Where energies make tomorrow

Enhanced Heat Transfer Solutions

Energy efficiency and compactness for the energy industry

T.EN TECHNIP ENERGIES

A unique enhanced heat transfer portfolio

Heat transfer is a pivotal unit operation in many industrial processes, including oil and gas production, gas processing, refining, petrochemical and others.

Enhanced heat transfer technologies serve as enablers of most compact and efficient designs to optimize CAPEX or OPEX depending on the project, which could range from greenfield to brownfield and from revamp to debottlenecking.

Field proven solutions

Technip Energies and its partners Kelvion Thermal Solutions and Wieland Thermal Solutions in the past two decades have successfully developed and implemented a wide range of enhanced heat transfer technologies in key industries such as Liquefied Natural Gas (LNG) and ethylene plants.

This success has been based on a clear market focus and long-term research and development roadmap to deploy new technologies. We cover all necessary aspects of the project life:

ONSITE PROGRAM
- Mandatory preservation program (storage, box-up, shutdown)

HEAT EXCHANGER FABRICATION
- Mandatory preservation program (storage, assembly, hydrotesti transportation onsite)
- Customer support (site visit, participation at kick-off meeting)

ENHANCED TUBE FABRICATION
- Tube fabrication / degreasing / quality control
- Corrosion protection program
- Project management and documentation

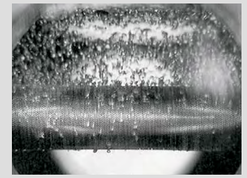
ENGINEERING PACKAGE
- Heat exchanger design
- Full design package (thermal design, detailed engineering, mechanical design and bidding service)
- Thermal guarantee

Three product lines are available today for process heat exchangers for oil and gas industry applications (LNG, ethylene, refineries, etc.)

GEWA-PB enhanced boiling tubes

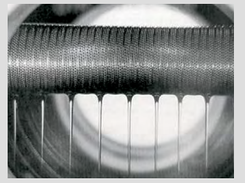
- External nucleate boiling structure
- Internal helical fin structure
- Especially suitable for horizontal shellside boiling of C_2, C_3 as well as higher molecular weight clean hydrocarbons.

Allows for minimal cold approaches together with a maximal overall heat transfer performance



GEWA-KS enhanced condensing tubes

- Externally and internally enhanced surfaces
- Horizontal external condensing of short clean hydrocarbons
- Internal available structures allowing for a robust operation with typical cooling water systems
- Lower fouling rates (e.g. refining) compared to conventional tubes



DIESTA enhanced bimetallic tube

- Dual Internally and Externally enhanced Structured Tube for Air Cooler (DIESTA)
- Enhanced external structure improving external heat transfer coefficient
- Dedicated enhanced internal structures available for viscous, fouling and clean applications
- Services ranging from gas and liquid cooling to condensation of hydrocarbon

References

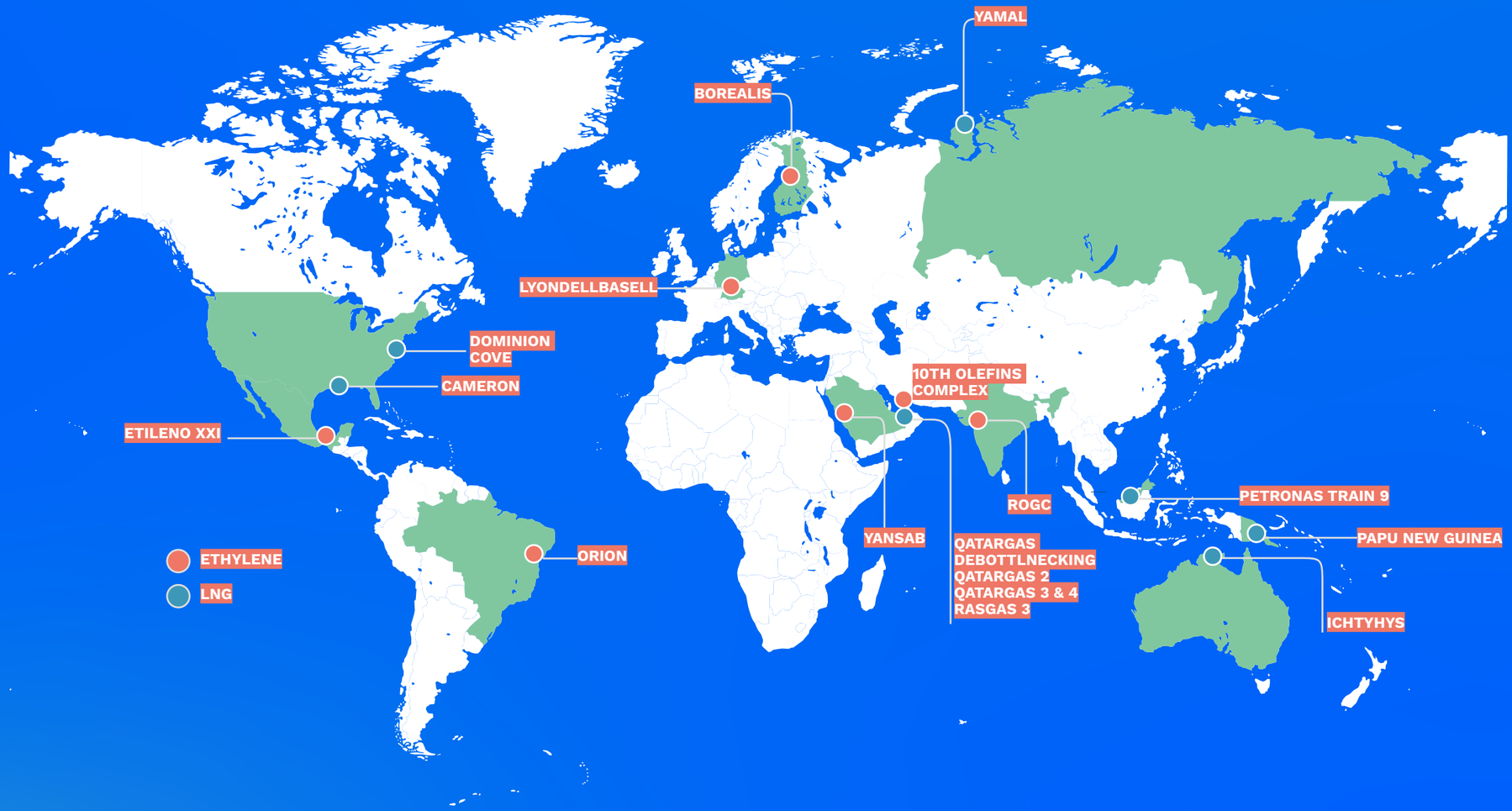
In the past 15 years, Technip Energies and its partners have supplied enhanced heat transfer technologies to major new plant constructions, revamp and debottlenecking projects. Combining LNG and ethylene plants, we have delivered approximately 150 heat exchanger equipment systems.

LNG

After our first references in Qatar, many more applications followed, accounting for about one-third of the current global LNG production capacity.

ETHYLENE

GEWA-PB and GEWA-KS tubes have been successfully implemented in major projects and in a wide range of revamp/debottlenecking projects.



“We had implemented in our Mexican complex four exchangers with Wieland Technology:

- Deethanizer Condenser – ¾" OD GEWA-PB boiling tube,
- C2 Splitter Reboiler – ¾" OD GEWA-PB boiling tube
- Ethane Vaporizer – ¾" OD GEWA-PB boiling tube
- C3 Refrigerant Condenser – ¾" GEWA-KS condenser tube.

All of them are performing well. As a precaution to guarantee a smooth performance, we suggest to take care to maintain the equipment under nitrogen all the time from fabrication until start-up.”

—Jose Luis Vela Barradas, Braskem Idesa Cracker Manager

“We have been recently upgrading our C3 splitter capacity with an open heat pump system using Wieland enhanced GEWA-PB boiling tube for the C3 thermosiphon reboiler/ condenser. Since start-up the performance early 2018 is as expected. We had been very pleased with the support by the Wieland team from the engineering phase as well as during the equipment fabrication until start-up.”

—Development Manager–Olefins

“Qatargas is using Wieland enhanced tube technologies, namely the GEWA-PB tube in the C3 refrigerant chillers and the GEWA-KS tube in the main C3 refrigerant condensers in all LNG mega trains (trains 4, 5, 6, 7). Since the start-up in 2009 with trains 4 and 5, Qatargas is extremely pleased with the functioning of these enhanced heat exchangers. We previously had very successfully utilized the Wieland enhanced GEWA-PB boiling tubes in our low pressure propane chillers to debottleneck LNG trains 1, 2, and 3, which allowed the desired LNG capacity upgrade.”

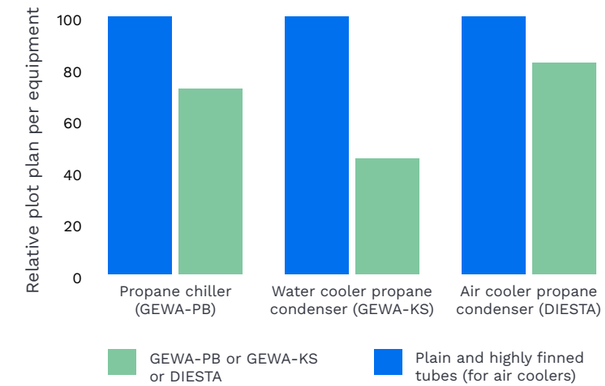
—Keith Merkley, former Asset Manager LNG Train 4 and 5, Qatargas

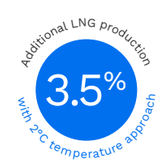
LNG production

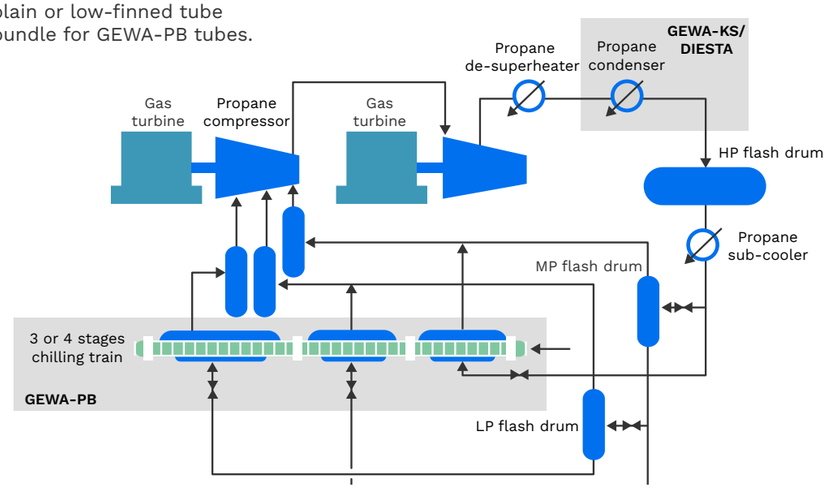
In 2019, more than 100 Mtpa of natural gas liquefaction capacity will be installed using enhanced heat transfer technologies.

Enhanced heat exchangers for propane evaporation and condensation allow the following development axis:

- Increasing compactness of heat exchangers to reduce CAPEX by lowering equipment, piping, structure and civil investment.
- Reducing CO_2 emissions and lowering power consumption (lower fuel gas consumption for turbine) to improve the sustainability of the plant.
- Increasing LNG production per unit of refrigerant compression power, which has been a goal of LNG plant developers.
- Increasing LNG production with unchanged power consumption when debottlenecking an existing plant by changing out a plain or low-finned tube bundle for GEWA-PB tubes.







Ethylene production

In the cold section of Ethane crackers, the Technip Energies-Wieland enhanced heat exchangers enable reductions in cost, energy consumption and CO_2 emissions.

Boiling and condensing applications

GEWA-PB

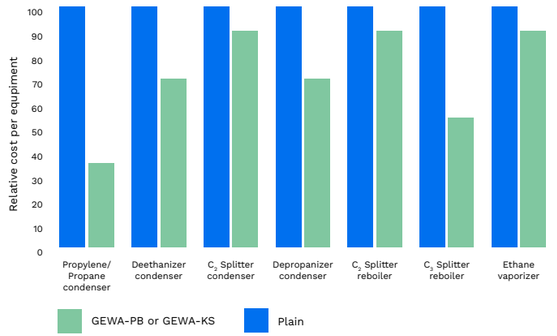
- Deethaniser condenser
- C_2 splitter condenser
- Depropaniser condenser
- C_2 splitter reboiler
- C_3 splitter reboiler
- Ethane vaporiser
- Ethylene refrigerant condenser

GEWA-KS

- C_3 splitter condenser
- Propylene / propane condenser

Cost saving

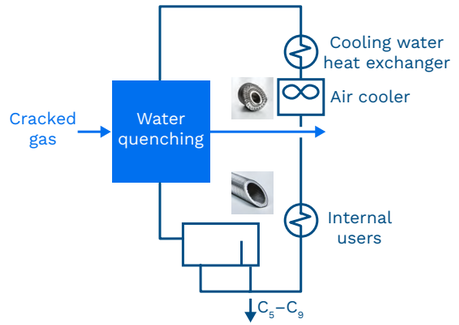
Compared to solutions with traditional plain and low-finned tubes, the Technip Energies-Wieland enhanced tubes contribute to a significant cost saving in the design of an ethane cracker.



Quench water applications

A dedicated arrangement is available for quench water heat exchangers in naphtha cracking units, generating two to three times less fouling compared to a standard design:

- Quench water heated reboilers with GEWA-PB, e.g. for C_3 reboiler
- Quench water air coolers with DIESTA



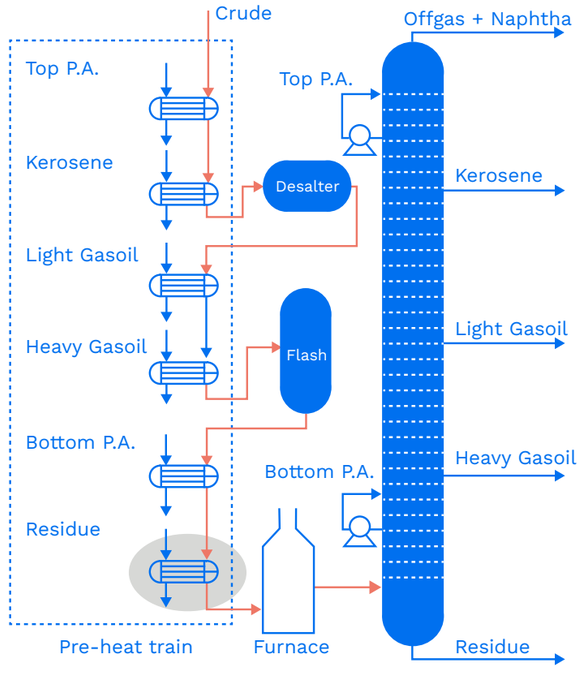
Refinery and other applications

Enhanced heat transfer technologies also are successfully used in multiple references in fouling services. With our partners and clients, we continuously expand our know-how and reference base to supply the most advanced solutions and technologies to support a more robust, reliable and energy efficient plant operation in a harsh refining environment with demanding crude oil qualities.

Fouling reduction in refineries' crude oil pre-heating trains

Crude oil fouling, especially in the hottest heat exchanger prior to the fired heater, is responsible for about 15 percent additional fuel consumption and 120,000 tonnes per year of CO_2.

Our tubes are equipped with a Low Fouling (LF) internal structure. Partnerships with Shell, Total and the CEA (French Alternative Energies and Atomic Energy Commission) have demonstrated a substantial reduction in the crude oil fouling rate by doubling the shear stress for the same fluid velocity.



Performance maximization in vacuum gas oil air cooling with DIESTA

Successful revamp and debottlenecking projects using DIESTA equipped with an LF internal structure show these results compared to a conventional technology:

Same power consumption	DIESTA/Standard
Footprint	Identical
Finned area	-20%
Weight	-4%
Ton of product/electric kW	+14%

Technip Energies

Paris
Jeremy Provost
+33 1 47 78 20 71
jeremy.provost@ten.com
www.ten.com

Wieland Thermal Solutions

Thomas Lang
+49 731 944 2957
thomas.lang@wieland.com
www.wieland-thermalsolutions.com

Kelvion Thermal Solutions

Nicolas Bilbault
+33 2 40 68 28 59
nicolas.bilbault@kelvion.com
www.kelvion.com