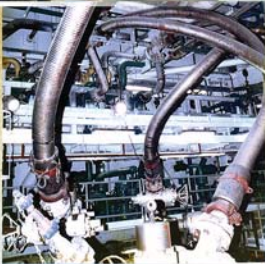


Technip's Drilling & Refining Applications Division

Coflexip® - Flexible Steel Pipe for Drilling and Service Applications



Technip

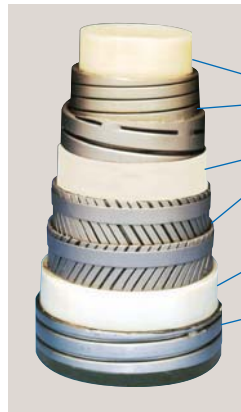
The Coflexip® Flexible Line

Coflexip® products are designed for oilfield services, both on and offshore, where heavy duty is required in combination with flexibility and reliability.

Flexible lines are manufactured in long continuous sections (up to several kilometres) and are cut to fit each client's requirements. End fittings with the most common types of end connectors are kept in stock thus minimising delivery times. End connectors not kept in stock will be machined or obtained according to the client's specifications. Delivery time depends mainly on the type of end connectors required and our client's particular specifications.

The pipe structure

Coflexip® pipes are composed of successive layers of steel and thermoplastic to produce unique structures that have the strength and durability of steel pipes combined with the flexibility of reinforced rubber hoses. Each layer works independently from the others, as no vulcanisation is used during manufacturing. This results in the structural stability of the pipe.



Functions of Coflexip® pipe components

1. The thermoplastic inner tube makes the pipe leak-tight.
2. The interlocked zeta and flat steel spiral pressure carcass resist internal pressure and external crushing loads.
3. The intermediate thermoplastic sheath is an anti-friction layer.
4. The double crosswound steel armours resist axial loads, protect the pipe from torsional strain resulting from handling and working conditions.
5. The thermoplastic outer jacket protects the armours from external corrosion.
6. The Stainless Steel Outer Wrap (SSOW), protects the pipe from mechanical impact, abrasion, weathering and accidental mishandling.

These requirements are in applications such as:

- Choke and kill lines
- Rotary and vibrator lines
- Test lines
- Hydraulic lines
- Acid and cement lines
- Nitrogen lines

Advantages

- Flexible, therefore easy to hook up
- No intermediate couplings or swivels that might leak
- Remarkable strength and crush resistance
- Heavy-duty capability, exceptional abrasion and fatigue resistance
- No maintenance
- Absorbs vibrations
- Corrosion free
- Minimum head loss and turbulence due to the smooth surface of the inner thermoplastic tube and no sharp bends
- Does not "belly out" (i.e. the diameter does not expand due to the internal pressure) or shorten due to pressure

Temperature limits

- Standard Rilsan® lines : -20°C to +100°C (-4°F to 212°F)
- High temperature Coflon® lines : -20°C to +130°C (-4°F to 266°F)



Coflexip® flexible pipes for drilling and service applications are manufactured by the Drilling & Refining Applications Division of the Technip Group

Physical characteristics vs. rubber hose characteristics

- For a given ID and working pressure, a Coflexip® flexible line with its Stainless Steel Outer Wrap (SSOW) has a smaller OD than rubber hose without SSOW.
- Smaller Minimum Bending Radii (MBR) than most rubber hoses
- a Coflexip® flexible line, with its SSOW, has a lower weight/foot than most rubber hoses without SSOW.



End fittings

Coflexip® flexible steel pipes are supplied complete with any common oilfield type of connector. The most widely used connectors, such as hubs, API flanges, hammer unions, etc are available from stock. Other connectors can be machined as required. All parts which are subject to corrosion undergo a special Nikaflex® treatment which gives them an excellent resistance to corrosion.

Bend stiffener

The bend stiffener is an additional component installed on the flexible pipe, during the end fitting mounting process (above). Its purpose is to increase the local bending stiffness in the region of the end fitting to attain a smoother stress transition from the end fitting to the flexible pipe structure.

The bend stiffener is an optional item. It will allow the flexible pipe to better resist overbending. Resistance to overbend damage at the end fitting/flexible line interface is increased by a significant factor when using these components. Manufactured in polyurethane, it is intrinsically resistant to corrosion.

This chart is not exhaustive, but indicates the range of Coflexip® pipes available.

I.D.	Maximum Working Pressure	Test Pressure	Weight in Air Empty		O.D.	Minimum Bending Radius for Storage		Recommended Radius		Temperature range*		TYPICAL APPLICATIONS					
												Rotary & Vibrat. Line Mud Line	Choke & Kill Bosser and Cement Line	Hydraulic Line	Acidizing Line	Test Lines	
in	psi	psi	lbs / ft	kg/m	in	feet	meters	feet	meters	100°C / 212°F	130°C / 266°F						
1	5,000	10,000	6.0	9.0	2.4	2.0	0.6	3.0	0.9								
2	5,000	10,000	21.0	31.2	4.5	2.3	0.7	3.4	1.0								
3	5,000	10,000	33.4	49.8	5.7	2.9	0.9	4.4	1.3								
3.5	5,000	10,000	22.9	34.0	5.4	2.7	0.8	4.1	1.3								
3.5	5,000	10,000	28.3	42.2	5.8	3.0	0.9	4.4	1.4								
4	5,000	10,000	58.3	86.8	7.5	3.8	1.2	5.7	1.7								
4	5,000	10,000	60.5	90.0	7.5	3.9	1.2	5.8	1.8								
2	10,000	15,000	21.0	31.2	4.5	2.3	0.7	3.4	1.0								
3	10,000	15,000	33.4	49.8	5.7	2.9	0.9	4.4	1.3								
3	10,000	15,000	52.3	77.7	6.5	3.3	1.0	5.0	1.5								
4	10,000	15,000	58.3	86.8	7.5	3.8	1.2	5.7	1.7								
4	10,000	15,000	60.5	90.0	7.5	3.9	1.2	5.8	1.8								
2.5	15,000	22,500	34.5	51.2	5.4	2.8	0.9	4.2	1.3								
2.5	15,000	22,500	42.0	62.4	5.8	3.0	0.9	4.4	1.4								
3	15,000	22,500	43.0	64.0	6.0	3.1	1.0	4.7	1.4								
3	15,000	22,500	52.3	77.7	6.5	3.3	1.0	5.0	1.5								

* These temperature are for permanent use. High temperatures can be acceptable for short periods. Please consult our representatives.

Coflexip® test lines

The absence of rubber components and the extreme resistance of the Coflexip® structure gives compatibility with crude oil and outstanding mechanical performance and durability. The lines are designed to resist abrasion and corrosion from all types of hydrocarbons, H₂S and CO₂, sand, etc. The concept of separate layers with independent functions ensures maximum stability during pressure surges.

Coflexip® rotary / vibrator lines

A Coflexip® line does not react like a rubber hose, it will not contract, elongate, "belly out" or kick as "classic" hoses do when submitted to pressure : the Coflexip® rotary / vibrator line will resist oil-based muds with a high aromatic content, up to temperatures of 100°C (212°F) or 130°C (266°F) for high temperature lines.

Years of experience have shown that when properly installed, all Coflexip® lines have an exceptionally long service life.



Coflexip® choke and kill lines

Choke and kill lines are an essential part of the well control equipment.

Coflexip®'s drilling application flexibles are specifically designed to handle the high pressures and flowrates demanded by this application.

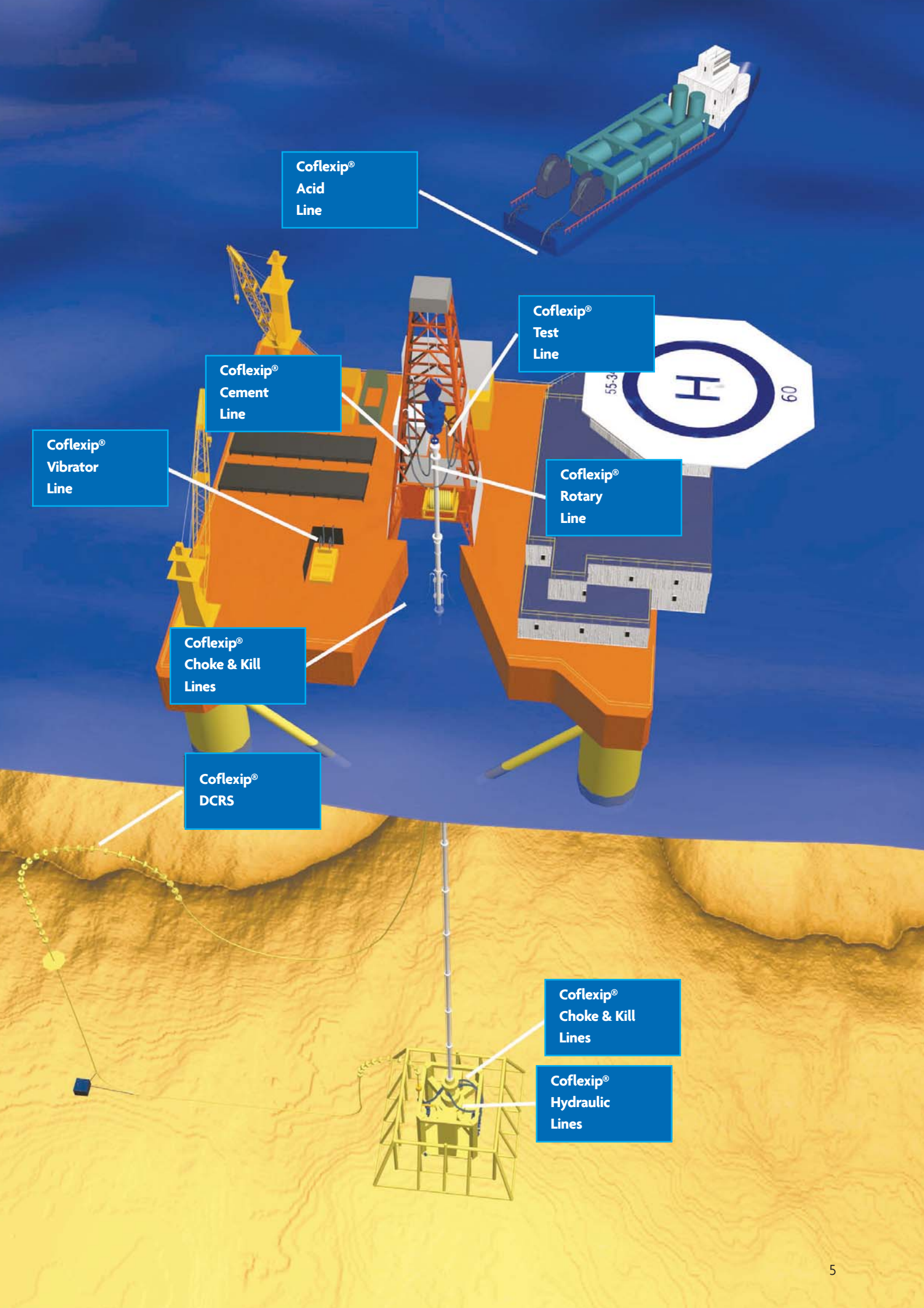
Other advantages make the Coflexip® solution very attractive to the end user:

- No welding
- No steel elbows to "wash out"
- Easy accommodation to height changes (installation of a new BOP spool), etc.

Coflexip® engineering services are available to calculate correct length and configuration of line.

Coflexip® acidizing and fracturing lines

Used on stimulation boats and work-over rigs worldwide. They are built to handle acidizing liquids and fracturing solutions, at high pressures and flowrates. The maximum continuous flowrate for all smooth bore, ie. thermoplastic inner sheathed lines, is 15 metres per second. Many lines, particularly those for acidizing / fracturing applications, have been subjected to flowrates well in excess of this figure for relatively short periods of time without any damage being sustained. This is entirely dependent on the abrasive properties of the flow medium, therefore maximum short term flowrates cannot be quantified for all flow conditions.



Coflexip®
Acid
Line

Coflexip®
Test
Line

Coflexip®
Cement
Line

Coflexip®
Vibrator
Line

Coflexip®
Rotary
Line

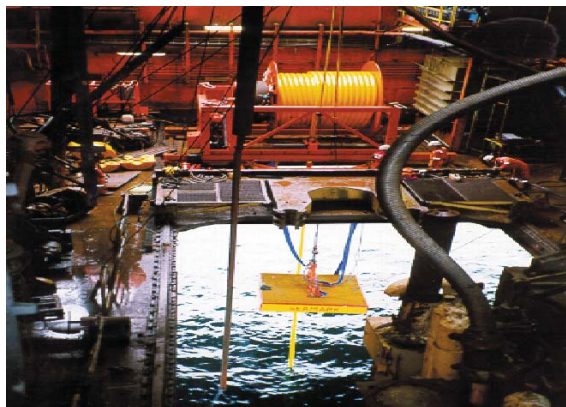
Coflexip®
Choke & Kill
Lines

Coflexip®
DCRS

Coflexip®
Choke & Kill
Lines

Coflexip®
Hydraulic
Lines

Coflexip® Drillcuttings Well Re-Injection System (DCRS)



System deployment

The solution to well debris problems

The question of what to do with contaminated drill cuttings from drilling with oil based mud has become an increasingly pressing issue in Norway, the UK, and anywhere around the world where environmental pressures require an alternative to partial treatment and dumping. Re-injection from semi-submersible rigs has not been possible, and with the vast majority of drilling done this way there has been no solution other than to transport well debris to shore as landfill. Until now.

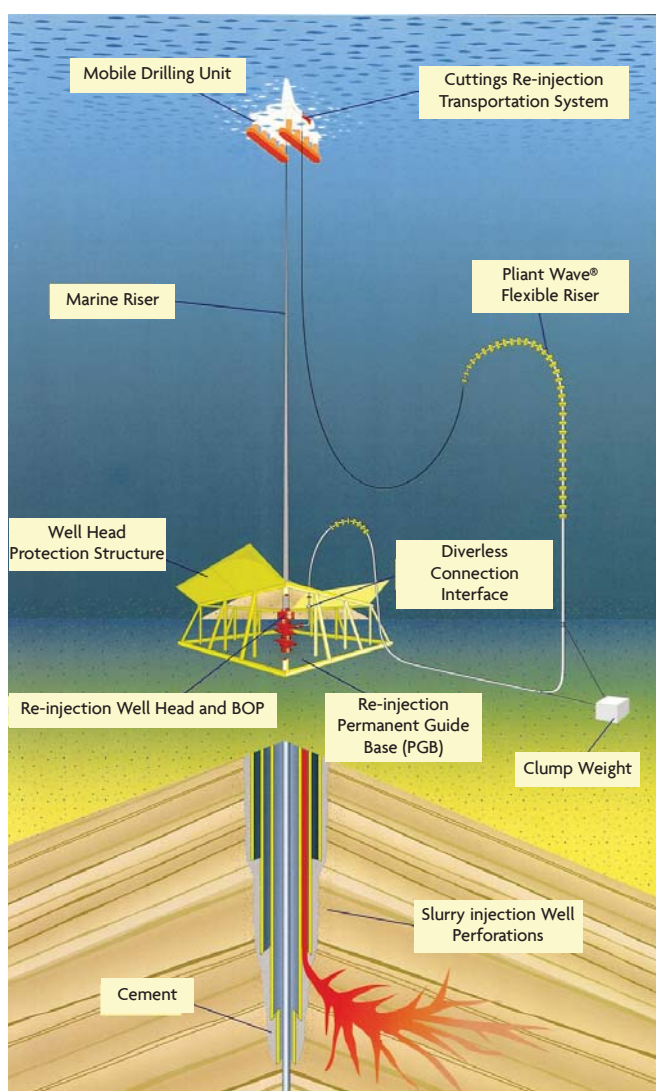
A new well re-injection system developed by the Technip Drilling and Refining Applications Division specifically for semi-submersible rigs, has used unbonded flexible pipe technology to solve the issue once and for all.

The system for grinding up cuttings is well established, with this part of the process being supplied by a cuttings slurrification unit. The drillcuttings are pulverised and mixed with seawater before being transported through a Pliant Wave® configured flexible riser system and re-injected at high pressure into the formation.

The hub of the system uses a Coflexip® flexible Riser in a Reverse Pliant Wave™ configuration, which connects the mobile drilling unit to the wellhead re-injection interface connection. The subsea end of the riser is connected to the subsea template via an ROV-operable end fitting.

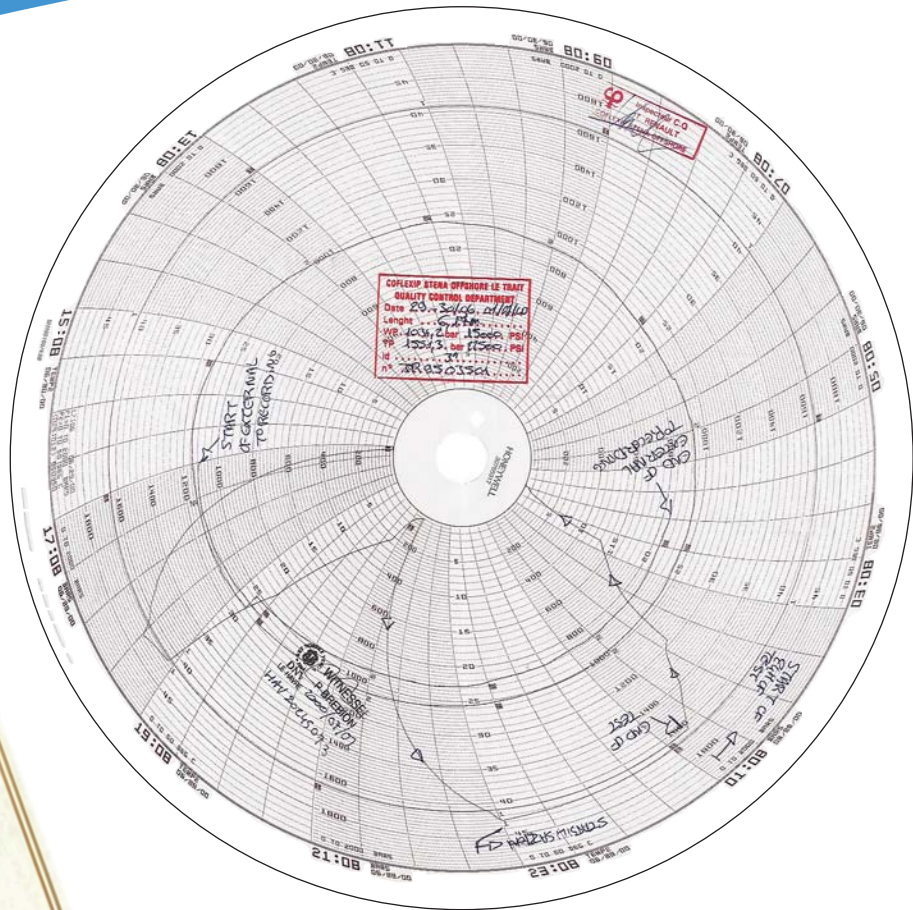
The riser system consists of a single length section of dynamic flexible pipe with buoyancy modules attached over a specified distance. The buoyancy modules orientate the riser into a "wave" configuration, the geometry of which is predetermined by design analysis. The riser is attached to the seabed and brought back on itself by a tether and clump weight arrangement, which controls the bending radius at the seabed touch-down position.

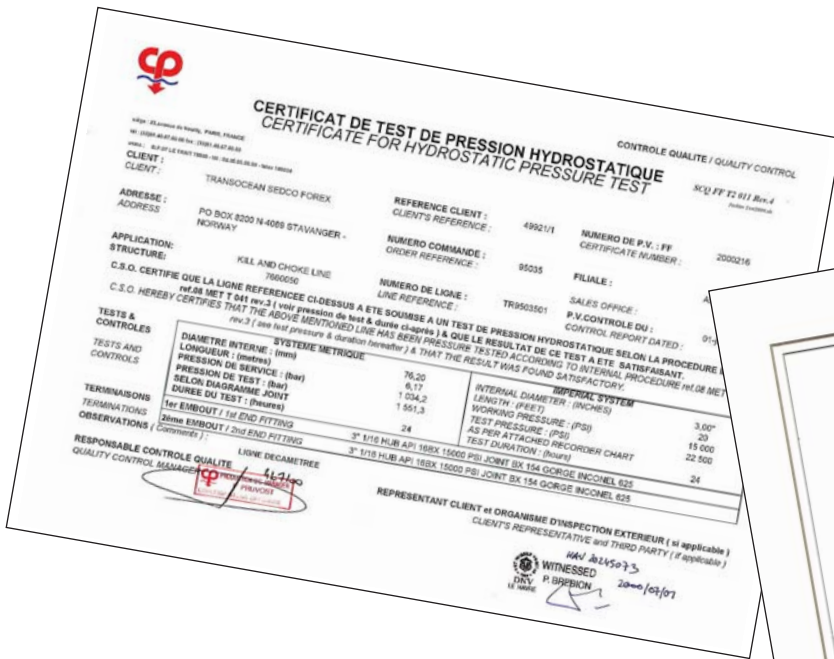
The flexible line is deployed from the drill rig using the chosen overboard system, (i.e. over the side by chute or by direct drop through the moon pool) and is terminated with a subsea diverless connection. The system can be installed totally independently from the rig and drilling operations.



Certification

All Coflexip® drilling and service lines are factory pressure tested before leaving the plant. The test pressure conforms to API recommendations. Each line is supplied with its own test certificate, certified by an independent third party.





Fire resistance

The flexible pipe structure itself has an excellent built-in resistance to fire. Upon request a further degree of fire resistance can be obtained by the addition of optimised end-fitting covers, in order to meet the client's requirements (on fixed Offshore installations for instance).

Warranty

All Coflexip® products are guaranteed against faulty materials and/or workmanship.

Coflexip[®], an Engineered Solution

Coflexip[®] offers application engineering for its products

Examples : Configuration and lengths of flexibles for:

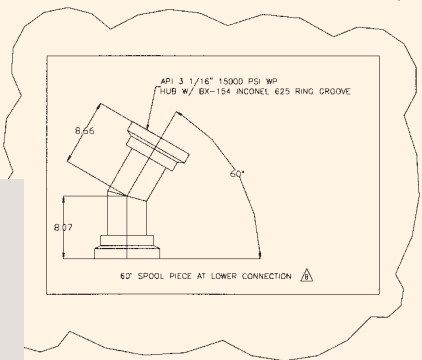
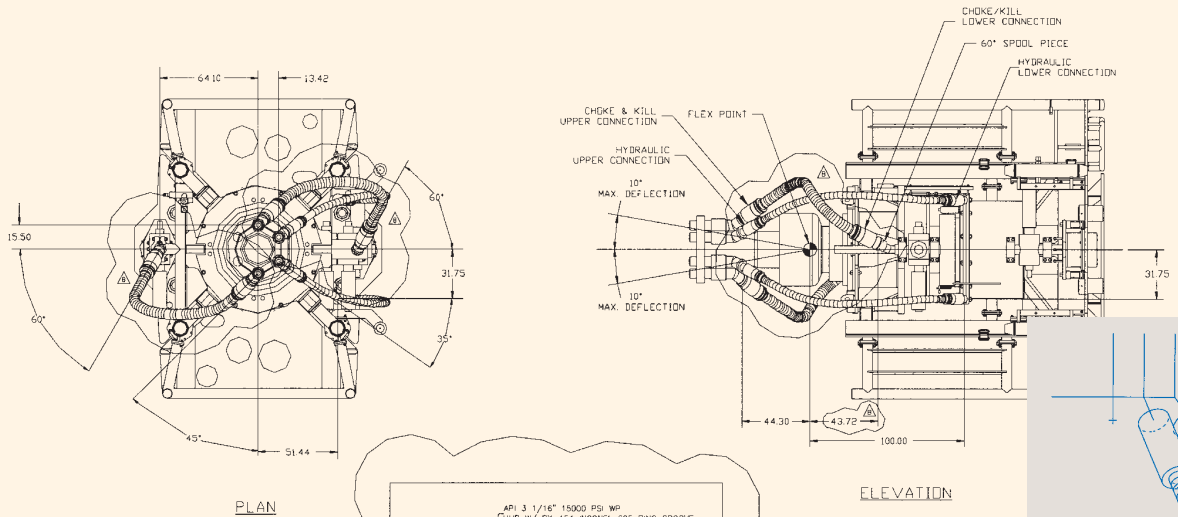
- Lower marine riser packages
- Moonpool lines
- Choke and kill lines on jack ups, land rigs, fixed platform rigs, etc
- Rotary "hoses" and vibrator "hoses"
- Skidding rigs
- Derrick mounted cement and circulation lines
- Installation between flow heads and choke manifolds
- Drag chains
- Special applications

Winches can be designed to take full advantage of the inherent qualities of Coflexip[®] flexibles. A most important factor is that our flexibles do not deform (become oval) when reeled and can therefore be used at full working pressure on the winch.



IMR (Inspection, Maintenance and Repair)

The Drilling & Refining Applications Division (DRAPS) has dedicated IMR facilities and authorised IMR agents throughout the world - France, UK, Brazil, the Middle East, Canada and Singapore. Details may be obtained by logging on to the DRAPS Division website www.technip.com/draps, or from your nearest sales office or authorised agent.

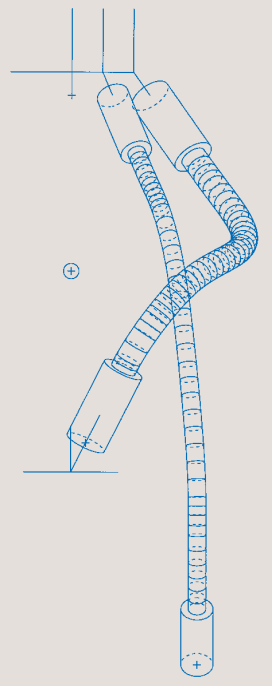
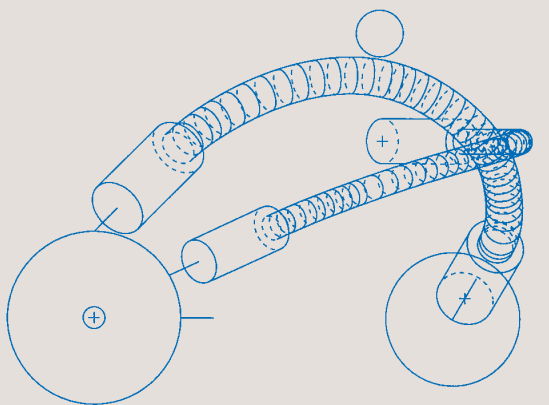


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 Signature _____
 Name _____
 Title _____
 Date _____

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Description					Appr.
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RIG "STENA DDN"					
CHOKE & KILL / HYDRAULIC LINES					



This brochure is provided for the purpose of introducing the range of products, services and sales office locations of the Drilling & Refining Applications Division of the Technip Group. Whilst every effort has been made to ensure the complete accuracy of all information and data contained herein, no responsibility can be accepted for any error or omission concerning these details. Note also that information and data contained in this brochure are subject to change without prior notice.

Technip's Drilling & Refining Applications Division
 Coflexip® Flexible Steel Pipe
 for Drilling and Service
 Applications
 User's Guide

Technip

A USER'S GUIDE is available which provides detailed information for end users. It can also be downloaded from our website.

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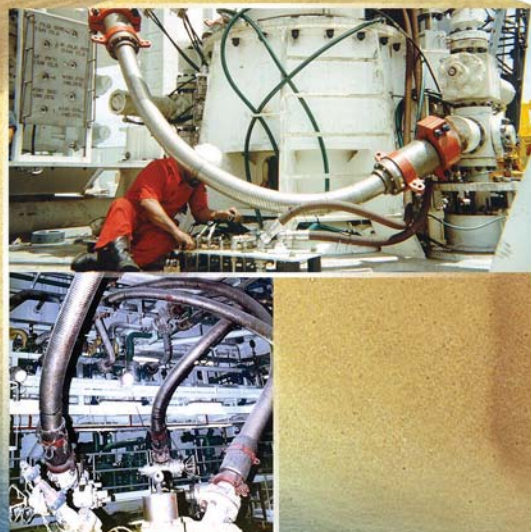
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With a workforce of over 21,000 people, Technip ranks among the top five corporations in the field of oil, gas and petrochemical engineering, construction and services. Headquartered in Paris, the Group is listed in New York and Paris. The Group's main operations and engineering centers and business units are located in France, Italy, Germany, the UK, Norway, Finland, the Netherlands, the USA, Brazil, Abu-Dhabi, China, India, Malaysia and Australia. In support of its activities, the Group manufactures flexible pipes and umbilicals, and builds offshore platforms in its manufacturing plants and fabrication yards in France, Brazil, the UK, the USA, Finland and Angola, and has a fleet of specialized vessels for pipeline installation and subsea construction.

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