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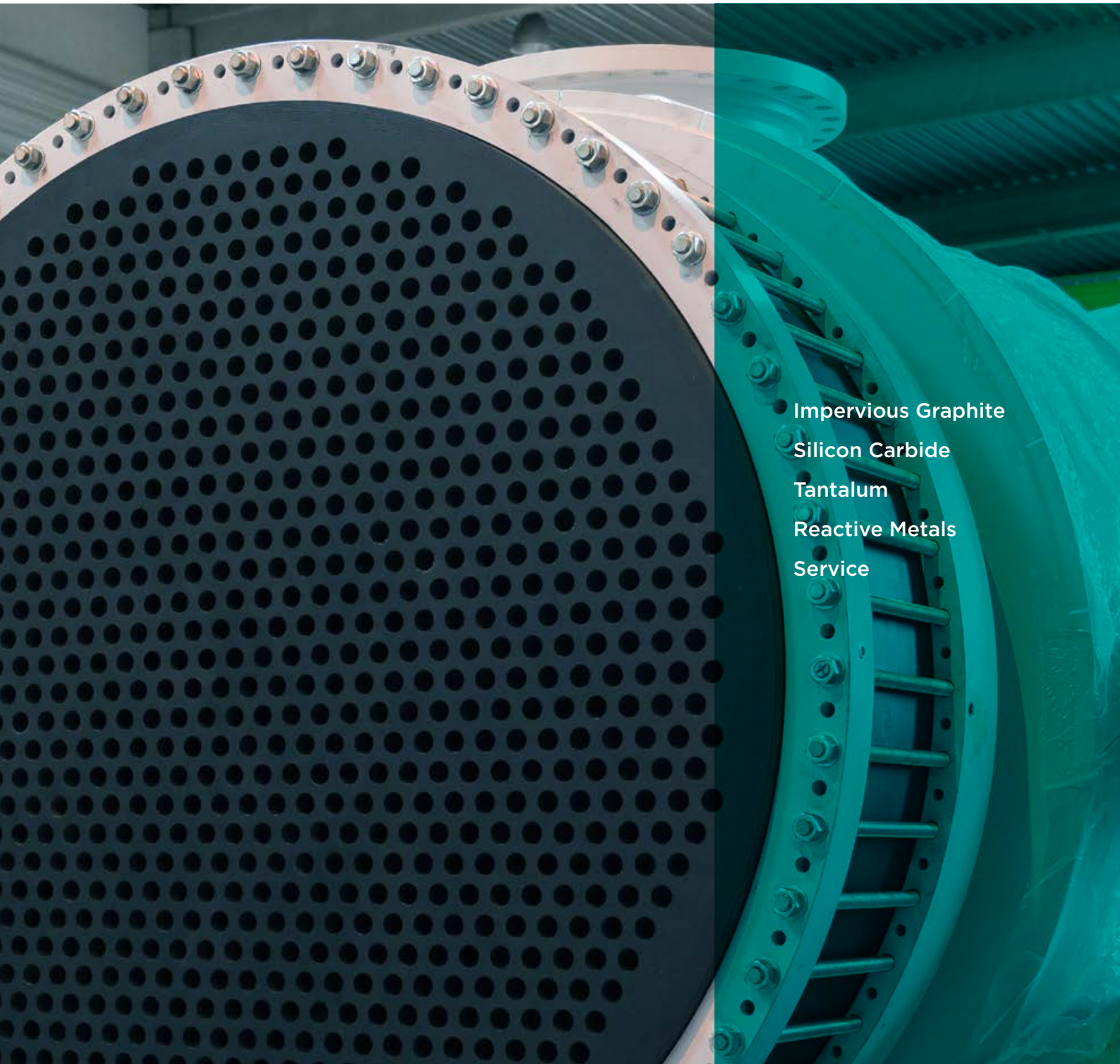
MERSEN
Expertise, our source of energy

CORROSION RESISTANT

HEAT EXCHANGERS



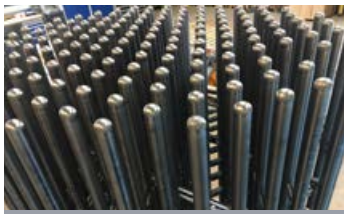
Impervious Graphite
Silicon Carbide
Tantalum
Reactive Metals
Service

SUMMARY

WORLD LEADER
IN CORROSION-RESISTANT HEAT EXCHANGERS

Mersen's Anticorrosion Equipment Division designs and manufactures a wide range of corrosion resistant heat exchanger types (shell & tube, block, plate, bayonet and coil) in corrosion resistant materials (SiC, impervious graphite, tantalum, zirconium, titanium or nickel alloys).

Being classified as pressure vessels, all our heat exchangers comply with the European Pressure Directive (PED), the ASME Pressure Vessel Code or other recognized standards. The thermal and dimensional sizing is carried out using customized software (e.g. finite element modelling).
You can count on our production sites in the USA, UK, Germany, France, India and China to manufacture the highest quality heat exchangers, as well as our local repair workshops (USA, Brazil, UK, France, Netherlands, Germany, Spain, South Africa, Korea, India, China, Turkey, Czech Republic, Australia, Indonesia and Malaysia) to fulfil all your service requests.

	HEAT EXCHANGERS			
GRAPHITE	 POLYBLOC	 POLYTUBE	 CUBIC	 ANNULAR GROOVE
SILICON CARBIDE	 BLOCK	 SHELL & TUBE	 PLATE & FRAME	
TANTALUM	 SHELL & TUBE	 COIL	 BAYONET	
ZIRCONIUM, TITANIUM AND NICKEL ALLOYS	 ZIRCONIUM	 TITANIUM	 NICKEL ALLOYS	

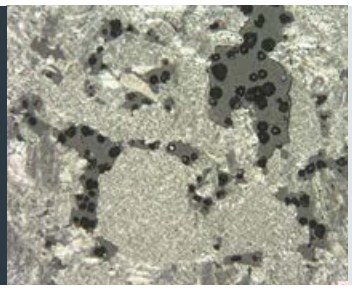
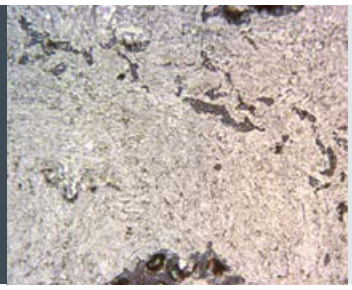
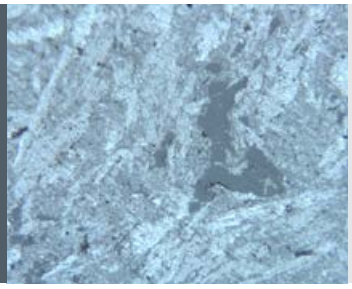
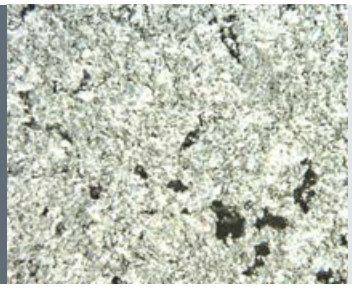
01

GRAPHILOR®: MERSEN IMPERVIOUS GRAPHITE

Impervious graphite is widely used for chemical applications, due to its excellent thermal conductivity, corrosion resistance and mechanical strength. Mersen offers the widest range of impervious graphite materials on the market, whether isostatic or extruded graphite grades.

Graphilor® XBS, XC and XTH are Mersen's isostatic impregnated graphite materials. Isostatic graphite has a very small grain size and hence very low porosity, which gives it an increased mechanical strength. Mersen produces internally its own isostatic graphite at our Saint Marys, Pennsylvania, USA and Chongqing, China plants, which guarantees full traceability and the highest quality.

Graphilor® is a unique material with phenolic resin (XBS), PTFE (XTH), or Carbon (XC) impregnation.

	MICROGRAPH	FEATURES	APPLICATIONS
GRAPHILOR® BS		Phenolic resin impregnated extruded graphite. **Maximum service temperature 200°C**	For most corrosive applications
GRAPHILOR® XBS		Phenolic resin impregnated isostatic ultra-fine grain graphite **Maximum service temperature 220°C**	Mechanically superior, for the upmost corrosive applications
GRAPHILOR® XC		Exclusive Carbon impregnated iso-static ultra-fine grain graphite **Maximum service temperature 430°C (material unique to Mersen)**	Mechanically superior, for extremely high temperature corrosive applications
GRAPHILOR® XTH		100% PTFE impregnated isostatic ultra-fine grain graphite **Maximum service temperature 250°C**	Chemically ultra-resistant, also for oxidizing applications

02

POLYBLOC®
IMPERVIOUS GRAPHITE BLOCK HEAT EXCHANGERS

Mersen has designed and manufactured block heat exchangers for over 50 years, with more than 10,000 units supplied worldwide.

FEATURES

- Graphilor® isostatic or extruded graphite grades
- Heat transfer area up to 1000 m^2
- Various block diameters: from Ø100 to 1500 mm
- Design pressure
  - Full vacuum to 7 barg on both process and service sides as standard
  - Up to 16 barg on service and up to 12 barg on process side on request
- Design temperature: from 200°C (BS), maximum 430°C (XC)
- Various drilling diameters and patterns
- Number of passes on process and service sides can be adjusted to achieve optimum velocities
- Number of blocks can be adjusted to achieve the necessary heat transfer area

BENEFITS

- Versatile, modular, and simple design
- Easy maintenance
- Large choice of graphite and impregnation grades
- Individual blocks can be replaced (no catastrophic failure)

APPLICATIONS

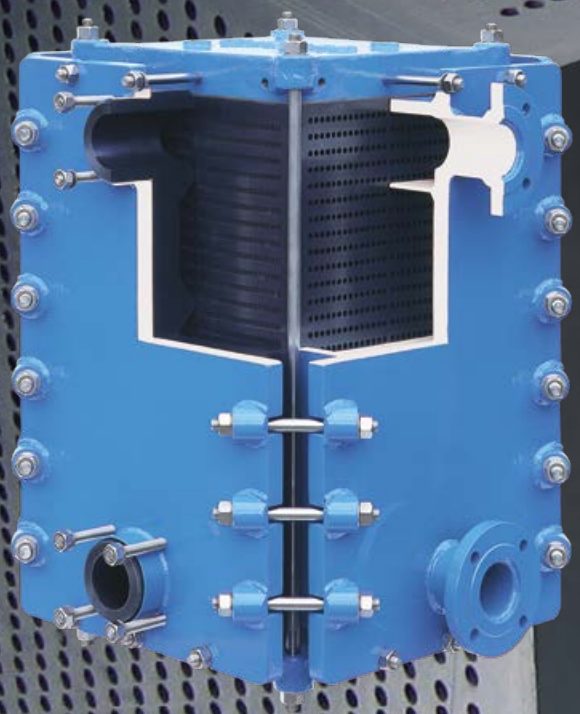
- **HEATING, COOLING, CONDENSATION, EVAPORATION (FALLING FILM OR FORCED CIRCULATION), ABSORPTION**
- **HEAVY CHEMISTRY**
  PHOSPHORIC ACID, TITANIUM DIOXIDE, HYDROMETALLURGY, VINYL CHLORIDE MONOMER, EPICHLOROHYDRIN, PLASTICS, VISCOSE, ARAMID FIBER, AND MANY MORE...
- **FINE CHEMISTRY, SPECIALTY CHEMISTRY, PHARMACY**
  ACTIVE PHARMACEUTICAL INGREDIENT, CROP PROTECTION, FUMED SILICA, SILICONES, FLAVORS AND FRAGRANCES, VITAMINS, AND MANY MORE...
- **CARBON AND STAINLESS-STEEL PICKLING**

OPTIONS

- Gas / Liquid Separation Chamber
- Header with Liquid Distribution for Falling Film Absorber
- Protection against erosion
- Dismountable Headers for easy access to the blocks for inspection or cleaning

03

HYKARB
IMPERVIOUS GRAPHITE CUBIC BLOCK HEAT EXCHANGERS



FEATURES

- Compactness - slots or double drilling on process side effectively doubling the process side surface area making units ideal for condensing duties
- Special GMP design features - fully draining, no process to service gaskets
- No hidden gaskets
- Heat transfer area: from 1m² up to 100 m²
- Various core blocks sizes: 250, 400, 500 & 600mm square and up to 1800mm long
- Design pressure up to 10 barg on process and service side
- Design temperature: from 200°C, maximum 430°C
- Different drilling diameters and patterns
- Multi pass arrangement - on both process and service side gives the most efficient thermal design using true counter-current flow

APPLICATIONS

- **HEATING, COOLING, CONDENSATION**
- **INTERCHANGER – MOST OPTIMUM SOLUTION FOR CORROSIVE FLUIDS ON BOTH PROCESS AND SERVICE SIDE**
- **FINE CHEMISTRY, SPECIALTY CHEMISTRY, PHARMACY**

  ACTIVE PHARMACEUTICAL INGREDIENT, CROP PROTECTION, FUMED SILICA, SILICONES, FLAVORS AND FRAGRANCES, VITAMINS, AND MANY MORE...

BENEFITS

- Temperature Cross Possible
- True Counter-Current Flow
- Compact Design
- Multi-Pass Optimisation
- GMP Features
- Easy to Clean and Maintain

04

ANNULAR GROOVE HEAT EXCHANGERS

FEATURES

- Heat interchange between two ultra-corrosive media.
- Wavy groove design for enhanced turbulence (optional)
- Carbon fiber reinforcement (optional)
- Heat transfer area up to 55 m^2
- Design pressure up to 10 barG on process and service side
- Design temperature up to 200°C
- Vertical or horizontal orientation

APPLICATIONS

- **HEATING, COOLING, CONDENSATION, EVAPORATION (FALLING FILM OR FORCED CIRCULATION), ABSORPTION**
- **INTERCHANGER PRIMARY & SECONDARY CONDENSERS ABSORBER**
- **HEAT RECOVERY BETWEEN TWO CORROSIVE MEDIA**
- **FINE CHEMISTRY, SPECIALTY CHEMISTRY, PHARMACY**

  ACTIVE PHARMACEUTICAL INGREDIENT, CROP PROTECTION, FUMED SILICA, SILICONES, FLAVORS AND FRAGRANCES, VITAMINS, AND MANY MORE...

BENEFITS

- Ultra-efficient heat transfer
- Compactness
- Great operational safety and reliability
- No risk of cross-contamination

05

GRAPHITE POLYTUBE® HEAT EXCHANGERS

FEATURES

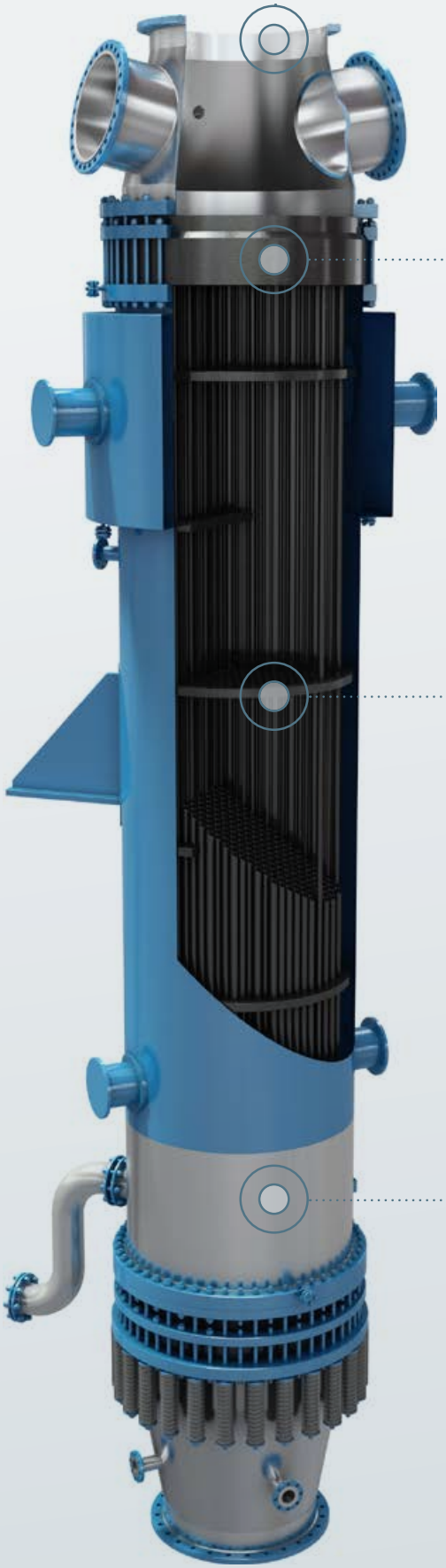
- Heat Transfer area up to 1850 m^2
- Tube Sheet Diameter up to 2100 mm
- Design Pressure: up to 7 barg on process side and up to 11 barg on service
- Design Temperature up to 220°C
- 1:1 Substitution: same Footprint as Heat Exchangers from other Original Equipment Manufacturers

APPLICATIONS

- **COOLING, HEATING, CONDENSATION, EVAPORATION (FALLING FILM OR THERMOSIPHON) AND ABSORPTION OF ULTRA-CORROSIVE FLUIDS**
- **HEAVY CHEMISTRY**
  PHOSPHORIC ACID, TITANIUM DIOXIDE, HYDROMETALLURGY, VINYL CHLORIDE MONOMER, EPICHLOROHYDRIN, PLASTICS, VISCOSE, ARAMID FIBER, AND MANY MORE...
- **FINE CHEMISTRY, SPECIALTY CHEMISTRY, PHARMACY**
  ACTIVE PHARMACEUTICAL INGREDIENT, CROP PROTECTION, FUMED SILICA, SILICONES, FLAVORS AND FRAGRANCES, VITAMINS, AND MANY MORE...

BENEFITS

- N°1 worldwide producer of graphite tubes with 50-years of experience
- Large Heat Transfer Area
- Longest monolithic Graphite Tubes in the industry
  - Superior thermal conductivity
  - Outstanding mechanical strength certified by TÜV SUD
  - Unique 6-meter jointless graphite tubes
- Protection against Erosion



HEADERS

- Headers in Graphilor®, PTFE or PFA lined steel, FRP, thermoplastic lined FRP, glass lined steel, rubber lined steel or reactive metals (e.g. titanium, zirconium or tantalum)
- Quick dismantling design option for easy access for cleaning and re-tubing.
- Special design according to the process (falling film, multi-pass process, kettle-reboiler, phosphoric evaporator or sulfuric acid dilution cooler)

TUBE-SHEET

- Protection against erosion
  - Amorphous carbon sleeves cemented into the tube sheet
  - Carbon fiber cloth (Rigilor®) bonded to the tube sheet surface
- Graphilor® 3 XC option for the most severe applications (up to 430°C)

GRAPHILOR® 3 TUBES

- 6-meter-long, monolithic graphite tubes (No joint)
- Phenolic resin impregnated graphite tubes
  - Excellent corrosion resistance
  - Superior thermal conductivity (≥ 50 W/m.K in radial direction)
  - Carbon fiber reinforced tubes (on customer request)
  - No resin film (on the inside or outside surface of the tube)
- 4 different tube diameters (25/16, 32/22, 37/25, 51/38 mm)
- Superior mechanical strength (G30-00-220)
- Guaranteed highest quality
- Every single tube is tested at 20 bar

SHELL

- Shell in carbon steel, stainless steel, PTFE or PFA lined steel (if necessary stainless steel), glass lined steel, rubber lined steel, nickel alloys or reactive metals (e.g. titanium, zirconium or tantalum)

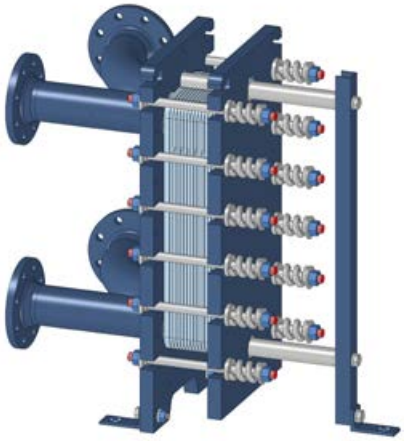
06

PRESSURELESS SINTERED SILICON CARBIDE (SIC)

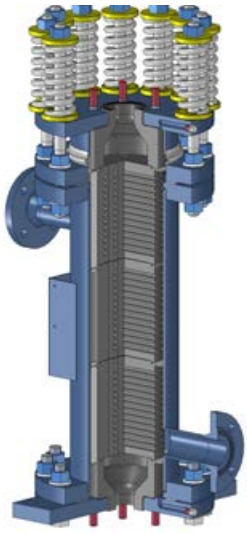
To guarantee optimal corrosion resistance and performance we only use pressureless sintered silicon carbide (SSiC) in our process equipment.

COMPLETE RANGE OF SILICON CARBIDE HEAT EXCHANGERS

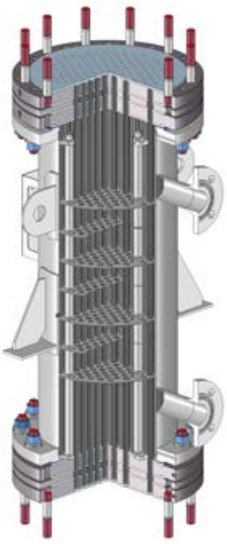
Mersen offers the largest, safest and most advanced range of 65 m2 silicon carbide heat exchangers in the industry. Our silicon carbide plate heat exchangers can be used as heaters and coolers. Our silicon carbide block and shell & tube heat exchangers can be used as condensers, coolers, heaters, evaporators and absorbers.



SILICON CARBIDE PLATE HEAT EXCHANGER, SP SERIE



SILICON CARBIDE BLOCK HEAT EXCHANGER, SE SERIE



SILICON CARBIDE SHELL & TUBE HEAT EXCHANGER, SR SERIE

FEATURES

- Outstanding corrosion resistance against all common acids, oxidizing media, and bases
- Plate, block, and shell & tube heat exchangers
- High thermal conductivity
- Good resistance against thermal shocks
- Design temperature between -60°C and +220°C
- Low total cost of ownership

BENEFITS

- Universal corrosion resistance of SSiC
- Extreme hardness leading to optimal resistance against abrasion
- Extreme purity, which makes SSiC a suitable material for electronic applications
- Good resistance against thermal shocks
- Design temperature between -60°C and +220°C

APPLICATIONS

- **CONDENSATION, EVAPORATION**
- **INTERCHANGER, HEAT RECOVERY UNIT, ACID RECEOVERY UNIT**
- **HEAVY CHEMISTRY DECHLORINATION IN CHLOR-ALKALI, ORGANIC SOLVENTS, BROMINE**
- **FINE CHEMISTRY, SPECIALTY CHEMISTRY, PHARMACY**

  ACTIVE PHARMACEUTICAL INGREDIENT, CROP, PROTECTION, FUMED SILICA, SILICONES, FLAVORS AND FRAGRANCES, VITAMINS, AND MANY MORE...

07

TANTALUM EQUIPMENT

MERSEN PRODUCES TANTALUM HEAT EXCHANGERS IN ITS DEDICATED WORKSHOP IN GERMANY. MERSEN LINSENGERICHT, THE HOME OF TANTALUM, IS DEEMED TO BE THE WORLDWIDE LEADER FOR THE MANUFACTURE OF TANTALUM EQUIPMENT.

The particular properties of Tantalum require know-how, specific equipment and highly skilled personnel. A long experience in designing, forming and welding Tantalum equipment, combined with an ethical sourcing policy, allow MERSEN to provide outstanding quality focused on meeting our customer's high expectations.

Mersen has many references for Tantalum Shell & Tube Heat Exchangers, Bayonet Heaters, U-tube Heat Exchangers, Heating/Cooling Coils, cladded and loose lined equipment as well as Interchangers for two corrosive fluids on both sides. We have the possibility to offer optimized designs for various special applications e.g. in the pharmaceutical condensation process.

The most important advantages of Tantalum compared to other anticorrosion materials are the high mechanical resistance, reliable solution with long operating time and minimum costs for maintenance (e.g. cleaning, retubing, gasket replacement).

ADVANTAGES

- Worldwide leader for the manufacture of Tantalum equipment
- Dedicated Tantalum workshops in Germany
- Highly skilled welders
- Numerous references in the most severe applications
- Custom designs to meet the customers specific requirements

APPLICATIONS

MDI/TDI, NAC/SAC,

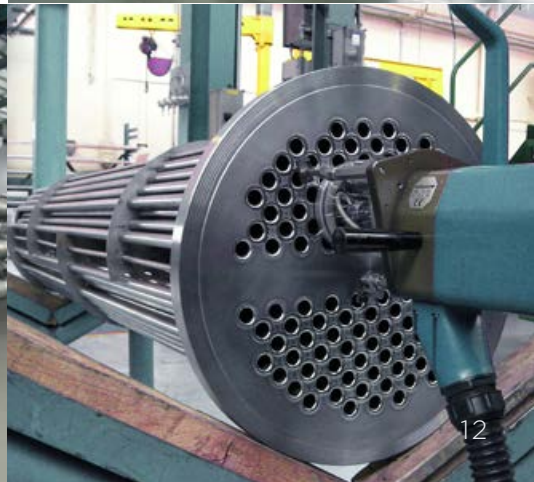
STRONG ORGANIC ACIDS, NITRIC ACID, HYDROCHLORIC ACID, PHOSPHORIC ACID, SULFURIC ACID, ACID CONCENTRATION/ DILUTION, BROMINE, PHARMACEUTICALS, PICKLING APPLICATION

08

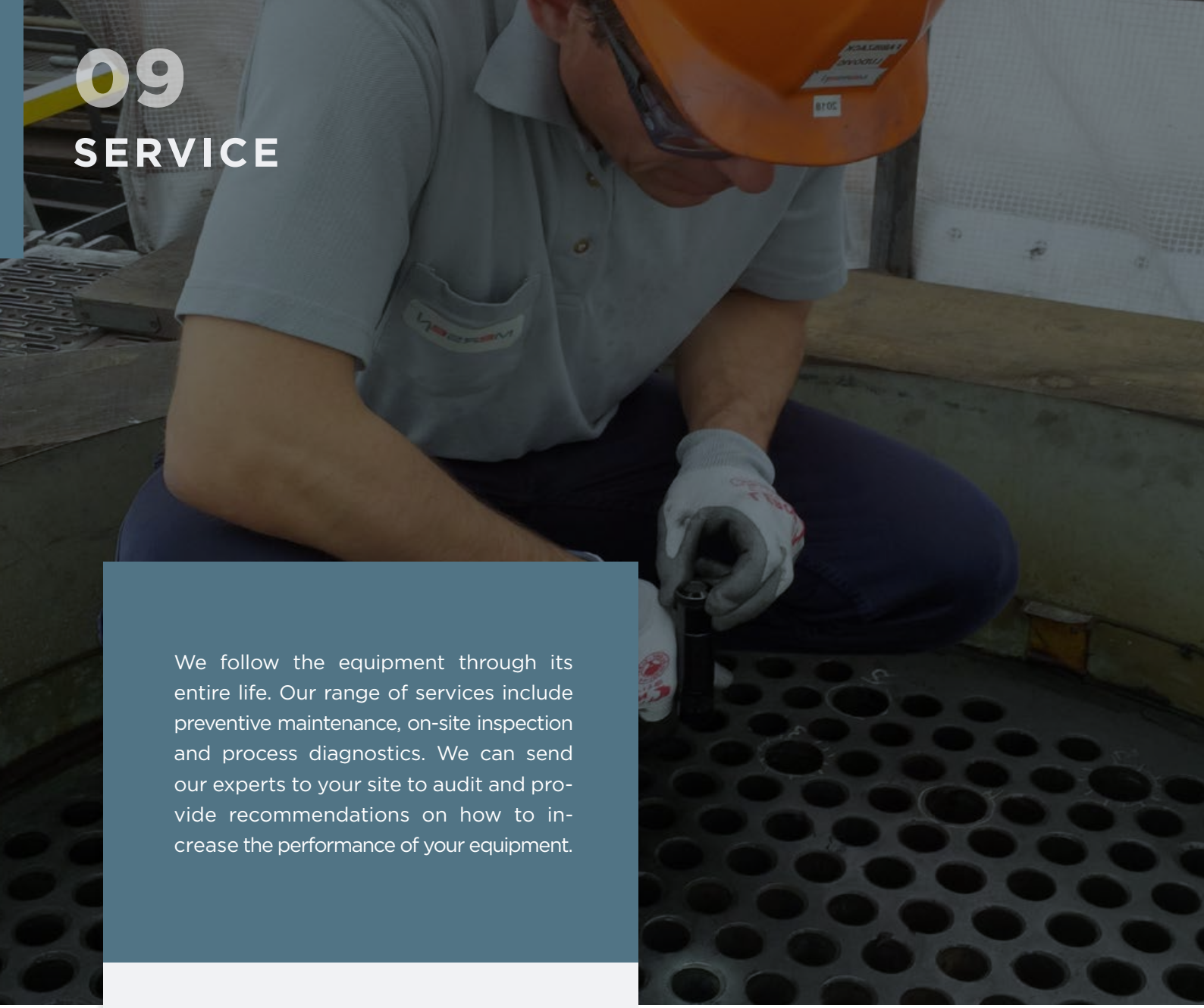
ZIRCONIUM, TITANIUM AND NICKEL ALLOYS HEAT EXCHANGERS

Mersen Xianda, located in the industrial park region of Shanghai, is a production center, equipped with the highest-level of industrial capabilities, including Waterjet Cutting machine, CNC Plasma welding and Automatic TIG welding machines for efficiency together with various inspection equipment such as Helium Leak Detector, PMI Spectrum Analyzer and Whole Element Analyzer.

For many years, both international and local customers have acknowledged Mersen Xianda as a leading manufacturer, particularly for the supply and project management of large contracts. The long experience of Mersen Xianda with many worldwide Engineering EPC companies, allows Mersen to handle international projects with various design code (ASME, EN13445, CODAP, JIS) and according to local regulations such as PED, GOST, KOSHA, etc



09
SERVICE



We follow the equipment through its entire life. Our range of services include preventive maintenance, on-site inspection and process diagnostics. We can send our experts to your site to audit and provide recommendations on how to increase the performance of your equipment.

On-site or remote service

Start up

After-sales and Maintenance

Support improvements

Audit

Training

With 19 service centers strategically located around the world, we provide immediate service to our customers.

MERSEN

WORLDWIDE LEADER IN CORROSION-RESISTANT HEAT EXCHANGERS

WHY MERSEN?

- 50-YEARS THERMAL AND MECHANICAL DESIGN EXPERIENCE
- MORE THAN 7,500 HEAT EXCHANGERS OPERATING WORLDWIDE
- MATERIAL EXPERTISE TO COPE WITH HOT CORROSIVE APPLICATIONS
- RELIABILITY AND QUALITY OF ALL ENGINEERED EQUIPMENT
- EFFICIENCY TO DESIGN OPTIMIZED SOLUTIONS
- LOW MAINTENANCE COSTS
- LONG PRODUCT LIFETIME
- MAINTENANCE AND SERVICE TO FOLLOW THE EQUIPMENT THROUGHOUT ITS ENTIRE LIFETIME

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