Umbilical Systems

Customised umbilical systems for the global offshore oil and gas market
A world leader in engineering, project management and technologies, serving the energy industry for more than 50 years

A regular workforce of 30,000

Confirmed leadership and proprietary technologies in 3 business segments:

**Subsea**

In subsea hydrocarbon field development, Technip's activities include the design, manufacture and installation of rigid and flexible subsea pipelines and umbilicals. Thanks to its portfolio of technologies and industrial and operational assets, Technip offers a unique vertically integrated model in the industry. The Group has 3 flexible pipe manufacturing plants, 4 umbilical production units, 9 logistics and pipeline assembly bases, and 1 construction yard. Technip's worldwide leadership is supported by a modern fleet of vessels for subsea construction, pipelay development (rigid and flexible pipes using S-Lay, J-Lay or Reeled technology) and heavy lift applications.

**Offshore**

In the Offshore business segment Technip performs engineering, procurement, construction, installation, commissioning and the refurbishment/upgrading of offshore facilities for the oil & gas industry. Technip provides these services for fixed platforms in shallow water with conventional sub-structures and self installing platforms such as the TPG 500 and for deepwater facilities including Spar, semi-submersible, TLP, FPSO and FLNG units. Technip is a world leader in floatover installation of topsides and its R&D effort is focused on technology transfer for local content and new frontier areas such as ultra-deepwater and the Arctic.

**Onshore**

Technip covers the full range of onshore facilities for the oil and gas chain, petrochemicals and other energy industries (nuclear, renewables including biofuels and offshore wind). It holds many proprietary cutting-edge technologies and is the leader in the design and construction of LNG and gas treatment plants as well as ethylene, hydrogen and syngas units. Technip is also one of the key actors in refining and petrochemical units, and has developed a leadership in the fertilizer industry. Moreover, the Group is very active in non-energy activities such as mining and metals, life sciences, buildings and infrastructures.
The geographic positioning of Technip’s umbilical facilities provides the unique ability to design, manufacture and supply customised umbilical products to the global offshore oil and gas market. All projects are supported by dedicated project management and engineering teams.

Customised solutions. We provide complete service from project inception to project completion. Every client project is unique and we specialise in providing optimised industry solutions. Technip Umbilical Systems has over 30 years of successful service experience in the offshore oil and gas industry.

As leaders in technology development, Technip Umbilical Systems capabilities extend from the shallow and medium water markets to the highly specialised ultra deepwater market. We have developed umbilicals in harsh environments from West of Shetland in the Atlantic Frontier region to the ultra deepwater in the Gulf of Mexico and West Africa. We continue to provide innovative solutions and engineering leadership in the industry.
Technip Umbilical Systems places the utmost importance on Quality, Health, Safety and Environmental (QHS&E) guidelines and standards. Effective QHS&E management is a key element to safe and efficient operations, and to continuously improve performance and capabilities at all levels.

**Certifications**
- ISO 9001:2000
- ISO 14001:2004
- OHSAS 18001:1999

**Accreditations**
- Shell Perdido INJURY FREE AWARD (2009)
- Queen’s Award for Enterprise: International Trade 2008
- RoSPA Gold Award (2001, 2006)
- Chevron Agbami IIF Award (2006)
- Investor in People (2001)

From project inception to design, procurement, manufacturing, installation and commissioning, Safety is our foremost consideration. Some of the QHSE methodologies we utilise include:

- Detailed engineering models reviews
- Material integrity assessments
- Detailed product stress analysis
- Advanced installation and operational diagnostics
- Safety systems analysis
- Emergency response and disaster planning
- Plant layout and equipment accessibility evaluations
- Detailed equipment risk and hazard analysis
- Extensive HAZOP reviews and safety impact studies
- Preventive and corrective action systems
- 5S, Lean Manufacturing Disciplines

QHS&E is about common goals and common culture. All our employees take part in the common drive for continuous improvement. QHSE awareness and functional training is provided to all employees to develop a positive culture within their individual work areas. Employees are encouraged to propose improvements and initiatives related to quality, health, safety, and environmental impacts.

*Certifications and accreditations vary by legal entity*
QHS&E leadership is the core of the Technip Umbilical Systems business. The Technip Group PULSE program is designed to positively impact HSE climate change to improve, identify and address key HSE leadership issues and establish a consistent approach to HSE leadership across the business.

**QHS&E common goals are:**
- To maintain a safe, healthy and injury free workplace
- To achieve quality in the performance of functions
- To have respect for, and avoidance of damage to the environment

**QHS&E common culture is:**
- Safe working systems which anticipate hazards and reduces risks
- Compliance with applicable laws, industry standards and clients’ requirements
- Working as a team and in partnership with clients and suppliers
- Measuring the effectiveness of each group company
- Follow-through and accountability

**Benefits of Pulse:**
- HSE Reference Company
- Exceptional Safety Performance
- People act safely
- Driven by perceptions
- Changing perceptions improved performance

Protecting the health and safety of our people is a core value and an absolute commitment.
Proven Process

Technip Umbilical Systems follows a proven process to ensure the highest level of client service and product quality. This process is based on Research and Development, experienced people, technologically advanced engineering and project execution with a focus on customer integration. Each of these is an integral part of the process and is considered fundamental to delivering highly reliable umbilical systems.

People

Employees are Technip Umbilical Systems key asset and are central to the success of our business. The intelligence, comprehension, skills and experience found in every one of our employees are recognised as the source of successful projects. Technip Umbilical Systems has several recognised subject matter experts, that are members of the Technip College of Experts and who support our R&D and projects. This approach provides our clients with access to industry experience and allows the organisation to utilise expert knowledge during their projects. Clients benefit from turnkey solutions provided by a single vendor, staffed with comprehensive product knowledge. Also, with the Angoflex University Initiative, we are taking a leading role in outreach programs in Angola.

Client satisfaction. The key ingredient to Technip Umbilical Systems proven process is the working relationship with clients for which we promote the project principles of integrity, fairness and transparency with the aim of achieving the highest levels of client satisfaction. We operate a Customer Focus Program where clients are encouraged to provide feedback on project performances. Feedback is reviewed and a lessons learned exercise undertaken, when appropriate, in conjunction with the client. Our project teams consider the customer to be an integral part of the solution.

We want to be known for:
- Delivering quality, safety and reliability in meeting our clients’ needs
- Valuing honesty and transparency in our people
- Achieving the highest standards of corporate governance
- Fostering environmental protection and sustainable development

We endeavour to deliver:
- Value to projects through cost and planning optimisation, and effective risk management
- Development opportunities to all members of our teams
- Technological innovation and cutting-edge technologies
- Value to all of our stakeholders
Technip Umbilical Systems considers Research and Development (R&D) fundamental to its current and future capabilities. A significant portion of revenue is invested in R&D to ensure that our capabilities continue to provide an industry leading benchmark for capital commitment. Technip Umbilical Systems is well positioned to meet the industry’s future challenging requirements.

**Areas of R&D focus include:**

- Improvements in umbilical/functional component structure in terms of performance and reliability
- Development and enhancement of mathematical modeling and analytical tools to further expand engineering predictive capabilities
- Improvements in hardware design to meet increasingly harsh environmental conditions
- Improvements in the installation capabilities of umbilical and hardware designs for ultra deepwater static and dynamic service
- Integration of electric power conductors into umbilicals, and impact on the umbilical structure and other functional components
- High performance thermoplastic hoses for chemical injection service and deepwater installations
- Development of alternative strength members for use in umbilical structures
- Subsea distribution system hardware development and validation
Technip Umbilical Systems places the highest importance on advanced engineering methodology and addresses umbilical systems as fully engineered products. This integrated approach is becoming even more important as operating, installation and reliability challenges, along with increasing product complexity, continue to escalate. Our engineering capabilities include comprehensive analysis of project deliverables. From assistance with field architecture, to hardware design, life of project analysis, and installation analysis, clients benefit from cutting-edge technologies and proven engineering processes. Engineering supports the process from inception to completion.

Flexibility is one of the key assets provided to the client by our engineering capabilities. Projects that require the development of novel designs are fully supported by our integrated approach. Technip Umbilicals Systems can readily produce engineered solutions to meet client design change requirements using state-of-the-art analysis software and reducing the need for prototypes. The development and engineering of in-house mathematical modeling techniques allows product behaviour and performance to be predicted with a high level of accuracy in a short period of time, without a prototype build and test program. These fully validated analysis techniques are indispensable in supporting offshore installation and commissioning activities.

Technip Umbilical Systems also has the flexibility to perform full scale testing on prototypes using a significant portfolio of test equipment. Our engineering capabilities include the real-time FEA analysis modeling and traditional testing facilities to accommodate every industry challenge and special project.

Engineering predictive capabilities include:

- Flex fatigue performance of an umbilical design
- Umbilical tensile strength
- Thermal analysis of umbilicals
- Dynamic analysis
- Clashing analysis
- Structural analysis
- Sea-bed stability
- Material compatibility and service life
- Crush friction properties
A core offering of Technip Umbilical Systems is project execution. We integrate product with process by establishing an experienced team to oversee each project. Our process considers all elements needed to ensure that the execution risk for the project is minimised. Being part of the Technip group ensures that integration risks can be identified and mitigated prior to project start.

Our project management team is a critical element of any umbilical systems contract, and a common project management model is operated at all of our umbilical system manufacturing facilities. The model includes all process and knowledge areas, such as scheduling, document control, integration management, and quality. Project teams provide product expertise, experience, and flexibility to our clients. Our Project teams are driven by project specific goals and work to ensure that the deliverables are on time and within budget.

**Customer Focus.** Project teams are there to assist clients from the start of their project until its completion. Our commitment to continuous improvement and uncompromising safety and quality requirements ensure that the project specific requirements are transferred all the way through the project, even to sub-suppliers. The integrated project management approach ensures that clients have transparency in planning, manufacturing, and installation.

**Typical project execution includes activities such as:**
- Project charter and initial project analysis
- Risk assessments throughout the project
- Detailed scope of work documentation
- Comprehensive design studies
- Fully integrated project scheduling for all deliverables
- Interface management for sub-contractors and EPCI vendors
- Offshore support for the products
- Project installation and completion
- Lessons learned
- Customer focus program
Technip Umbilical Systems offers a broad range of custom and hybrid umbilicals, available with thermoplastic, steel tube, optical fiber, and electrical power components. Our manufacturing facilities are strategically located next to developing fields worldwide. Our capabilities include turnkey solutions for offshore developments comprising umbilicals and subsea products and services. Manufacturing of umbilicals, flying leads, termination hardware, and other subsea products is supported at all of our locations worldwide.

**Field optimised solutions.** As part of the Technip group of companies, Technip Umbilical Systems is well positioned to provide optimal logistical solutions to our clients. Access to Group carousels, reels, lifting equipment, etc. ensures that we have the assets necessary to deliver a customised solution based on the projects specific needs. Our multiple site manufacturing capabilities provide the seamless operations for world-class projects. The strategic position of Technip facilities provide flexibility in the provision of shared assets, resulting in highly efficient project planning and execution. The availability of Technip construction assets, experience, and expertise provides a strategic advantage to our customers.

### Manufacturing

**Production control umbilical system functionality includes:**

- Hydraulic control
- Low/medium voltage electrical power
- Electrical/optical communications
- Chemical injection
- Gas lift
- Annulus bleed

**Functional components include:**

- Steel tube/thermoplastic hose fluid conduits
- Optical fibres
- Medium and low voltage electric conductors
Umbilical Systems

Functional components

Fluid conduit functional components for hydraulic control, annulus bleed or transmission of chemical injection and gas lift fluids are available in the form of steel tubes or thermoplastic hoses. These two types of functional components are very diverse in physical characteristics, but when combined in an umbilical can result in an improved field development solution. Pioneered by Technip Umbilical Systems, this hybrid solution can offer technical and commercial advantages and should be considered at the design stage of a field development.

Steel tubes

The main considerations for steel tubes in umbilical service are tensile strength, corrosion resistance (both internal and external), and operating temperature. Materials available for umbilical construction include a range of materials from carbon steel to superduplex. External corrosion protection, afforded by a bonded polymer or zinc sheath, is available when required. Insulation and thermal shielding are also available upon request.

Thermoplastic hoses

Technip Umbilical Systems has over 30 years of successful service experience with thermoplastic hoses in the offshore oil and gas industry. Thermoplastic hoses offer an extensive range of control and chemical injection fluids, and are available in long continuous lengths in excess of 20,000m (72,000 ft) depending on bore size. Hose design working pressures up to 860 bar (12,500 psi) is available. Ultra-low permeation DUCOflex® liner materials can be added for use with low molecular weight fluids. For low specific gravity service fluids, where collapse due to external hydrostatic pressure may be an issue, an internal carcass can be incorporated within the hose design. DUCOflex® also exhibits excellent chemical compatibility characteristics.
Electrical power can be provided by low voltage power cables as part of a subsea production system or by medium voltage cores for subsea pumping or processing. Communications in an umbilical can be provided by means of low voltage signal or optical fiber cables.

Major considerations in cables and cores for submarine service are reliability of the product and production/repair splices. Technip Umbilicals Systems ensures high level reliability of functional components with quality of design and product manufacture, backed by extensive R&D and service experience.

**Electrical cables**
- Power typically available for operation up to 3kV, communications up to 1kV
- Pair, triple, quad or multi-core construction, with screen if required
- Two conductor cable also available as a co-axial construction
- Polyethylene insulation with other materials available to suit particular characteristics or client specific requirements
- High axial tensile and compressive strength to maximise conductor fatigue resistance during umbilical installation and dynamic service

**Medium voltage power cores**
- Available up to 36kV and conductor size up to 400mm²
- Power cores can be integrated with production control and/or pump service functional components
- Single and/or multiple three phase power circuits can be readily accommodated in tre-foil arrangements to ensure balanced power circuit design
- Thermal analysis to establish electric current rating

**Optical fiber cables**
- Long continuous lengths in excess of 20,000m (72,000 ft)
- High resistance to tensile and crushing loads on the fibers
- Hermetically sealed steel tube construction with excess fiber length and hydrogen absorbing gel component
- Oversheath to prevent corrosion of steel carrier tube
- Additional strain relief incorporated for severe service conditions
Hardware

To provide functionality an umbilical has to be terminated at each end and may also need intermediate devices such as breakout arrangements. Terminations may be both simple and complex depending on their function and may be designed for diver or Remotely Operated Vehicle (ROV) connection. They also range from very compact to extremely large depending on functionality and the means of undertaking subsea connections.

Technip Umbilical Systems has trained and experienced engineers who can provide design and analysis for any project. Our hardware solutions are supported by an extensive supply chain of qualified vendors.

Hardware solutions include:

- Topside umbilical termination units
- Pull-in and hang-off arrangements
- Subsea termination units (diver and/or ROV operable)
- Intermediate umbilical breakout arrangements (SSIV operation, etc.)
- Weak links
- Buoyancy modules
- Mud-mats for subsea terminations and break-out arrangements
- Bend stiffeners and bend limiters
- Umbilical termination assembles
- Subsea installation equipment (parking and deployment frames, etc.)
Technip Umbilical Systems can provide a wide range of ancillary products and services. This provides clients with a number of distinct advantages including interface simplification, commonality and compatibility with the main scope of supply, greater understanding of client requirements and issues, and simplified procurement.

Global availability from any of our facilities

Products
- Thermoplastic hose and electric cable jumper assemblies
- Jumper bundles
- Flying leads with steel tubes, thermoplastic hoses or combinations of both forms
- Stabplates with elastomer or metal seals
- J-Tube Seals
- Clump weights
- Tethers and tether clamps
- Umbilical Termination Assemblies including distribution manifold for hydraulic, electrical and chemical services
- IWOC umbilicals and reeling equipment, sheaves and termination housings
- Topside dry tree jumpers

Services
- Topsides hook-up
- Offshore testing and commissioning
- Flushing and cleaning hydraulic lines Compatibility and corrosion testing Design studies
- Budget analysis and detailed cost estimates
- Oversheathing steel and textile ropes
- Field architecture optimisation
- FEED Studies
- Detailed Engineering Studies for high-temperature & high-pressure Umbilical Systems applications, extended subsea tie-backs, and hardware standardisation
- Storage & Customer Property Management including inventory control, cost optimisation, and maintenance of spare equipment

Expert onshore and offshore umbilical systems support
- Installation monitoring, hook-up and commissioning
- Cold storage spare length inspection and testing services
- Emergency repairs
- Diagnostic Investigations
- System integration testing
- Installation equipment
- Hydraulic pressure testing
- Flow rate testing
- Electrical testing
Pioneering subsea production projects for over 30 years