



# Oil & Gas Solutions

## **Oil & Gas Hoses**

For enhanced fluid transfer solutions



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# Oil & Gas hoses Applications

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



## Oil

Trelleborg's SEALINE and KLELINE hoses are designed for offshore transfer of crude oil and refined petroleum products. Hoses are qualified in accordance with GMPHOM 2009 and can be used on all existing submarine and floating configurations. REELINE is a high

performance hose designed for the reeling applications with a specific and exclusive design. For a long service life, specific applications or harsh environments, we offer the TRELLINE hose, certified according to API Spec 17K standard.



## Water

Trelleborg's SWILINE hose is a large diameter hose for FLNG and FPSO seawater intake systems. The SWILINE hose can be equipped with internal or external hypochlorite injection lines.

This technology can be used to pump seawater up to a depth of 1000m. The system can be API spec 17K certified for a service life up to 30 years.



## Gas

Trelleborg's CRYOLINE LNG hose is a key component for offshore LNG offloading solutions. It enables FLNG projects to be considered in tandem configurations in harsh environmental conditions.

For the small scale LNG market, dedicated solutions for LNG transfer

(ship-to-ship, ship-to-shore...) have also been developed.

Trelleborg's KLELINE LPG hose is a dedicated hose with a specific and continuous inner liner for the transfer of LPG (butane and propane).



## Chemicals

Trelleborg's CHEMILINE hose is fitted with a continuous Fluoroelastomer (FKM) inner liner. This is designed for the transfer of aggressive fluids like aromatic solvents, strong acids and oxidizing fluids.

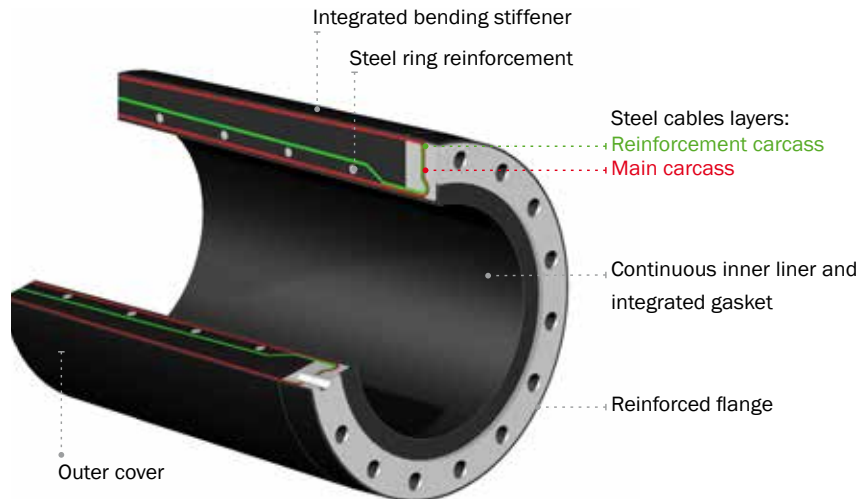
The CHEMILINE hose is GMPHOM 2009 certified. It covers a wide range of applications for the petroleum and chemical industries.



Trelleborg Oil & Gas can provide both nippleless and nipple hose designs in accordance with the highest quality standards.

## KLELINE / REELINE / TRELLINE / SWILINE / CHEMILINE / KLELINE LPG

## Exclusive nippleless design

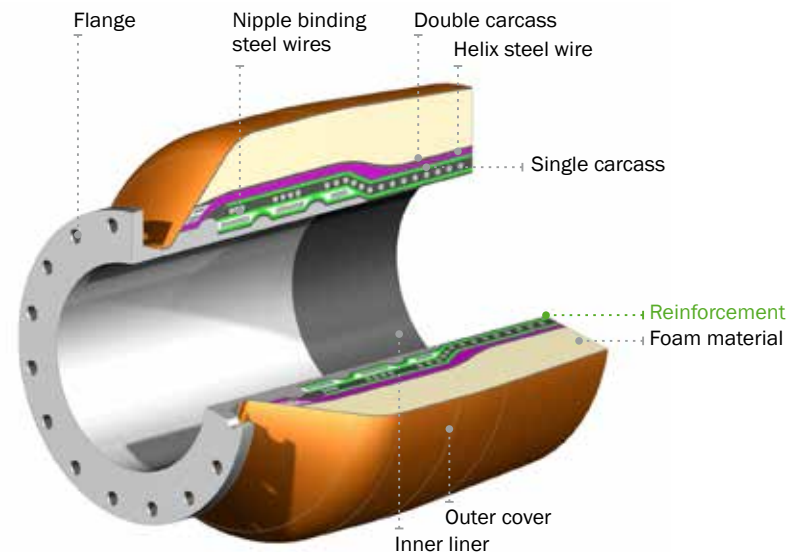


- ▶ Integrated bending stiffener
- ▶ Continuous inner liner & integrated gasket
- ▶ High fatigue resistance
- ▶ Dual carcass
- ▶ High flexibility
- ▶ GMPHOM 2009 / API Spec 17K

## Standard nipple design

## SEALINE

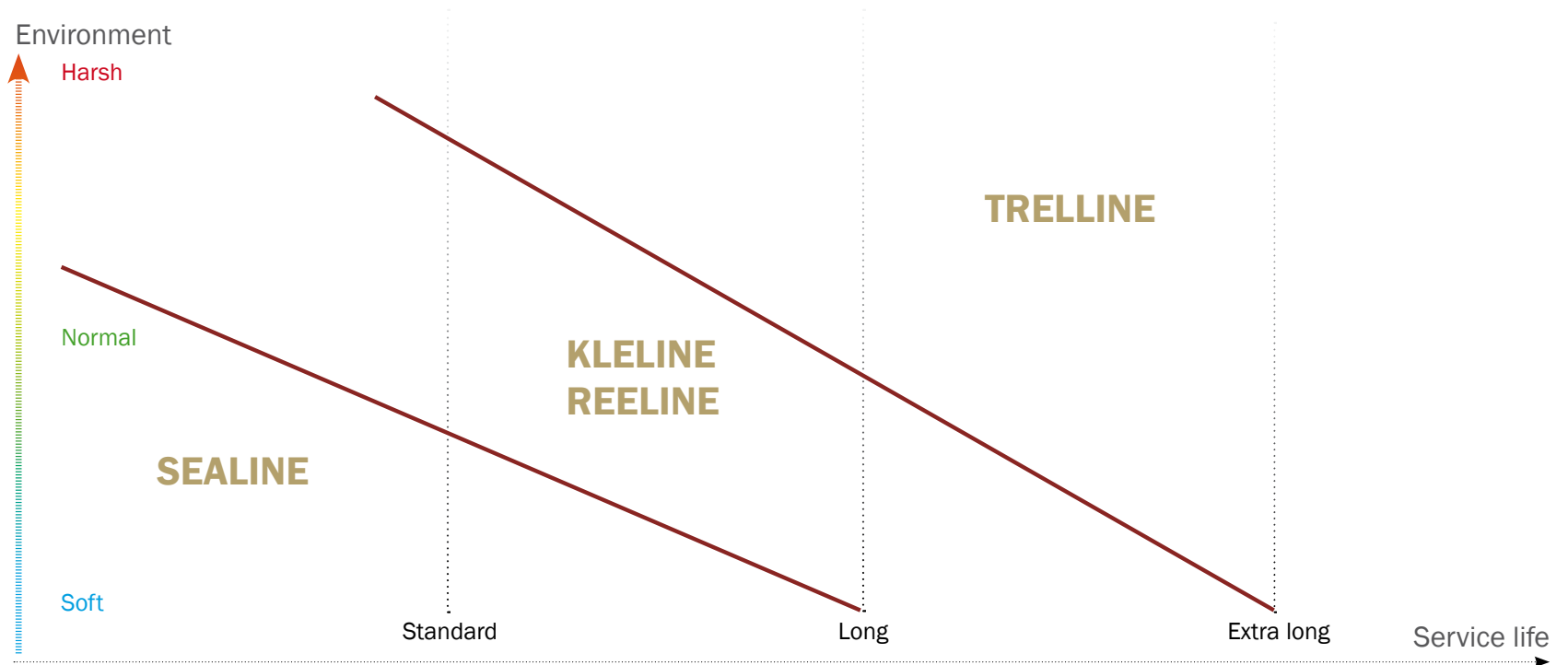
- ▶ Conventional hose construction
- ▶ Single or double carcass
- ▶ Leak detection system
- ▶ GMPHOM 2009





# Oil applications Customized solutions

Trelleborg's wide range of products enables us to suggest the right solutions for each application. Each system and geographical areas imply different levels of constraints. Trelleborg always recommends the most suitable solution.


























































# Oil applications Customized solutions

Trelleborg is pleased to advise on both standard and premium solutions that best suit your needs. Trelleborg always proposes the most suitable solution.

-  Premium
-  Standard

	FLOATING CONFIGURATIONS				SUBMARINE CONFIGURATIONS											
	CALM	TANDEM	SALM	REEL	FLOWLINE	CHINESE	LAZY S	STEEP S	OOL	RISER	JUMPER	REEL	CBM	BUNKERING/ REFINERY	SHIP-TO-SHIP	SHIP-TO-SHORE
SEALINE Nipple Flange GMPHOM 2009																
KLELINE Nippleless flange GMPHOM 2009																
REELINE Nippleless flange GMPHOM 2009																
TRELLINE Nippleless flange API Spec 17K																
CHEMILINE Nippleless flange GMPHOM 2009																



# Oil applications Full range of solutions

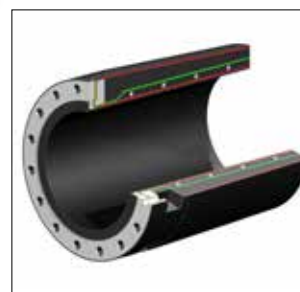
## Trelline

### The best of the hose technology

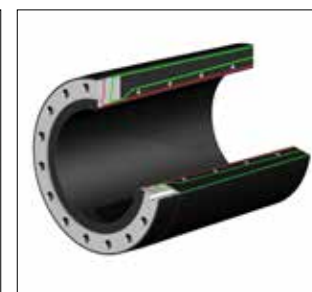
TRELLINE is a bonded custom-built flexible hose with a long service life certified by hydrodynamic and fatigue analysis. Hose structure and reinforcements are adapted to each project and configuration to provide our customers with a truly dedicated solution.

### Key Features & Advantages

- ▶ Nippleless flange
- ▶ From 6" to 24" ID
- ▶ Custom built design
- ▶ API Spec 17K certified
- ▶ High quality, performance and resistance
- ▶ Service life guarantee
- ▶ Cost effective solution
- ▶ Hydrodynamic and fatigue analysis with certified methodology
- ▶ Field proven technology



Standard flange



Reinforced flange

## Reeline

### The dedicated hose for reeling applications

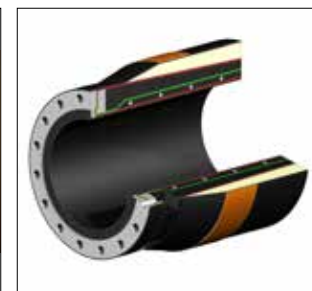
REELINE is a submarine/floating hose designed with nippleless and embedded compact flanges. With more than 50 offloading lines in operation worldwide since 1998, REELINE's reliability is now well established. Thanks to its high flexibility, it can be fitted on the smallest reels so that to save space onboard FPSO's.

### Key Features & Advantages

- ▶ Nippleless design
- ▶ From 6" to 24" ID
- ▶ GMPHOM 2009 certified
- ▶ Operating pressure up to 21 bar
- ▶ Continuous inner liner
- ▶ Light weight hose
- ▶ High performance
- ▶ Perfect sealing solution
- ▶ Long service life
- ▶ Corrosion free
- ▶ Field proven technology
- ▶ Cost effective solution



Perfect sealing solution



Standard flange





# Oil applications Full range of solutions

## Kleline

### The premium solution for terminals and floating units

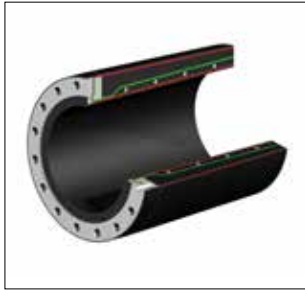
KLELINE is either a submarine or floating hose for terminals and floating units. Designed in the mid 1970's, KLELINE's performance in demanding environment is well established.

The KLELINE hose can also be fitted with an integrated bending stiffener reinforcing line end connections.

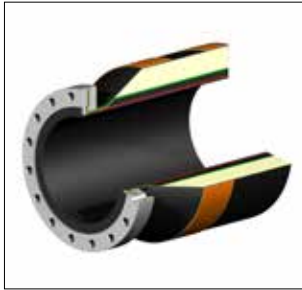
According to configuration, kinkable design can also be proposed.

### Key Features & Advantages

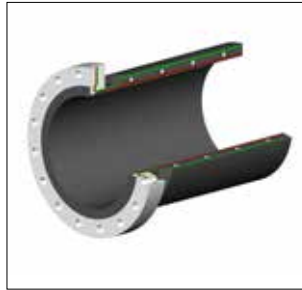
- ▶ Nippleless design
- ▶ From 6" to 24" ID
- ▶ GMPHOM 2009 certified
- ▶ Continuous inner liner
- ▶ Operating pressure up to 46 bar
- ▶ Long service life
- ▶ 40 years worldwide field-proven technology



Reinforced flange



Floating kinkable design



Submarine standard flange

## Sealine

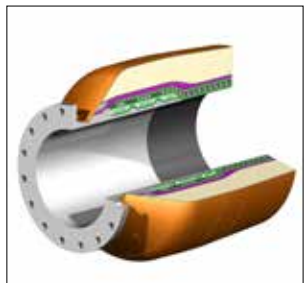
### The traditional solution for terminals and floating units

SEALINE is a standard submarine or floating hose dedicated for general oil transfer applications.

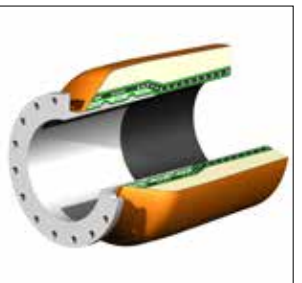
This hose is one of the most common designs around the world for standard applications.

### Key Features & Advantages

- ▶ Nipple design
- ▶ From 6" to 24" ID
- ▶ GMPHOM 2009 certified
- ▶ Single or double carcass
- ▶ High quality
- ▶ Standard service life
- ▶ Operating pressure up to 21 bar



Double carcass design



Single carcass design





# Water intake applications Swiline

## Derived from reliable and field proven technology

The SWILINE hose is based on the reliable and field proven technology used on floating units.

The SWILINE hose can be offered in two versions: standard or API Spec 17K certified. It ensures you the best quality and performance for your water intake system with complete fatigue analysis, in line with the environmental and operational conditions of your project.

## Complete solution

Through specific material development and structure optimization, SWILINE hoses provide a dedicated solution for the cooling process challenges of FPSO and FLNG facilities. A Hypochlorite injection

system can be added to the riser in an external or internal configuration. A turnkey solution can be supplied with interface parts, strainer, hypochlorite dispersion system, assembly tools from bolt tightening to installation hang-off system.

SWILINE is specially designed to be easily vertically installed with light equipment and tools.

## Dedicated design

The nippleless flange with steel cable reinforcements is fitted with an integrated bending stiffener to connect the hull.

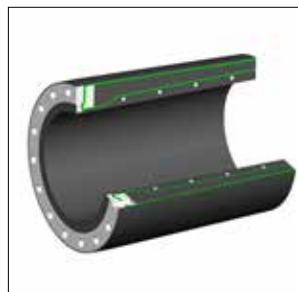
The SWILINE hose is always fitted with a specific continuous inner liner and integrated gasket. API Spec 17K mainline hoses feature

rubber encapsulated flanges for enhanced corrosion protection as well as integrated bending stiffener to face extreme survival conditions. SWILINE hoses can be manufactured to meet your flowrate requirements with an internal diameter up to 1000mm (40 inches) and section length up to 12.2m (40 feet).

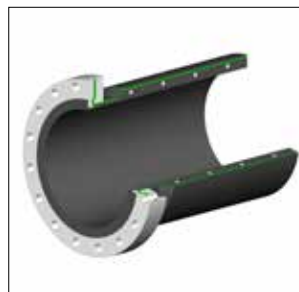
*SWILINE has been selected for the seawater intake system on SHELL PRELUDE FLNG.*

## Key Features & Advantages

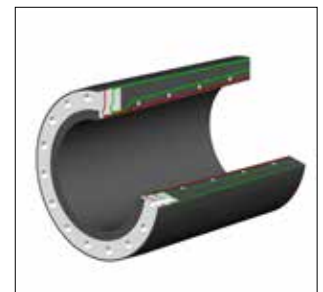
- ▶ Nippleless design
- ▶ From 24" to 40" ID
- ▶ API Spec 17K certified (service life up to 30 years)
- ▶ Specific inner liner for extra-long durability against hypochlorite effect
- ▶ Integrated bending stiffener for hull connection
- ▶ Enhanced continuous thermal insulation
- ▶ Turnkey solution with hypochlorite injection system, strainer and riser interface



Reinforced flange



Standard flange



Extra reinforced flange







## Dual carcass technology

The CHEMILINE hose is derived from KLELINE field proven technology.

The Trelleborg dual carcass technology with steel cords and distributed steel rings constitute the basis of the CHEMILINE hose. Like most of Trelleborg marine hoses, CHEMILINE is fitted with integrated gaskets. An integrated bending stiffener can be added on the CHEMILINE to cope with high bending instances typical of lines end connections. The CHEMILINE specificity is its special inner liner made of fluoroelastomer (FKM). This specific lining combined with field proven dual carcass technology enables the CHEMILINE to transfer aggressive fluid in harsh environments.

## Key Features & Advantages

- ▶ Nippleless design
- ▶ From 6" to 12" ID
- ▶ GMPHOM 2009 certified
- ▶ Compliant with large range of chemicals
- ▶ Continuous inner liner made of Fluoroelastomer
- ▶ Versatile solution for innovative and cost effective installations
- ▶ Built on a combination of field proven technology and material expertise

## Perfect sealing solution

CHEMILINE is fitted with a continuous liner preventing contact between the hose structure or end fittings and the conveyed fluid. This particularity can be of importance when strong acids are considered. The unique Trelleborg integrated gasket ensures a perfect sealing of undisputed reliability.

## High chemical compatibility

The special CHEMILINE inner liner enables this hose to handle aggressive fluids such as almost pure sulfuric acid, phosphoric acid, and hydrochloric acid without any issue.

Light petroleum products including oil with very high aromatic content, xylene, toluene, and

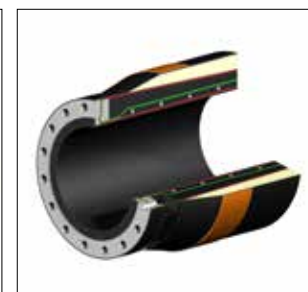
benzene can also be transferred with CHEMILINE. In the same time, the CHEMILINE FKM inner liner exhibits excellent properties in high temperature conditions.

## Certified solution

The CHEMILINE hose is GMPHOM 2009 certified for diameters in the range of 150mm to 300mm with available rated pressures of 15, 19, and 21 bar. Larger diameters up to 600mm may be available on request.



Standard flange



Reinforced flange



## Cryoline LNG

### A game changing technology

CRYOLINE LNG is a combination of Trelleborg's unique expertise in both composite and rubber bonded hoses. It ensures safe LNG transfer with minimum Boil Off Gas generation since it combines high flexibility and thermal insulation. This solution helps the operators to meet the demanding sets of challenges for FLNG and Small Scale LNG applications.



### Key Features & Advantages

- ▶ Hose-in-hose design with insulation
- ▶ From 6" to 20" ID

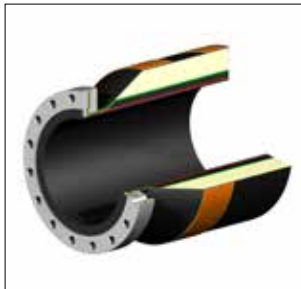
#### ▶ EN 1474-2 Certified Technology

- ▶ Maximum allowable operating pressure 20 bar
- ▶ For floating, submarine or aerial configurations
- ▶ Integrated leak monitoring system
- ▶ For environments up to Hs = 5.5 m

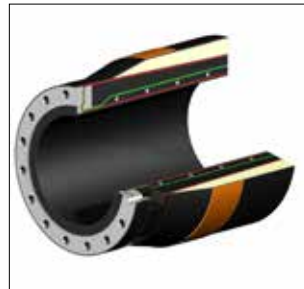
## KLELINE LPG

### Your solution for offshore LPG transfer

The KLELINE LPG hose is a dedicated and reliable solution for offshore LPG transfer. Based on dual carcass technology with a specific inner liner, KLELINE LPG can be used in both floating or submarine configurations. This solution has already been successfully commissioned on several offshore LPG transfer terminals, operating in harsh environments.



Standard flange



Reinforced flange

### Key Features & Advantages

- ▶ Nippleless design
- ▶ From 6" to 24" ID
- ▶ Based on GMPHOM 2009 certification
- ▶ Temperature range from -50°C to +85°C
- ▶ Operating pressure up to 21 bar
- ▶ Specific and continuous inner liner



## Floating LNG

For global FLNG operators who want to maintain the highest levels of safety and give increased flexibility to LNG production, Trelleborg Oil & Gas is your global partner in delivering high-performing, innovative and qualified solutions to enhance overall efficiency of FLNG terminals.

CRYOLINE LNG hoses render FLNG projects possible in harsh environmental conditions. Unlike side-by-side LNG transfer systems, this solution enhances safety, operability and availability of the FLNG facilities as it enables the distance to be increased between the vessels.

### Safety

Pioneers a step change in the safety of LNG offloading operations

### Operability

Allows consideration of FLNG projects in harsher conditions

### Availability

Increases offloading system and liquefaction process availability

## Re-thinking LNG transfer

- ▶ Offshore LNG transfer offloading
- ▶ Enhanced STS LNG transfer system
- ▶ Alternative to loading arms
- ▶ Ship-to-shore LNG transfer system
- ▶ Autonomous Transfer System
- ▶ Certification according to EN 1474-2

## Small Scale LNG

The CRYOLINE LNG hose allows the re-thinking of LNG transfer by enabling cost effective systems for small scale LNG projects. Unlike traditional terminal solutions, this technology enables the reduction of overall costs, installation lead time and environmental impact.

### Cost Effective

Significant cost reductions compared with traditional transfer solutions

### Easy to install

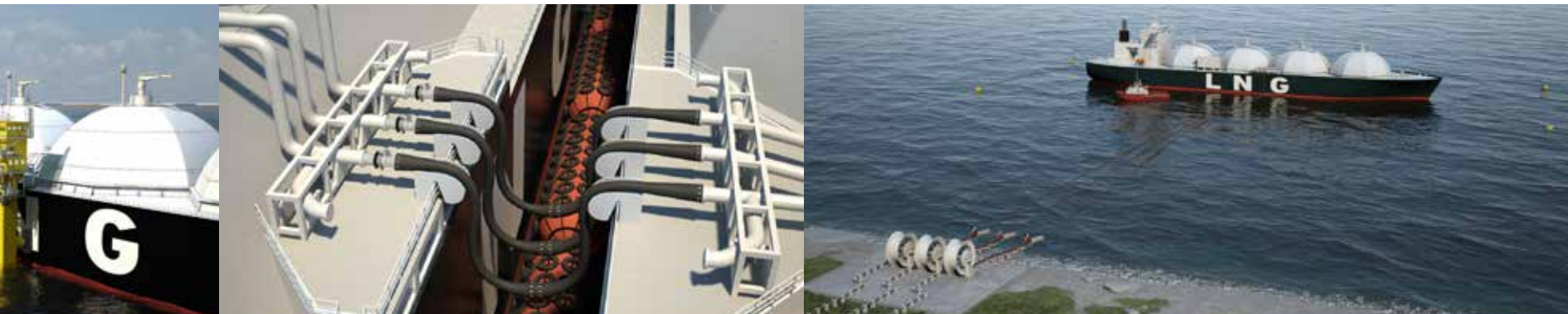
Important reduction of engineering, construction and installation lead time

### Optimized operability

Savings on handling and transfer operations

### Eco friendly

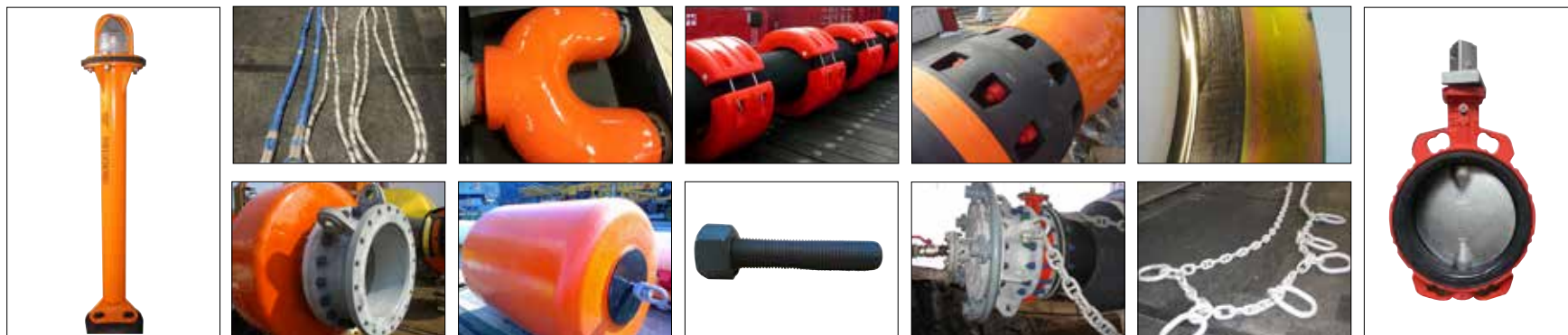
Minimum impact on environment and landscape







Our wide range of ancillaries provides the means to efficiently handle, store, transport, inspect, test, connect, install, operate and maintain marine hoses. We apply best practices and standards in terms of material quality, welding, non-destructive tests and coating.



▶ Floating Y-piece or reducer

▶ Body float

▶ Marker or Pick-up buoy

▶ Winker light and marker beacons

▶ Chain & Shackle

▶ Wire or synthetic rope

▶ Spool piece

▶ Camlock Coupling

▶ Butterfly Valve

▶ Gasket

▶ Bolting

▶ Caps

▶ Trolleys

▶ Lifting beam

▶ Manual wrench

▶ Torque wrench

▶ Test flange

▶ Vacuum plate

▶ Hydrostatic pump

▶ Vacuum pump



## Services & After-sales

Trelleborg Oil & Gas is willing to support its customers throughout project execution and is able to offer the following services:

- ▶ On-site commissioning survey
- ▶ Inspection and tests for requalification
- ▶ Hose maintenance and inspection program
- ▶ Cleaning operation

- ▶ Bolt tensioning check
- ▶ Repair works
- ▶ Recommendations on use of lines

# 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 22 billion (EUR 2.48 billion, USD 3.29 billion) in over 40 countries. The Group comprises five business areas: Trelleborg Coated Systems, Trelleborg Industrial Solutions, Trelleborg Offshore & Construction, Trelleborg Sealing Solutions and Trelleborg Wheel Systems. In addition,

Trelleborg owns 50 percent of TrelleborgVibracoustic, a global leader within antivibration solutions for light and heavy vehicles, with annual sales of approximately SEK 16 billion (EUR 1.78 billion, USD 2.36 billion) in about 20 countries. The Trelleborg share has been listed on the Stock Exchange since 1964 and is listed on Nasdaq Stockholm, Large Cap.

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



Trelleborg Coated Systems



Trelleborg Industrial Solutions



Trelleborg Offshore & Construction



Trelleborg Sealing Solutions



Trelleborg Wheel Systems

## Trelleborg Fluid Handling Solutions

Trelleborg Fluid Handling Solutions is part of the business area 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 & Gas 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.

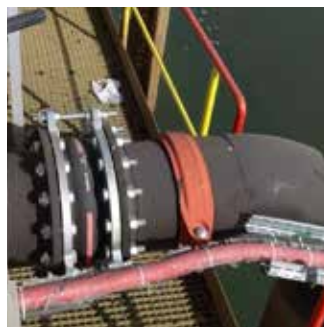
Trelleborg Fluid Handling Solutions offer a very large range of competitive products, solutions and services that meet your needs and requirements for all types of applications.



Industrial Hoses



Oil & Gas Hoses



Expansion Joints



Rubber Sheetting & Matting





## Health & Safety

We shall manage Health & Safety in accordance with the Group's common standards, as described in our Safety@Work Manual. We shall maintain good health and safety standards wherever we operate and work to minimize the risks and effects of accidents.

## Quality

The main objective of our Quality policy is the satisfaction of our Customers. Their satisfaction can mainly be reached by improvement in the areas of delivery time, quality and cost. Trelleborg guarantees a high quality hose manufactured in an ISO 9001, ISO 14001 and **API Spec Q1** certified factory.

## Environment

### Environmental Management

All production and development units implement and maintain a certified environmental management system in accordance with ISO 14001. We train and inform our employees about environmental, health and safety issues and involve them in a continuous improvement process.

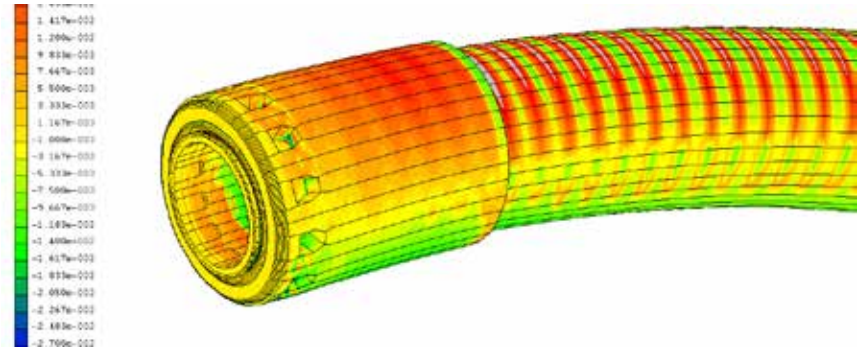
### Energy & Materials

We work to increase our resource efficiency by reducing energy consumption and raw materials in our production and by finding ways to improve the recovery of materials and energy from production.



# Research & Development

Our R&D team gets involved in the earliest stage of Oil & Gas projects in order to cooperate with our customers in defining the most appropriate technical solutions for the targeted application and design life.



Laboratories are dedicated to materials and product development as well as control of chemical compositions in order to guarantee a high quality standard throughout the chain. Mechanical and chemical testing are performed to determine material behavior laws, establish ageing models for realistic service conditions as well as fatigue performances which are critical in order to accurately assess hose fatigue in highly demanding environments. Using these material characteristics and based on our expertise, high fidelity finite element models (FEM) can be created for each specific hose construction.

This permits us to render the exact hose behavior under complex load combinations and compute strains and stresses in any rubber layer or internal reinforcement. Global configuration study and fatigue analysis can therefore be performed in a dedicated hydrodynamic software using the hose properties derived from the hose local FEM.

All of these design tools and methodologies have been extensively checked and validated through full scale static, dynamic and fatigue tests.





# Trelleborg Oil & Gas solutions

## Trelleborg Fluid Handling Solutions Oil & Gas hoses

For more information, please visit [www.trelleborg.com/fluidhandling](http://www.trelleborg.com/fluidhandling)  
or email [oilandgashoses@trelleborg.com](mailto:oilandgashoses@trelleborg.com)

As the leading supplier of innovative and field-proven flexible bonded hoses for offshore transfer applications, Trelleborg provides a wide range of products. These products are specifically designed for demanding applications with long service lives and high levels of reliability relying on one team and two world class factories in France and Brazil. We are a technology and innovation driven company manufacturing flexible bonded hoses with unrivaled and undisputed performance.

Our products are designed and built with cutting edge solutions used in the tire and aerospace industries, with high resistance to extreme operating environments and severe fatigue conditions.

Trelleborg Oil & Gas provides full service worldwide through global life cycle – engineering studies, delivery of complete solutions (hoses and ancillaries), on-site assistance, and recommendations for installation, maintenance and repairs.



## Trelleborg Offshore Offshore protection

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



## Trelleborg Marine Systems Terminals equipment

[www.trelleborg.com/marine-systems](http://www.trelleborg.com/marine-systems)









Trelleborg is a world leader in engineered polymer solutions that seal, damp and protect critical applications in demanding environments. Its innovative solutions accelerate performance for customers in a sustainable way.

[WWW.TRELLEBORG.COM/FLUIDHANDLING](http://WWW.TRELLEBORG.COM/FLUIDHANDLING)