

Where energies make tomorrow ●

Loading Systems

Offering advanced technology, expertise
and innovation

T.EN

**TECHNIP
ENERGIES**

Loading Systems

Leading provider of fluid transfer systems for the energy industry



Technip Energies Loading Systems is a trusted solutions provider. As an offshore and LNG leader, we differentiate ourselves through quality products, innovation, unmatched engineering support structures and unrivaled after-sales services.

Technip Energies Loading Systems serves clients across the petrochemicals, gas and new energies industries from offshore facilities to refineries and chemical users. Safety and quality drive everything we do and we maintain a strong focus on developing new technology.

Since the 1950s, we have been providing marine loading arms for onshore and offshore use with different applications for the energy market. Our superior loading arms engineering has helped to distinguish us in the LNG market. We have been blazing trails in offshore and ship-to-ship transfers while providing

a full-fledged FLNG offer. We have field-proven technologies to meet any energy transition challenge.

Worldwide footprint

Global commitment, proven expertise and quality

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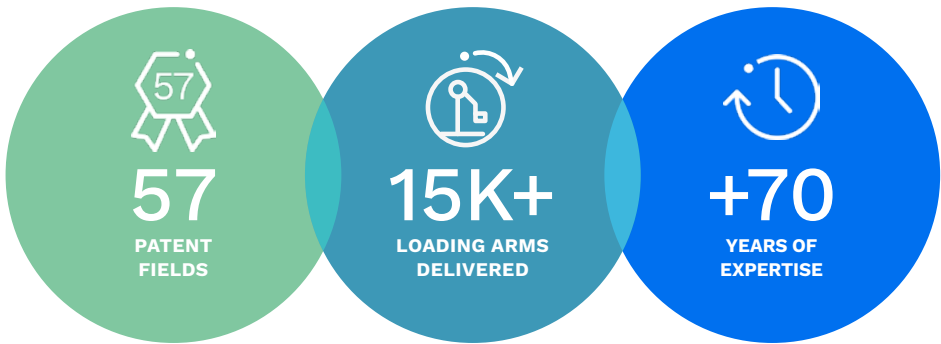
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In a nutshell

- Three certifications
 - ISO 9001: 2015 – Quality management systems.
 - ISO 14001: 2015 – Environmental management.
 - ISO 45001: 2018 – Occupational health and safety.
 - ISO/IEC 27001: 2013 - Information security management system.
- 24/7 responsive service.
- 83,000 m² main plant in Sens, France.
- Scope: Design and manufacture of loading systems for crude and refined products, chemicals, liquefied and cryogenic gases and other fluids.
- 33 highly-skilled field engineers with global coverage dedicated to rapid intervention and onsite supervision.
- Two manufacturing plants.





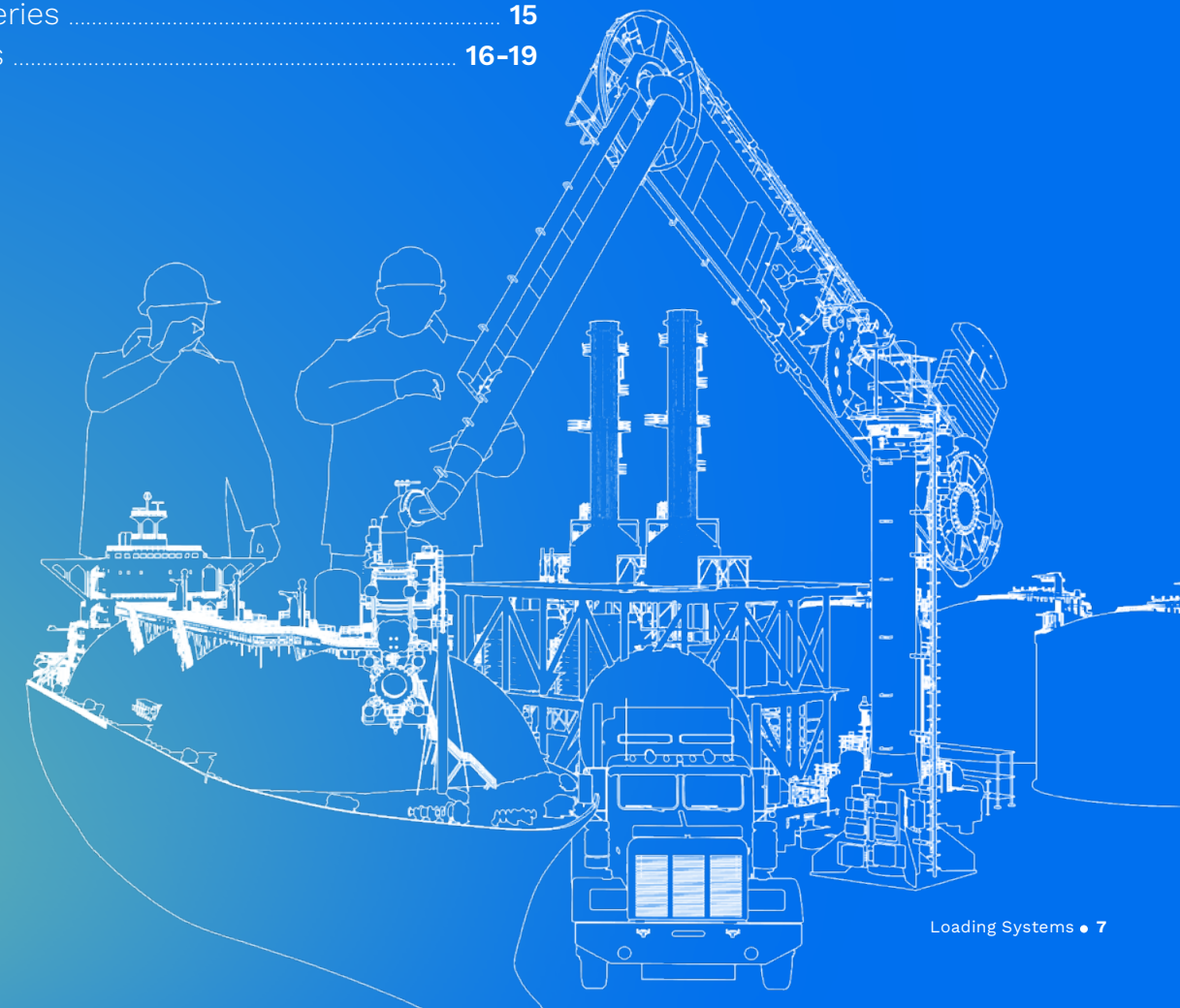
Our Products, Technologies & Services

We use advanced technology in transfer operations to offer innovative designs, systems and packages for the oil, gas, petrochemical and chemical industries. We deliver onshore and offshore loading solutions that can manage a variety of fluids and gases at normal, high and very low temperatures and at different levels of operating pressures.

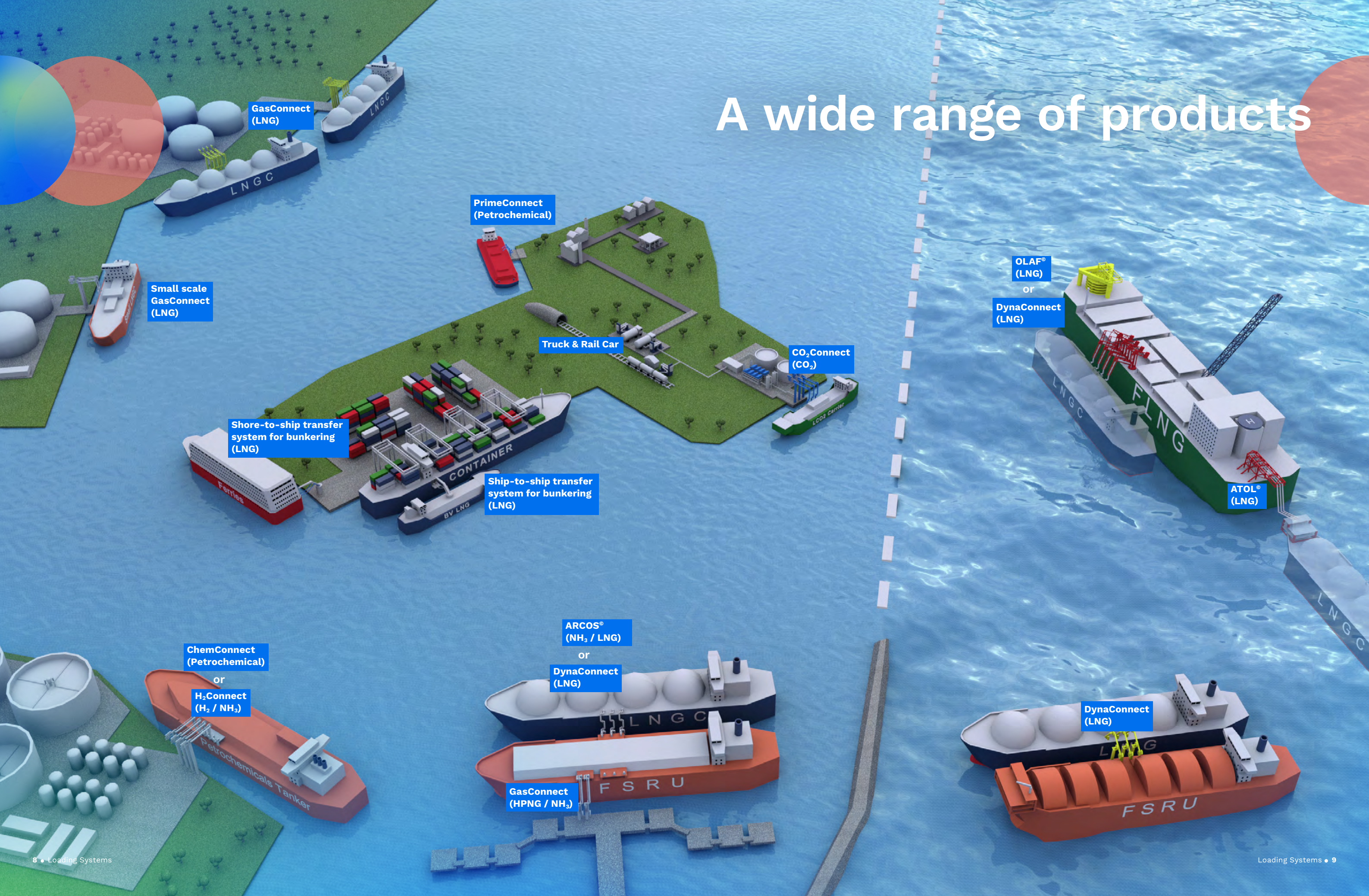
To support our high-quality products, we provide a services network of top professionals based in various locations worldwide, ensuring a personal approach to our clients and their needs.

We offer practical advice and skilled assistance throughout the life of the equipment from installation and commissioning to upgrades and major overhauls.

- Shore-to-Ship Transfer Solutions **10-11**
- Ship-to-Ship Transfer Solutions **12-13**
- Truck and Railcar Transfer Solutions **14**
- eMAX Series **15**
- Services **16-19**



A wide range of products



Shore-to-Ship Transfer Solutions

Rethinking onshore loading transfer operations with our advanced technology for all energies.

ChemConnect

Loading arms for crude oil, LPG, refined products and chemicals transfer

- Configurable loading arm design adapted for the transfer of petroleum, LPG, refined products or chemicals (including sulfuric, nitric acids, chlorine, sulfur, bitumen, ammonia, etc.)
- Applicable for liquid CO₂
- Diameter from 6" to 24" and design pressure up to 50 bars (ANSI 300)
- Self-supported product line
- Integrated control system
- Reliable and field-proven pantograph system, swivel joints, quick connect / disconnect couplers (QC/DC) and emergency release systems (ERS)
- Multiple configuration options available such as piggy back line, heat tracing system, insulation, constant position and management system (CPMS), EasyDrive, AutoDrive, electrical drives, etc...



GasConnect

LNG loading solutions

- Leader in LNG transfer systems including swivel joints, ERS and QC/DC in-house components
- LNG loading arms designed for small-to large-scale LNG transfer (from 6" to 20")
- Unique offering of complete 20" full bore
- Exposed jetties solutions with our patented technology

GasConnect

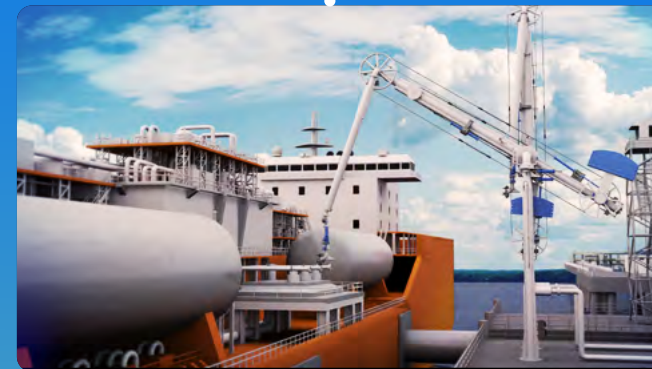
High-pressure natural gas

- Diameter: 12"
- Two design pressure classes: ANSI 600 and ANSI 900
- Heavy-duty swivel joint design with three redundant sealing levels
- Tri-redundant dynamic sealing for swivel joints to reduce maintenance and optimize availability
- Simple, reliable and safe emergency shutdown (ESD) philosophy

CO₂Connect

Loading arms for liquid and vapor CO₂ transfer

- Self-supported product line
- Diameter from 6" to 16" full bore
- Flow rate up to 4,900 m³/h
- Design pressure:
 - Low pressure: 7 barg at -46°C
 - Mid pressure: 17,8 barg at -27°C
- Manually, hydraulically or electrically powered
- Double sealing system for swivel joints safety
- Stainless steel product line to minimize corrosion risks



H₂Connect

Loading arms for liquid ammonia transfer

- Self-supported product line
- Diameter from 6" to 16" full bore
- Flow rate up to 4,900 m³/h
- Design temperature -46°C
- Design pressure up to 50 bars (ANSI 300)
- Manually, hydraulically or electrically powered



PrimeConnect

Standardized, economical loading arms solution for transferring hydrocarbons to river barges and small vessels

- Self-supported product line
- Diameter from 6" to 10" full bore
- Flow rate up 2,000 m³/h (13,000 bbl/h)
- Design pressure 19 bars (ANSI 150)
- Design temperature -29°C (-20,2°F) to +90°C (194°F)
- Manually operated
- Shipped fully assembled for transportation by truck
- Short lead time delivery
- Designed for quick installation, commissioning and startup



Ship-to-Ship Transfer Solutions

Tailored offshore transfer systems with advanced technology backed by decades of expertise

DynaConnect

A safe connection in harsh environments

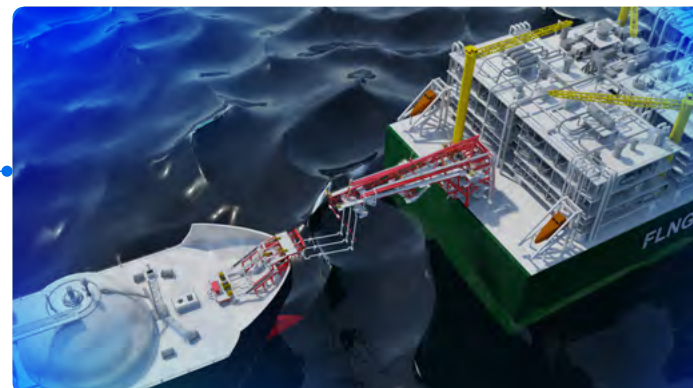
- Designed for side-by-side LNG offloading configuration from the FLNG to the carrier
- Suitable for dynamic environmental conditions with wave heights (Hs) up to 2.5m.
- Size typically 12" to 16"
- Equipped with a targeting system which enables a safe, repetitive and reliable loading arms connection and disconnection. Based on a fiber rope and stretched at a constant tension, the system guides the loading arm during its approach towards the LNG manifold flange.
- Safe connection operation with no clash risk between MLA and ship manifold
- Field-proven design with over 20 years of operational feedback



ATOL (Articulated Tandem Offshore Loader)

A full rigid transfer solution for tandem connection

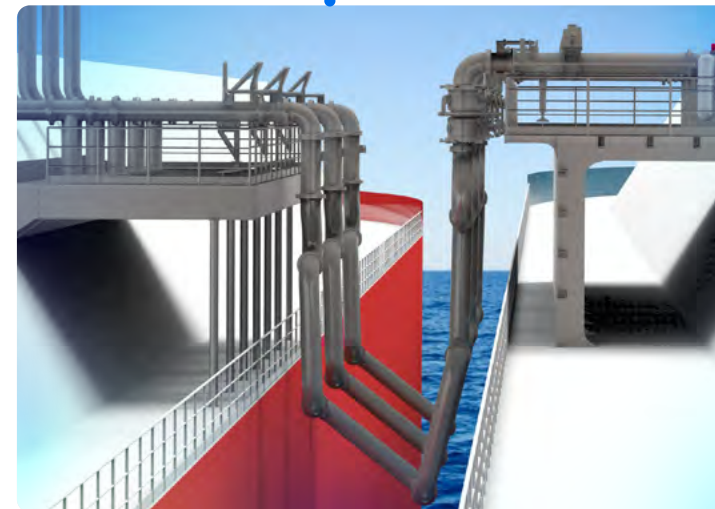
- Full rigid transfer system allowing LNG transfer up to Hs 5.5m
- Offloading rate up to 16,000 m³/h of LNG flow rate with 20" full bore product lines
- Field-proven components including constant motion swivel joints, ERS and QC/DC



ARCOS (Articulated Rigid Catenary Offloading System)

A unique combination of rigid and flexible performance for LNG transfer

- Designed for LNG transfer from FSRU/FSU/FLNG to LNGC, transshipment or permanent connection
- Suitable for dynamic environmental conditions with wave heights (Hs) up to 1.5m.
- A special combination of rigid field-proven technologies with flexible behavior.
- Improved flow performance equivalent to Marine Loading Arms.
- Faster operations with 40% time saving vs. flexible hoses solutions
- Competitive CAPEX and OPEX
- Safe operations with enhanced connection in dynamic conditions
- SIL 2 ESD capabilities
- A compact design making the ARCOS easy to remove, store and transport in ISO containers



OLAF

An innovative marine loading arm design for small carriers

- Designed for side-by-side LNG offloading configuration from the FLNG to the LNGC
- Suitable for an elevation difference between FLNG and LNGC decks exceeding 8m. (e.g. Shell Prelude FLNG).



Truck and Railcar Transfer Solutions

A full suite of single loading arms, skid-mounted loading packages and complete turnkey installations

Truck and Railcar Loading Arms



Proven and innovative solution for petroleum products, LPG, Ammonia, LNG and chemicals transfer

- Standard as well as customized loading arms
- Top/bottom loading and unloading arms
- Top-closed systems loading arms for pressurized service
- Composite spring for arms balancing
- Loading systems for special applications (e.g. heated, corrosive and toxic products)
- Innovative composite spring for arms balancing

Safety:

- Field proven
- No exposed balancing components

Performance:

- Quick connection and disconnection operations
- High flow rate performance

Operation:

- Easy weight setting and precise balancing
- Connection / disconnection with minimal effort

Integrated Skids



Efficient and safe transfer for LCO₂, LNG trucks, railcars loading and unloading

As a pioneer in LCO₂ and LNG transfer solutions, we provide loading arms and integrated skids for loading and unloading LCO₂ and LNG trucks and railcars with a high flow performance, quick connection and disconnection and safe transfer with full system control and monitoring by the terminal.

eMAX Series

Unlock the future by elevating your loading arm user experience with electric, monitoring, automatic and X – Cross applications

eMAX Series: A New Era for Loading Arms

Our vision is to improve our clients' user experience with marine loading arms and map the road to unmanned operations and targeted maintenance interventions.

EASIER OPERATIONS

- Reduction of human exposure and improvement of operational safety
- Reduction of operator training requirements
- Reduction of manning requirements
- Reduction of operations duration
- Reduction of material damage and environmental risks due to misoperation

SIMPLER MAINTENANCE ACTIVITIES

- Simplify integration on jetty
- Log operations data, learn and improve
- Detect and alert operations team of abnormal arm behavior
- Customize maintenance schedule
- Redirect operations team from corrective / preventive maintenance to predictive model

Available for new equipment and for overhaul



AutoDrive



Monitoring Arm Status



Electric Drives






Developed with our exclusive partner



Key references




Sinopec Tianjin LNG (Phase 1 & 2)

 China  2015 & 2020  2018 & 2021
Nine marine loading arms delivered in two phases for one of the biggest LNG terminal in China.






STAR Refinery 4

 Turkey  STAR RAFINERI A.S.
 2014  2016
Thirty-four marine loading arms delivered and associated field services for the \$5.6 billion Star Refinery project (SOCAR Turkey Aegan Refinery), one of the biggest project in the Middle East and North Africa.

Petronas FLNG (Satu & Dua)

 Malaysia  2013 / 2014  2017 / 2021
LNG offshore loading arms for Satu (first worldwide operational FLNG facility) and Dua FLNGs.

Al Zour LNG Import Terminal

 Kuwait  Jan 2017  2021
 **ENGINEERING:** Hyundai Engineering Company
 **END :** Kuwait Integrated Petrochemical Industries Company (KIPIC)
Delivery of two sets of four 20" full bore LNG loading arms for the LNG import terminal in Al-Zour.





Shell Prelude

 Australia  Shell
 2012  2019
The world's largest offshore floating facility, including seven 16" marine loading arms (four LNG and three LPG loading arms).





Basra Oil Export Terminal

 Iraq  2017  2019
 Gulf Commercial Group for Basra Oil Company (BOC)
24" marine loading arms delivered and the associated field services as part of the refurbishment of the crude oil export jetties of the Basra Oil Export Terminal in Iraq.

Northern Lights

 Norway  2021  2023
 Aker Solution for Equinor
Three world first marine loading arms 8" to transfer liquid CO₂.

Porto de Açu

 Brazil  Acciona Industrial
 2019  2020
Two 12" high-pressure natural gas marine loading arms for the 3GW LNG to power project of Gas Natural Açu (GNA).

 Location |  Client |  Award |  Startup

Acronyms glossary

ALLS: Amplitude LNG Loading System
ARCOS: Articulated Rigid Catenary Offloading System
ATOL: Articulated Tandem Offshore Loader
CPMS: Constant Position and Management System
DCMA-S: Double Counterweight Marine Arm Structure
eMAX: electric Monitoring AutoDrive X Apps
ERS: Emergency Release System
ESD: Emergency Shut Down
FLNG: Floating Liquefied Natural Gas

FSRU: Floating Storage Regasification Unit
LNGC: LNG Carrier
MLA: Marine Loading Arms
OLAF: Offshore Loading Arm Footless
PLS: Parallel Loading System
PMI: Preventive Maintenance Inspection
QC/DC: Quick Connect / Disconnect Couplers
RPA: Remote Piloted Aircraft
T&RC: Truck and Railcar

First-rate Services

Supporting our clients' loading system operations from start to finish

FIT-FOR-PURPOSE GUIDANCE AND ASSISTANCE

Technip Energies Loading Systems' extensive experience with installation and maintenance offers valuable services throughout the life of our clients' equipment.

New projects

Installation, commissioning and assistance in first shipments

Existing installations

New requirement upgrades and safety measures

Aging installations

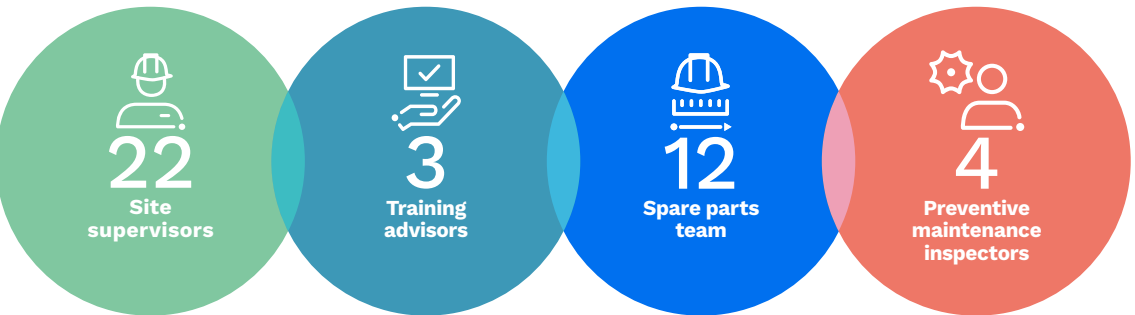
Major equipment overhaul operations

Throughout the life of the installation

Preventive maintenance inspection and expertise (PMI)

Our long-term commitments to our clients give us a unique understanding of their needs. We listen to you and strive to make a difference every step of the way.

LOADING SYSTEMS SERVICES TEAM



Upgrade and Revamp



T.EN Loading Systems offers reliable retrofits and upgrades to enhance your equipment and meet industry standards, featuring a wide range of options with the latest technologies.

- Maintenance cost optimization
- Customized solutions to extend the life of the loading arm
- Technical documents and support
- Management of technical issues with dedicated action plans

Spare Parts



- Providing a wide range of supplies for new and older systems.
- Ensuring a minimum stock of standard spare parts like packings and seals to secure short lead times.
- Supporting clients with consumption forecasts, order management, parts delivery and personalized spare parts management packages.

Training



Our training services are customizable and available on-site, online, or at our Sens facility in France.

- Courses covering operations, maintenance and troubleshooting
- Mechanic, electric, hydraulic and control system logic
- Theoretical training and practical exercises
- Customized training qualification certificates

Through our SquirrelEyes solution, we also offer a fully immersive training experience via virtual reality with different live and online training scenarios that can be customized to real client assets and environments.

Preventive Maintenance Inspections (PMI)



Our preventive maintenance inspections are designed to optimize loading systems maintenance, extend equipment life, ensure safe and efficient operations and define short-, mid- and long-term maintenance actions. With our **EagleEyes** solution, we can help significantly reduce downtime and eliminate working at dangerous heights.

- Reduced jetty downtime
- No special preparation or scaffolding required
- RPA fly permission managed by T.EN Loading Systems
- Detailed full HD live broadcasting
- More than 200 checks performed
- Digital tools supporting the intervention
- No need for working at threatening heights

For clients preferring to inspect assets or intervene with their own experts, T.EN Loading Systems can support you with our **TigersEyes** solution. It provides more service flexibility and faster assistance with deeper insight between field technicians and loading systems experts, real-time interactions and a dedicated interactive software to facilitate live troubleshooting via shared screen and augmented reality.

SERVICES AGREEMENT

We provide complete maintenance, repair and overhaul services for all installed loading systems based on different types of contracts adapted to our clients' specific needs.

Main benefits:

- Reduced maintenance costs
- Optimized operability
- Negotiated fixed rates
- Forecasted annual maintenance costs
- Quick support
- Tailored service and maintenance agreements
- Access to our digital web portal **Beyond LS**

Typical maintenance contract:

- Preventive maintenance inspections
- Training
- Routine corrective maintenance
- Emergency services
- Technical advisory services
- Major equipment overhauls
- Fully detailed report including recommendations
- Remote assistance

With our master services agreement, you get access to our digital web portal **Beyond LS** that gathers all our current services in one place, offering instant access to information and prompt assistance.



Three key apps provide personalized technical support:



PROJECT ORIGINAL DOCUMENTATION



MY CONTRACTS & ORDERS



ADVANCED TECHNICAL SUPPORT (ATS)

To support our global services commitments, our helpdesk gives direct access to our Loading Systems technical experts.

ats-loadingsystems@ten.com

Additional apps and digital services are under development.



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