wieland

Enhanced tubes for the process industry

Providing efficiency for the process industry

Wieland Thermal Solutions provides enhanced heat transfer solutions to a wide range of industries

Key areas of enhanced heat transfer solutions in the process industry

– Oil and Gas Production and Processing Industries
– Petrochemical Industry
– Chemical Industry
– Power Industry
– Industrial Refrigeration

Wieland is the right partner when it comes to developing efficient and innovative solutions

Product Efficiency
Wide range of high-quality products optimized for heat transfer according to customers' requirements: inner-grooved, extruded finned and dual enhanced tubes and heat exchangers in different alloys ranging from copper and copper alloys, aluminium, carbon and stainless steel as titanium.

Know-How Efficiency
On the basis of more than three decades of experience our employees develop solutions meeting the latest technical, economical and environmentally-friendly requirements.

Development and Production Efficiency
Wieland Thermal Solutions uniquely combine the production possibilities of an international manufacturer with its own stateof-the-art Research and Development capabilities.

Wieland | Thermal Solutions
The Wieland Group, with headquarters in Ulm, is one of the world's leading manufacturers of semi-finished and special products in copper and copper alloys with manufacturing companies, slitting centres and trading companies worldwide. As part of the Wieland Group, Thermal Solutions provides sophisticated heat transfer solutions with enhanced tube surfaces and customized heat exchanger designs resulting in substantial capacity and energy efficiency improvements. Materials range from copper to carbon and alloy steel depending on the requirements in the industry.

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Optimized heat exchanger equipment

Compact and efficient for new and existing plants using low-finned and dual enhanced tubes

The optimization of heat exchanger equipment is driven by investment (capex) and operational (opex) costs and efforts

Opportunities
to optimize heat exchangers with enhanced tubes

- Reboiler both kettle and thermosiphon type
- Condenser both horizontal shellside condensation as well as tubeside condensation in fractionation and refrigeration systems
- Gas and liquid coolers
- Steam and gas reheater

Improvements
with enhanced tubes

- Reduction of volume and weight of the equipment with savings along the whole supply chain (equipment, fabrication, transportation, on-site installation)
- Increased plant performance and extended maintenance schedule for cleaning (fouling reduction)
- Efficiency improvements and heat integration reducing the CO_2 footprint

Attractive for new and existing plants

For new plants
substantial cost reduction through

- Optimization of the heat exchanger
- Savings in the construction (racks, piping, foundation, etc.)

In existing plants
a "low risk" and "low cost" option for capacity increase, leaving piping and construction unchanged, by replacement of

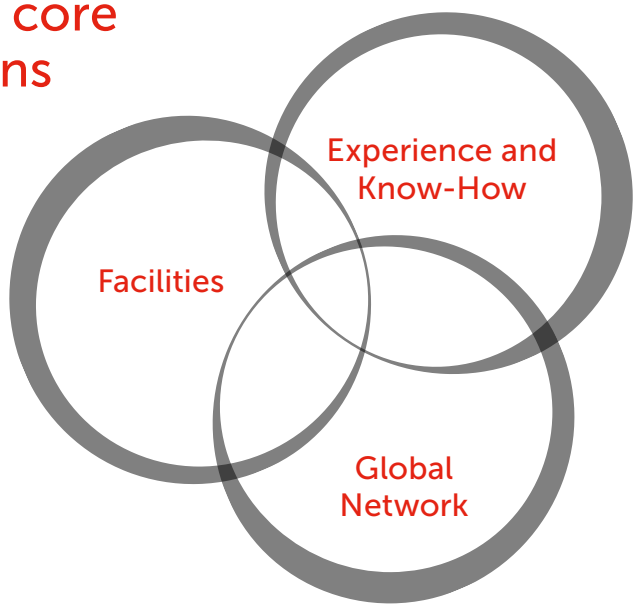
- Installed heat exchanger equipment
- Plain tube bundle only

Tailor-made solutions: Engineering service

More than 30 years of experience in developing optimal heat transfer solutions

Engineering and R&D is the core of Wieland Thermal Solutions

Excellent solutions
Combining experience and know-how from more than three decades with our own heat transfer laboratory as well as a global network of partners, allows to find excellent answers to the challenges of our clients



Experience and know-how
in heat transfer

- Wide range of skills covering enhanced heat transfer, metal working and fabrication technologies for a very target-oriented approach
- Experienced assessment of inquiries as well as product development

Facilities
heat transfer lab and R&D center

- Various test rigs for condensation, boiling and single phase heat transfer operations
- Short lead-time for product development and optimization
- High measurement accuracy

Global network
of partners

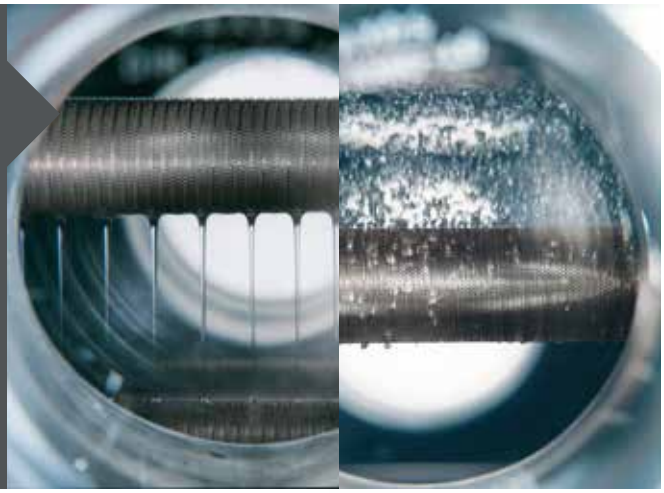
- Suppliers, clients, universities and research institutions
- Multiple on-going R&D projects and product developments
- Continuous improvement of products, skills and know-how

The thermal design and rating of enhanced heat exchangers
is based on industrial heat exchanger design software through membership of HTRI (Heat Transfer Research Inc., USA) and own Wieland applications software and correlations.

Access to a valuable support on material topics is given through the Wieland Group corporate laboratory and R&D center on material science (accredited according to DIN EN ISO/IEC 17025:2005).

Enhanced surfaces: Low-finned and dual enhanced tubes

Optimized heat transfer in a wide range of materials



Wieland GEWA-Tubes have Tailor-made enhanced surface structures

Advantages

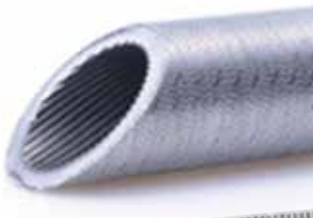
- Optimal mechanical and thermal connection of the tube and the fins, integrally connected to the root wall
- Suitable for expansion into tube-sheets as plain ends remain soft
- Equivalent simple assembly of the tubes into a shell and tube heat exchanger like a plain tube as fin tip diameter being equal to the plain end diameter
- Suitable for U-bending for U-tube heat exchanger designs

Applications

- Boiling
- Condensation
- Single phase heat transfer

Tube materials

Copper, copper alloys and aluminum, various carbon steel alloys and stainless steel grades ranging from austenitic, ferritic to duplex grades as well as titanium.



GEWA-PB, CS

GEWA-KS,

GEWA-K, 19 fpi, CS

GEWA-K, 11.5 fpi, CS

GEWA-K, 30 fpi, CS

GEWA-K, 30 fpi, SS

GEWA-K, 36 fpi, Ti

GEWA-PB nucleate boiling tube

is a dual enhanced tube for nucleate boiling at low temperature differences, used for propane chillers within the pre-cooling system of LNG plants as well as reboilers and condensers for splitter and fractionation units in ethylene plants.

GEWA-K and KS tubes

for reboilers, condensers as well as gas and liquid coolers and heaters with an outside low-fin structure and density adjusted for the respective process conditions. The GEWA-KS tube has also an internal helical fin structure.

- **GEWA-K** tubes for cases with a very large imbalance between the shellside and tubeside heat transfer coefficient.
- **GEWA-KS** tubes for cases of low tube side heat transfer coefficients or similarly low heat transfer coefficients on both sides.

Joint experience of two industry Leaders: Technip & Wieland

Improved energy efficiency and substantial savings to Ethylene and Liquefied Natural Gas (LNG) plants

An agreement based on long-term collaboration and R&D efforts

In November 2007, Technip and Wieland entered into a formal agreement to jointly market innovative heat exchangers.

This agreement followed 10 years of collaboration between these two groups to qualify dual enhanced tubes with the aim of becoming a hydrocarbon processing industry standard especially for large shell-and-tube heat exchangers for grassroots LNG and ethylene plants.

For LNG plants
these are enhanced kettle type reboilers and condensers using propane refrigerant in the pre-cooling system to cool down both the feed gas as well as the mixed refrigerant from the main cryogenic unit.

For ethylene plants
the key heat exchanger equipment is within the cold section of ethylene plants within splitter and fractionation units. Key heat exchanger items are the process reboilers and condensers as well as the refrigerant condensers.

Two types of enhanced tubes
GEWA-PB and the GEWA-KS tube, both in carbon steel:

- The **GEWA-PB** tube is for horizontal nucleate boiling shellside boiling in both thermosiphon and kettle type reboiler with clean C2 and C3 hydrocarbon fluids.
- The **GEWA-KS** tube is for horizontal shellside condensation with clean C3 hydrocarbons. Tubeside cooling is with cooling water.

More than 50 Large heat exchangers in operation

This long-term collaborative effort together with industrial references established since 2000 in the petrochemical and LNG industry contributes to making Technip-Wieland heat exchangers standard equipment in large capacity ethylene and LNG plants.

With this initial success the cooperation Technip-Wieland has proven to be a successful platform for introducing innovative enhanced heat transfer solutions in a wide field of applications for the process industry.

References across various Industries

Projects in the process industry range from the first idea to the implementation of an industry standard

Our experience is based on projects in many areas

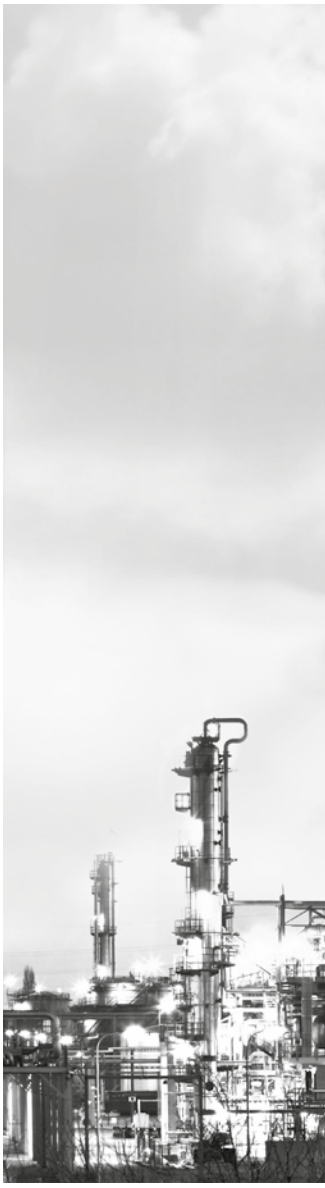
Oil and Gas production industry
– Gas/gas heat exchanger
– Compressor inter- and after-cooler
– Stabilizer reboiler

LNG Industry
– C3 refrigerant/feed-gas chiller
– C3 refrigerant/mixed-refrigerant chiller
– C3 refrigerant condenser

Oil and Gas process industry
– Crude oil preheating
– Reboiler and condenser in distillation system and
– Light-ends sections

Petrochemical and chemical industry
– Reboilers and condensers in ethylene plants
– Gas/gas heat exchanger in hydrogen plants
– BFW heater ammonia plants

Power Industry
– Turbine oil cooler
– Moisture separator and steam reheater (MSR)
– Reboiler, condenser and gas cooler (ORC plants)



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