooling Technology (Suzhou) Co., Ltd
Add: No.666 Jianlin Road,Export Progressing Zone Sub-industrial Park,
Building 8,Suzhou, 215151,
China

Vestas aircoil România
Hala 1, Parcul Industrial Braşov,
Str. Hermann Oberth 23, 507075 Ghimbav,
Romania

Vestas aircoil UK Ltd
G4A, Fort Dunlop, Fort Pkwy,
Birmingham B24 9FD,
United Kingdom