



# Enhance Oil & Gas Transfer applications

**Enhance Oil & Gas transfer applications**  
using innovative and field-proven solutions  
**[www.trelleborg.com/fluidhandling](http://www.trelleborg.com/fluidhandling)**

# Trelleborg group, **leader in polymer solutions**

Trelleborg is a world leader in engineered polymer solutions that seal, damp and protect critical applications in demanding environments.

Its innovative engineered solutions accelerate performance for customers in a sustainable way.

The Trelleborg Group has annual sales of about SEK 21 billion (EUR 2.3 billion, USD 3.2 billion) in over 40 countries.

In addition, Trelleborg owns 50 percent of Trelleborg Vibracoustic, a global leader within

antivibration solutions for light and heavy vehicles, with annual sales of approximately SEK 14 billion (EUR 1.55 billion, USD 2.2 billion) in about 20 countries.

The Trelleborg share has been listed on the Stock Exchange since 1964 and is listed on NASDAQ OMX Stockholm, Large Cap.

[www.trelleborg.com](http://www.trelleborg.com)

## **The group** comprises **5** business areas

► Trelleborg Coated Systems



► Trelleborg Offshore & Construction



► Trelleborg Wheel Systems



► Trelleborg Industrial Solutions



► Trelleborg Sealing Solutions



# Trelleborg Fluid Handling Solutions

## **Trelleborg Fluid Handling Solutions is part of Trelleborg Industrial Solutions.**

With over 1,000 employees and a head office located in Clermont-Ferrand, France, Trelleborg Fluid Handling Solutions is a leading developer, manufacturer and supplier of low and medium pressure industrial hoses, oil and marine hoses, rubber sheeting and matting and expansion joints based on advanced polymer technology.

We provide the optimum high performance solutions for every situation with production sites in France, Spain, Sweden, Brazil and Turkey.

Trelleborg Fluid Handling Solutions offers a very large range of competitive products, solutions and services that meet your needs and requirements for all types of applications.



### **► Your Partner for Fluid Handling**

Trelleborg Fluid Handling Solutions is organized around 9 applications areas:

- **Oil and Gas**
- **Construction and Mining Equipment**
- **Energy**
- **Chemical, Pharma and Food**
- **Agriculture and Farms**
- **Environment and Cleaning Waste Water**
- **Processing Equipment and Machine Tools**
- **Industrial Transportation**
- **Life Science**

This enables better reactivity to adapt our offer to fast moving application or to design special solutions tailor-made for you. In all cases we follow closely legal requirements or standard evolutions.

### **► Our logistics platform: availability, reactivity and reliability**

Over 5000 different items are stored in our 3 logistic platforms in Clermont-Ferrand (France), Trelleborg (Sweden) and Izarra (Spain) to meet your need for immediate and reliable delivery.

### **► Our research and development centers through continuous innovations**

Located in France and Brazil for Oil & Marine Hose, France and Sweden for Industrial Hose and Spain for Rubber Sheeting/ Matting and Expansion Joint, our R&D centers provide innovating solutions for compound, finished products and customized solutions.

All production sites are well equipped with laboratory, test bench and calculation centers to provide ready-to-use solutions based on our experience of the applications and competences.

### **► Our couplings technical centers**

With location all over Europe (Germany, Norway, Sweden and France), Brazil and China we offer a large range of rubber hose assembly, composite hose, Stainless Steel or PTFE hose with dedicated service (24 hours to 48 hours delivery) and accessories.

### **► Trelleborg Oil & Marine Hoses**

**Trelleborg Oil & Marine is the leading supplier of innovative and field-proven large-bore flexible bonded hoses for crude oil, chemicals, and LPG/LNG offshore transfer applications.**

Trelleborg Oil & Marine provides full service worldwide through global life cycle – engineering studies, delivery of complete solutions (hoses and ancillary equipments), on-site supervision, and recommendations for installation, maintenance and repairs. Trelleborg Oil & Marine is a technology and innovation driven company that makes flexible bonded hoses with unrivalled and undisputed performance.

Our products are designed and built with cutting edge solutions used in tire and aerospace industry, with high resistance to extreme operating environments and severe fatigue conditions. The acquisition of a Brazilian company in 2011 in Sao Paulo enlarged and completed the range of products and technologies. In Brazil, the business focuses on specially designed oil hoses for floating and submarine applications in order to answer the strongly growing local offshore oil and gas extraction industry.

**Trelleborg Oil & Marine provides a wide range of products specifically designed for demanding applications with long service life and high level of reliability:**

**One team, two world class factories,  
in France and Brazil,  
serving the global Oil & Gas transfer and offloading business**



São Paulo, Brazil



Clermont-Ferrand, France

**In order to help you to accelerate the development of your business, our service list also covers**



| Compounding formulation | Hose configuration modeling | Finite element calculations | Hose design

| Hose testing (pressure, bending, elongation resistance, ...) | Hose certification (PED, ADR, REACH, ...) | Handling and storage instructions

| Installation instruction and supports | Hose inspection and refurbishment | Hose failure analysis

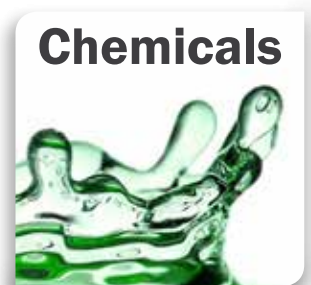
| After sales support | Training for sales team | Training for assembly workshop operators



**REELINE** *[advanced solutions for oil transfers in demanding conditions]*

# Oil & Marine flexible hoses

Trelleborg Oil & Marine inovative and field-proven hoses for offshore applications:

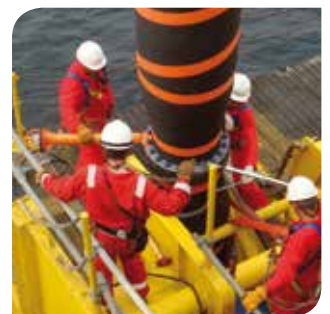


## Our main customers

- |                  |                |                |
|------------------|----------------|----------------|
| ★ AKER SOLUTIONS | ★ PETROBRAS    | ★ SEVAN MARINE |
| ★ APL            | ★ EXXONMOBIL   | ★ SHELL        |
| ★ BP             | ★ MODEC        | ★ SOFEC        |
| ★ BW OFFSHORE    | ★ PERENCO      | ★ SONATRACH    |
| ★ CNOOC          | ★ SAIPEM       | ★ SUMED        |
| ★ CONOCOPHILLIPS | ★ SAUDI ARAMCO | ★ TOTAL        |
| ★ ECOPETROL      | ★ SBM OFFSHORE | ★ WOODSIDE     |

## Maintenance contract

- △ Inspection and tests for requalification.
- △ Planned maintenance and inspection.
- △ Cleaning operations.
- △ Bolt tensioning check.
- △ Repair works.
- △ Recommendations on use of lines.





# Water applications



A dynamic splash of water in shades of blue and white, creating a sense of movement and freshness. The water droplets are captured mid-air, with some larger droplets falling and others smaller ones floating.

## Seawater suction hoses for FLNG and FPSO cooling applications

In 2006, Trelleborg Oil & Marine has qualified and delivered the SWILINE hose for sea water. Intake systems: the first large bore water suction hose with integrated hypochlorine lines to cool down the FLNG and FPSO process with the ability to pump cool water over 300 m depth along with long service life.

For this application, API 17K certification is available.



Dedicated Solution: **SWILINE hose**





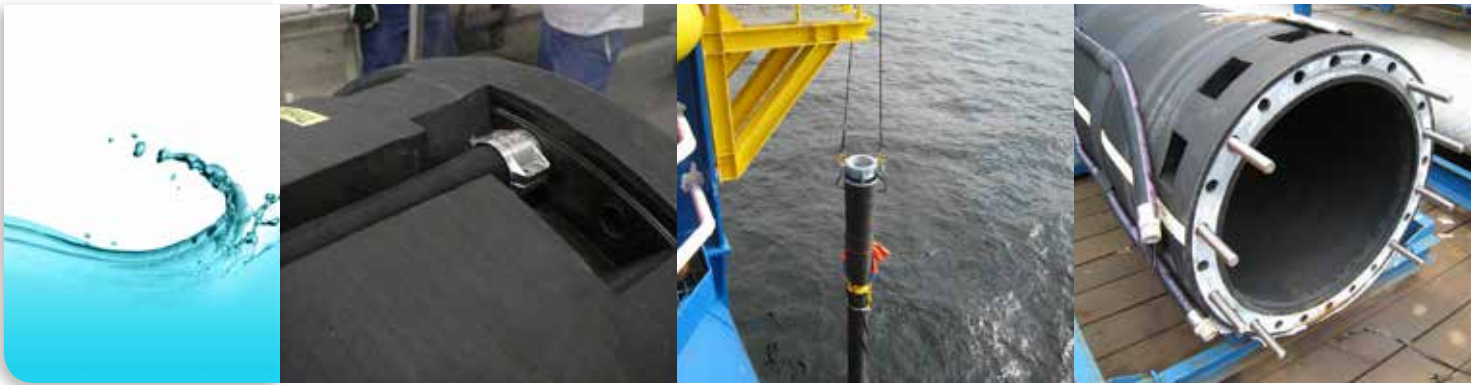
# Swiline Hose

**The SWILINE hose is a submarine seawater suction hose for FLNG and FPSO cooling applications.**

*With built-in hypochlorine lines and expected long service life without maintenance.*

**API 17K certified**

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



## Easy to install

Horizontal assembly on rotating trolleys or vertical assembly on specific platform requiring light installation tools.

## Key features

Large bore to fulfill with water cooling flowrate requirements.

Long service life of 10 to 25 years without maintenance.

Built-in hypochlorine lines.

High resistance to tension and fatigue loads.

Flanges fully embedded in rubber eliminating corrosion.

Integrated bending stiffener on all flanges.

Specific flange design with integrated rubber gaskets.



SWILINE





# Oil applications

## Calm buoys and terminals

Since their inception in 1975, KLELINE hoses have been used worldwide on offshore terminals. As a reliable field-proven technology, KLELINE hoses fulfill the requirements related to tanker and FPSO offshore offloading systems.

Based on nipple flanges and helix design and available with single and double carcass, SEALINE hoses are a reliable alternative to KLELINE hoses, should our customers require bonded flexible hoses with nipple flanges and/or double carcass structure.

For challenging applications, TRELLINE hoses are the ultimate solution for both floating and submarine configurations as they provide long service life without maintenance.

## Deepwater oil offloading lines

Trelleborg Oil & Marine has been developing since 2000, jointly with SBM Offshore, the TRELLINE Oil Offloading Lines (OOL) transfer system.

Designed according to API 17K standard allowing long service operation of 10 to 25 years and available in diameters up to 36", this solution pioneers the use of bonded hoses to provide the cargo transfer link between a deepwater moored FPSO and its adjacent export terminal.

For most deepwater applications, the TRELLINE system renders the use of rigid steel pipelines or flexible unbonded risers obsolete.

It is a system which is economic and easily installed, requiring minimal equipment.

**Dedicated Solutions:**

**KLELINE & SEALINE hoses**  
**TRELLINE hose**

**TRELLINE hose**





## Reeling applications

Early in the 2000's, Trelleborg Oil & Marine has launched REELINE, the first large diameter hose designed specifically for reeling applications with integrated flanges, without nipples and combined with integrated bending stiffeners.

Trelleborg's REELINE solutions have an impressive long service life track record.

## Flowlines and jumper hoses

As a reliable alternative to steel pipes, TRELLINE is an economic – for short and medium distances – and easy-to-install solution for flowline application in significant water depths.

For stringent applications, TRELLINE API 17K solution has been also successfully commissioned as dynamic risers and jumpers hoses on tanker loading systems or submerged loading systems in harsh environments.

**REELINE hose**

**TRELLINE hose**

**KLELINE is a submarine and floating hose for terminals and FPSO applications in the most severe environments and operations.**

*Based on 40 years of field-proven technology all over the world.*

**GMPHOM 2009 certified**

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



## Key features

About 40 years of references worldwide.

Resistance to fatigue thanks to high properties steel wire cords.

Nippleless flanges bringing continuous bending stiffness.

Helix free design.

Steel rings reinforcement for severe applications.

Continuous inner liner with integrated gaskets.

Integrated bending stiffener for demanding applications.

Design available with standard, reinforced and extra reinforced flanges depending on the service conditions.





# Sealine Hose

**SEALINE is a submarine and floating hose for terminals and FPSO applications in the most severe environments and operations.**

*With single and double carcass, nipple flange and helix design.*

**GMPHOM 2009 certified**

**ID from 6" to 20"**

Max. section length 40'



## Key features

Available with single or double carcass.

Polyurethane outer cover for abrasion resistance.

Design according to GMPHOM recommendations with nipple flanges and helix steel wires.

Inner liner made of NBR rubber offering full sealing solution.

Reinforcement composed of polyester cords to withstand static and fatigue loads.

SEALINE double carcass hoses are provided with leak detection system using electronic or mechanical sensor technology.



SEALINE

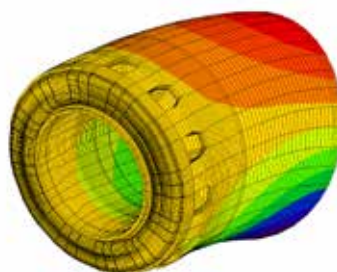
# Trelline Hose

**TRELLINE is a submarine and floating hose for the most stringent applications in shallow or deepwater.**

*A field-proven and innovative alternative for Oil Offloading Lines based on API 17K certification. With long service life without maintenance.*

**API 17K certified**

**ID from 6" to 26"**  
Max. section length 40'



## Innovative solution

Trelline is an innovative and cost-effective alternative for Oil Offloading Lines offering major technical, commercial and project execution advantages over other types of OOL solutions:

- Transportability, installation and maintenance.
- Cost effective solution (low capital, transportation and installation costs).
- Short delivery time.
- Very attractive from the perspective of overall terminal optimization.

## Key features

Trelline technology has been used as OOL solutions on several deepwater projects, as it has numerous advantageous features compared to unbonded hose and steel pipe technologies, among them:

- Field-proven technology.
- Reliable technology based on API 17K certification.
- High resistance to fatigue and long service life.
- High thermal insulation properties and a corrosion-free solution.
- Specific and unique design optimized for OOL application.
- Harsh environment compliance.
- Large bore for oil transfer requirements.
- Easy installation and maintenance operations (onshore or offshore).



TRELLINE



**REELINE is a submarine and floating hose for reeling applications.**

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

**GMPHOM 2009 certified**

**API spec 17K compliant**

**ID from 6" to 24"**

Max. section length 40'



## Cost effective solution

Smaller reel overall dimensions.

Allowing small capacity of hydraulic power unit and braking system.

More space on deck available for other equipments.

Compact and light equipments above the reel.

Reduced weight of the string leading to smaller and cheaper reel.

Continuous external diameter avoiding drum damages.

## Specific design for reeling application

Designed to be fitted on the smallest FPSO reels.

Specifically adapted for reeling application: light and highly flexible design.

Specific flanges reinforced by integrated bending stiffener.

Internal and external integrated rubber gaskets.

Flanges fully embedded in rubber to eliminate corrosion.

High resistance to foreseen loads: tension, bending, collapse ...

Designed to smoothly integrate marine breakaway coupling.

Long service life.



# Gas applications

## **Floating and submarine hoses for LPG transfer**

Trelleborg Oil & Marine offers floating and submarine hoses specially designed for LPG (butane and propane) transfer in flowline, shallow water, CALM and reel configurations for the most stringent applications.

Trelleborg Oil & Marine has a strong track record of continuous service in demanding environments for LPG transfer.



**Dedicated Solution: CRYOLINE LPG hose**





## A key component for offshore LNG offloading solutions

Combining its unrivalled expertise in both composite and rubber-type hoses, Trelleborg Oil & Marine has developed a specific hose-in-hose design with high flexibility and long service life for LNG tandem offloading systems.

The qualification program according to EN 1474-2 standard is expected to be completed in 2012.



Dedicated Solution: **CRYOLINE LNG hose**



# Cryoline LPG Hose

**Submarine and floating hoses specially designed for the most stringent LPG transfer applications: flowline, shallow water, CALM and reel configurations.**  
*The longest LPG hoses service life you can get in the market.*

**Based on GMPHOM 2009 certification**

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



## Specific design for LPG application

Integrated flanges reinforced by integrated bending stiffener.

Specific and continuous ultra high molecular weight polyethylene inner liner with integrated gaskets.

Temperature range from - 50 °C to + 85 °C.

Operating pressure up to 50 barg.

High fatigue performance components.

Specific permeability test program performed to analyze gas permeation risk.

Specific pressure test with propane gas to prevent explosive decompression risk.

## Key features

Flanges fully embedded in rubber to eliminate corrosion.

Designed for harsh sea environment combined with severe fatigue conditions.

Already successfully commissioned on several offshore LPG transfer terminals.



# Cryoline LNG Hose

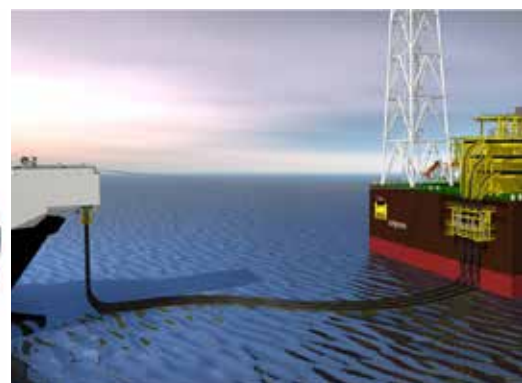
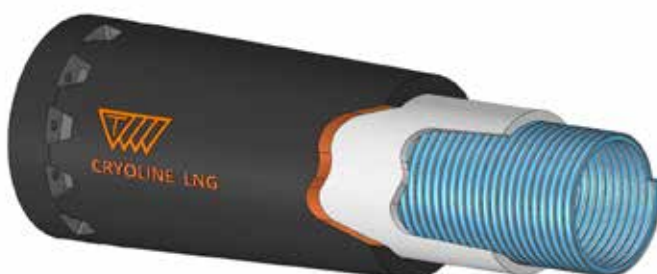
**Floating and submarine hoses for LNG marine transfer applications.**

*A key component for innovative offshore LNG offloading solutions.*

**Applicable standard: EN 1474 - 2**

**ID from 8" to 20"**

Max. section length 40'



**CRYOLINE LNG is a combination of Trelleborg unique expertise in both composite and rubber bonded hoses.**

## Hose-in-hose concept

Hose-in-hose concept designed to ensure LNG transfer with minimum BOG generation, to meet LNG offloading requirements – safety, flowrate and availability – and to combine high flexibility, reliability and long service life.

- Inner cryogenic hose derived from composite hose technology.
- Innovative and efficient insulation materials to reduce heat loss and ensure hose buoyancy.
- Outer protective marine hose derived from conventional flexible bonded hose technology with specific design adjusted for harsh environment compliance and high resistance to fatigue.
- Compact and specific connection system to ensure load transfer and leak integrity, and to minimize heat loss.
- Leak monitoring system based on optical fibers technology (fiber Bragg grating) for leak detection.

## Operating range

Maximum allowable working pressure higher than 15 barg.

Design temperature range from - 196°C to + 40°C.

Minimum bending radius of 5 m (20")/3 m (12").

Nominal operating life of 5 years (± 500 offloading operations).

**CRYOLINE LNG has been developed thanks to the support of Total and Saipem.**



CRYOLINE LNG



# Chemicals applications



## **Dedicated flexible hoses with high chemical resistance**

To meet market demand, Trelleborg Oil & Marine has been developing a dedicated flexible hose for the transfer of aggressive chemical products or high aromatic content fluids. Based on field proven and long lasting technology, CHEMILINE hose includes a continuous inner liner made with best Fluoroelastomer (FKM) available. Either floating or submarine, CHEMILINE hose is designed and qualified according to GMPHOM 2009 standard.



**Dedicated Solution: CHEMILINE hose**





# Chemiline **Hose**

**CHEMILINE is a floating or submarine hose specifically designed for transfer applications of chemicals or highly aggressive fluids in offshore demanding conditions.**

*Dedicated design including a continuous inner liner made with best Fluoroelastomer (FKM) available.*

**GMPHOM 2009 certified**

**ID from 6" to 12"**

Max. section length 40'



## Specific design for chemicals transfer

Available both for floating or submarine configurations

Continuous inner liner and integrated gasket made with Fluoroelastomer (FKM)

High chemical resistance to highly aggressive fluids, e.g. MTBE, Xylene, Toluene...

Perfect sealing solution with no risk of fluid migration through the hose structure

Good insulation properties ensures a higher temperature of the conveyed fluid

Based on 40 years of field-proven technology all over the world

Reinforced structure with high resistance to fatigue

Working rated pressure up to 21 bar



CHEMILINE







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