Enhance Oil, Chemicals, LPG and LNG transfer and production using innovative and field proven Trelleborg bonded hose solutions
Trelleborg group, leader of elastomers

For over 100 years, Trelleborg is a global industrial company developing world-leading solutions in advanced polymer technology.

Our research and development centers around the world are constantly searching for new and better solutions for sealing, damping and protecting.

Thanks to extensive knowledge of our customers and their industries, Trelleborg is able to provide unrivalled expertise and comprehensive application knowledge.

Trelleborg is a Swedish group organized around 4 Business Areas:
Present in 40 countries, employing 20,000 people. Certified ISO 9001 and ISO 14001, Trelleborg is running over 120 manufacturing plants.

Trelleborg Oil & Marine flexible hoses for Crude Oil, Chemicals, LPG and LNG marine transfer

Trelleborg Oil & Marine is the leading supplier of innovative and field proven large-bore bonded hoses for Crude Oil, Chemicals, LPG, Cryogenic LNG.

We provide full service worldwide through all life cycle – engineering studies, delivery of complete solutions (hoses and ancillary equipment), on-site supervision, and recommendations for installation, maintenance and repairs.

We are a technology and innovation driven company that makes hoses with unrivalled and undisputed performance.

Our bonded hoses are designed and built with cutting edge technologies used in tire technology and aerospace, with high resistance to extreme operating conditions and severe fatigue.

Key features include a nippleless and helix-free design, steel armor cables (instead of textile fabrics) and continuous liner, integrated bending stiffener with built-in gaskets.

Maintenance contract
Inspection and tests for requalification, planned maintenance and inspection, cleaning operations, bolt tensioning check, repair works, recommendations on use of lines.

Marine services
Assembly/disassembly operations, marine operations, repair works, towing, change-out.

On-call services
Correct diagnosis ensures proper treatment, telephone support, technical support, onboard services.

Our main customers
BP
CONOCOPHILLIPS
EXXONMOBIL
PERENCO
PETROBRAS
SAUDI ARAMCO
SHELL
STH
SUMED
TOTAL
WOODSIDE

Flexible water intake hose
KLELINE™
TRELLINE™
REELINE™
Trelleborg
Oil & Marine flexible hoses

**Calm Buoys and Terminals.**
Since its inception in 1975, Trelleborg has developed a full KLELINE™ portfolio of OCIMF single and double carcass solutions.
We have fulfilled the requirements related to tanker and FPSO offshore offloading: tandem, reeling, chute, catenary, floating flare for shallow and deep water projects.
For long service life and challenging applications, we have developed in 2008 TRELLINE™ API 17K for floating and submarine hoses.

**Reeling Systems.**
In 2003 we have launched REELINE™ the first large diameter hose designed specifically to be reeled and built without nipples and with integrated flanges combined with integrated bend stiffeners.
It is available with either OCIMF or API 17K certification. Our REELINE systems have an impressive long service life track record.

**FPSO suction hoses.**
In 2006 we have qualified and delivered Flexible water intake hose: the first large bore water suction hose with integrated hypochlorine lines to cool down the FPSO’s with the ability to pump cool water over 100 m depth along with long service life. API 17K certification is also available.

**Deep water OOL (Oil Offloading Lines) API 17K.**
Starting in 2000 we, jointly with SBM offshore, have developed the TRELLINE™ - OOL transfer system.
This system, for long service operation, 10 to 25 years and in diameters up to 30”, pionee rs the use of bonded hoses to provide the cargo transfer link between a deep water moored FPSO and its adjacent deep water export terminal.
For most deep water applications the flexible TRELLINE™ system renders the use of rigid steel pipelines or flexible unbonded long length systems obsolete. It is also a most economic and easily installed system requiring minimal equipment.
As of today we have built over 1000 TRELLINE™ hoses and executed several API 17K certified projects in both shallow and deep water all over the world.

**LNG transfer for FLNG.**
2009 has seen the launch of the TRELLINE™ – LNG development project to meet our customer demands and allow them to exploit offshore (remote) gas fields through FLNG.
TRELLINE™ – LNG is being developed to cover the full spectrum of offloading configuration including aerial, side by side, tandem, floating and submarine.
It will be ready for LNG and cryogenic service in extreme operating conditions and severe fatigue generated by sea motion – as TRELLINE™ is known and recognized for in the offshore industry we proudly serve.
Early 2010, the 12” TRELLINE™ – LNG was completed.
We are now testing and qualifying the 20” according to EN 1474 plus very specific fatigue tests jointly defined by leading contractors and major oil and gas companies.

**LPG FS0/FPSO.**
In 2008 we have developed and successfully commissioned TRELLINE™ - LPG (Butane and Propane) as our customers reported that OCIMF LPG hoses were not able to last more than 6 months in harsh sea environment combined with a severe fatigue for the LPG FPSO and terminals.
Flexible water intake hose

Submarine seawater suction hoses with integrated hypochlorine lines for FPSO’s cooling applications with an expected long service life with no maintenance.

Available with API 17K certification.

The first FPSO sea water suction hose with built-in hypochlorine lines

Flexible water intake hose
FPSO’s critical cooling applications

Specific flange design
- Built-in bending stiffener at each flange
- Internal and external rubber gaskets integrated within the flange
- Corrosion free: no contact between seawater and steel flanges

Installation controlled (field proven)
- Horizontal assembly on rotating trolleys
- Vertical assembly on specific platform
- Torque tightening with hydraulic wrenches

Flexible water intake hose

- Armour metallic carcass to cope with fatigue and long service.
- Hose structure designed with steel rings reinforcement to avoid collapsing (important for suction operation).
- Built-in hypochlorine lines.

Large flow rate for water cooling
Integrated hypochlorine line
Integrated Bending Stiffener on all flanges
No maintenance
Long service life

API 17K
ID from 24" to 40"
Max. section length 40'

FPSO’s critical cooling applications
Submarine and floating hoses for all terminals and FPSO's applications.

OCIMF certified.

- Nipple and helix free, kinkable or reinforced, field proven floating and submarine lines in the most severe environments and operations

KLELINE™
CALM, ALP, CBM, Tandem, SALM applications

Single Dual Carcass, Double Carcass
- Integrated rubber gasket
- Easier assembly
- Continuous rubber liner
- Armour metallic structure uncoupling pressure effects and dynamic loads
- Available with kinkable or collapsable structure
- Integrated bending stiffener and steel rings reinforcement for severe applications
- Light weight
- Small outside diameter
- Leak detection systems for floating and submarine lines

Unique nippleless design with integrated flange.
- Increase flexibility for service in harsh water.
- Long service life.

KLELINE™
OCIMF
ID from 6" to 30"
Max. section length 40'

Calm, ALP, CBM, Tandem, SALM applications
**TRELLINE™**

Submarine and floating hoses for long service life (10/25 years) for the most stringent applications in shallow or deep water. *API 17K and OCIMF certified.*

➡ Designed for Oil, LPG and LNG transfer with a demonstrated service life without any maintenance

**TRELLINE™**

OOL (deep offshore), Flowline, Shallow Water, Calm Buoys, LPG, LNG applications

#### Theoretical demonstration and qualification with tests
- Mathematic modeling of the hose structure
- Dynamic resistance and fatigue ability
- Structure adapted to environmental conditions specific to each site

#### Specific flange design
- Built-in bending stiffener at each flange
- Internal and external rubber gaskets integrated within the flange
- Corrosion free and high thermal insulation: no contact between seawater, hydrocarbon and steel flanges
- Reinforced structure by steel rings between the 2 carcasses

#### Installation controlled (field proven)
- Horizontal assembly on rotating trolleys
- Vertical assembly on specific platform
- Torque tightening with hydraulic wrenches

➡ Pressure drop
Due to its smooth bore, the pressure drop in the TRELLINE™ is minimal which reduces the booster pumps size needed on a FPSO.

➡ SPM design
Due to its low suspended weight, the SPM buoy size and anchoring can be reduced which leads to significant savings on the equipment and installation.

➡ Transportability
Hose sections can be transported using conventional transport means, as opposed to large carrousels required for unbonded flexible lines.

➡ Assembly and installation
Assembly is possible on or near shore or directly offshore. The TRELLINE™ requires light installation means in any case.

➡ Offshore repair
Due to the fact that the TRELLINE™ consists of hose sections, the offshore repair is both practicable and cost efficient.

➡ Cost
The combination of capital, transportation and offshore installation costs makes the TRELLINE™ solution commercially very attractive compared to other solutions.

➡ Delivery
The delivery time is shorter than other OOL systems.

➡ Assembly
Full encased flanges eliminate corrosion
Integrated Bending Stiffener on all flanges
Integrated rubber gasket
Continuous rubber liner
Long service life

*ID from 6" to 36"*
*Max. section length 40'*
REELINE ™

Submarine and floating hoses for reeling applications.
API 17K and OCIMF certified.

- Designed with no nipples and integrated flanges to be fitted on the smallest FPSO reels

**REELINE ™**

**Reel applications**

**Specific flange design**
- Built-in bending stiffener at each flange
- Internal and external rubber gaskets integrated within the flange
- Corrosion free: no contact between seawater, hydrocarbon and steel flanges
- Reinforced structure by steel rings between the 2 carcasses

**Cost effective solution**
- Smaller reel overall dimensions.
- Compact and small capacity of hydraulic power unit and braking system.
- More space on deck available for other equipments.
- Equipments above the reel will be compact and light.

**Structure adapted for reeling systems**
- Small diameter of winding up (1.4 x Hose ID)
- Winding up on 2 layers
- Designed to smoothly integrate Marine Breakaway Coupling
- Reduced weight of the string: smaller and cheaper reel
- Minimized maintenance (storage on reel: line protected)

**Installation controlled (field proven)**
- Horizontal assembly on rotating trolleys

**Small permanent winding up diameter**
(1.4 x Hose ID)

**Reduced weight of the string:** smaller and cheaper reel

**Minimized maintenance (storage on reel:** line protected

**Integrated Bending Stiffener on all flanges**

**Long service life**

API 17K / OCIMF

ID from 6" to 24"
Max. section length 40'

Cost effective solution

- Low bending moment due to short flange length.
- Continuous diameter: no hoses or drum damage.
- Hoses with integrated flanges: no need of large hose body, less buoyancy material, light weight hose, more flexible hose, no damage from flange to other hoses or reel.

Cost effective solution

- Smaller reel overall dimensions.
- Compact and small capacity of hydraulic power unit and braking system.
- More space on deck available for other equipments.
- Equipments above the reel will be compact and light.

Cost effective solution