

# No corrosion, lower cost and less CO<sub>2</sub>





Thermoplastic Composite Pipe:  
The disruptive, **maintenance free**  
and field proven pipe solution  
for offshore and onshore energy  
applications.

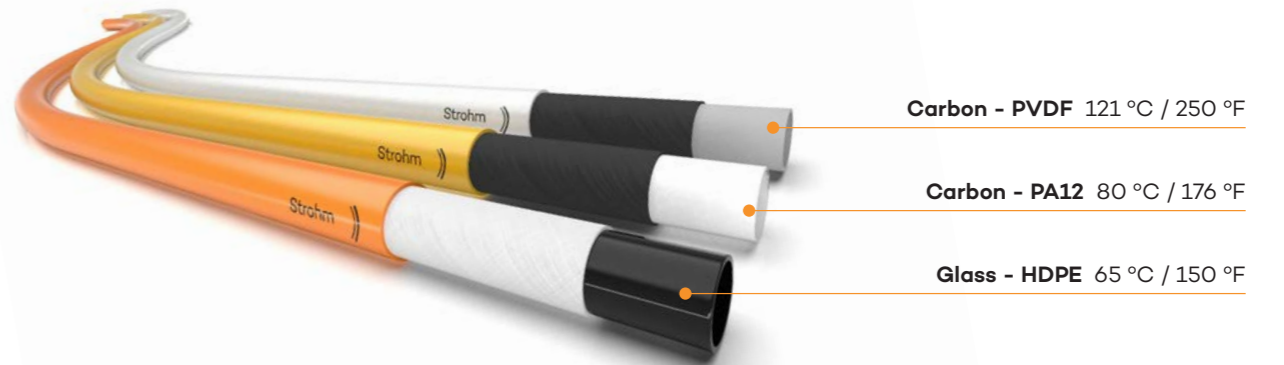
## Strohm

Strohm is the world's first and leading company to have developed Thermoplastic Composite Pipe (TCP).

Strohm develops TCP products for high-end applications in the energy sector, onshore and offshore. TCP does not corrode, it has a reduced cost of ownership throughout its lifecycle and a reduced carbon footprint.

**Renewable energy:** carbon capture, utilisation and storage (CCUS) and hydrogen  
**Conventional oil and gas applications** including hydrocarbon service, gas lift, water injection, and chemical well treatment.

The company manufactures flowlines, jumpers, and risers for the energy sector, with multiple applications including:



### Thermoplastic Composite Pipe

TCP is a high performance, spoolable pipe that does not corrode, reduces total installed cost and has a smaller carbon footprint compared to steel.

The benefits at a glance:

- No corrosion and excellent chemical resistance, reducing maintenance and avoiding the need for the use of corrosion inhibitors
- Certified small carbon footprint, reducing total footprint by more than 50% compared to steel
- Light weight, reducing transportation costs
- Spoolable in long lengths, reducing installation costs
- Smooth inner bore for optimised flow, whilst maintaining collapse resistance



- Suitable for CO<sub>2</sub> and hydrogen transport, as well as hydrocarbons and a wide range of chemicals
- High internal pressure rating
- Flexibility

Case studies and project references can be available upon request.

# Traditional energy: TCP reduces the carbon footprint of your infrastructure

In today's oil and gas industry, operators are working hard to reduce their carbon footprint as part of their sustainability efforts.

One of Strohm's shareholders, Shell, is aiming to decrease the net carbon footprint of the products it sells, with 30% by 2035 and with 65% by 2050. A growing list of operators have similar ambitions to reduce the carbon footprint of their operations and products they sell. As such the oil and gas industry is taking

unprecedented steps towards a lower carbon energy system.

Strohm aims to help clients achieve their sustainability goals. The company is working hard to reduce the CO<sub>2</sub> footprint related to its products.



## TCP Flowline

With the introduction of Strohm's non-metallic, fully bonded TCP Flowline, corrosion is no longer a threat for the integrity of subsea infrastructures. Corrosion mitigation becomes a thing of the past and operational expenditure is reduced significantly.

Strohm's TCP Flowline is delivered in long, spooled lengths on standard offshore reels, enabling cost-effective transport and allowing for horizontal and vertical installation methods using small vessels such as multipurpose vessels.

### The TCP Flowline offers the following advantages:

- No corrosion
- Flexible and spoolable
- High internal and external pressure ratings
- Smooth bore - fully piggable
- Simple, reliable and field-mountable end fittings
- Low U-value compared with steel pipe
- Continuous lengths of 3,000 to 6,000 metres depending on diameter and pressure rating
- Quick installation by horizontal lay or surface tow method
- Lowest total installed cost and total cost of ownership ("Totex")

Strohm's TCP Flowline is qualified according to DNV's standards and by a number of operators, and the company's field track record includes hydrocarbon production and water injection.

# TCP Jumper

Subsea spools are used as interface between flowlines, risers, manifolds and wellheads and need to absorb dynamic and static loads and displacements. Conventional steel spools are often complex 3D structures and come with a number of design, installation and operational challenges.

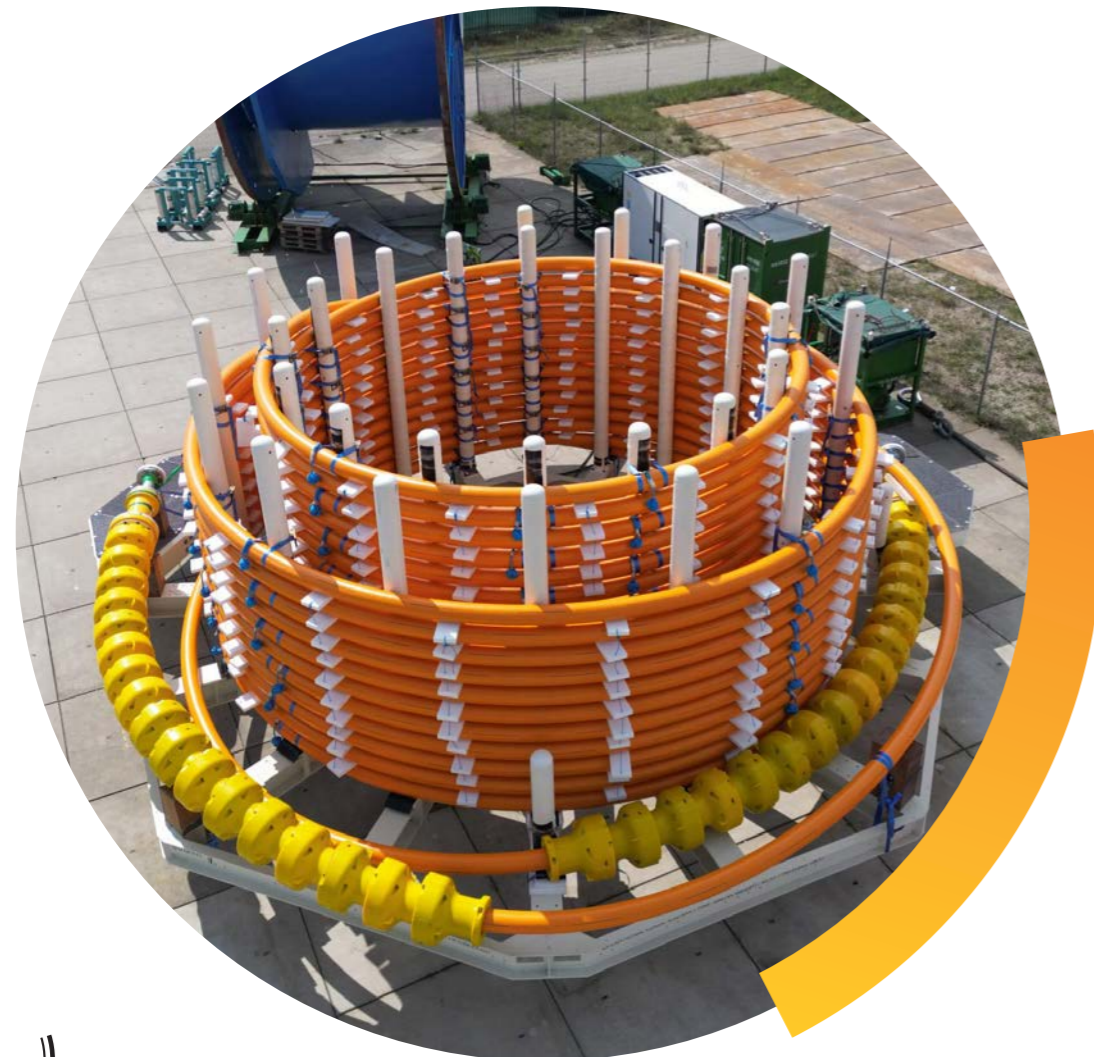
One of the most prominent issues and main cost drivers is the metrology to establish the final jumper geometry. In addition, the manufacturing time of a conventional steel spool is typically adding two months to the project critical path, resulting in longer time to first oil.

The TCP Jumper is Strohm's answer to these challenges. **TCP is flexible and can absorb significant installation tolerances, pipeline expansions and dynamic riser motions.**

This removes the need for metrology, shortening time frames, reducing installation costs and mitigating project risk.

## The TCP Jumper offers the following advantages:

- No metrology required
- Manufactured and terminated at required lengths, or in long lengths to be cut and terminated on site
- No complex geometry to weld and insulate
- Significantly more tolerance in length than rigid pipe
- No buoyancy required on most designs
- Reduced transport and installation costs
- Can be coiled down on deck or on reels
- More pipe can be transported in a single mobilisation
- Lower vessel specifications
- Multiple methods of deployment
- Direct installation using a vertical or horizontal lay system
- Conventional with less complex spreader bar
- Reduced barge / transport vessel costs, more jumpers per mobilisation



“The ability to cut TCP to the required length and terminate in country simplifies our project, reduces our cost and de-risks our schedule.”

*Global operator*

## Jumper on Demand

The TCP Jumper offers the option of having a length of TCP readily available near site, reducing schedule risk and cost.

Clients can take advantage of a single pre-agreed continuous design shipped on a reel that can be spooled off to the required length, when and as required.

Strohm's simple and easy to terminate end fittings are shipped separately, ready to be terminated on-site at short notice by Strohm technicians or by our clients' own trained and qualified personnel. Strohm can provide the TCP Jumper with all required ancillaries and with subsea deployable pallet on rental basis.

### Value proposition:

- De-risk and fully own the schedule
- Take advantage of volume cost optimisations
- Logistics costs reduced, simplified and known
- Ready to deploy in days, not months





## TCP Riser

Deepwater risers connect wells on the seabed at water depths of more than 3000 m with the production facility at the surface.

The challenges associated with the use of deepwater risers are large vessel payloads, complex riser layouts and associated high procurement and installation cost. Corrosion, fatigue and flow assurance further increase the design difficulties.

The TCP Riser is lightweight, able to cope with high internal and external pressures and features superior chemical resistance. It can be used for highly corrosive fluids and gases, including high contents of CO<sub>2</sub> and H<sub>2</sub>S.

In particular, the TCP Riser allows for simple riser configurations that otherwise would not be possible. In the free hanging catenary configuration using TCP, the top tensions are low, well within the riser and end fitting capacity and without added buoyancy. Compared to conventional risers, the TCP Riser does not require any buoyancy modules and is lighter, reducing installation cost dramatically while still reducing the weight at the floating platform.



### The TCP Riser offers the following advantages:

- No corrosion, capable of handling high CO<sub>2</sub> and H<sub>2</sub>S
- Low top tension, higher allowable topside payload
- Simple free-hanging catenary configuration, including less components and interface
- Lower installation cost
- Superior fatigue properties

To meet the challenging conditions of deepwater risers, Strohm is developing a superior TCP Riser based on carbon fibre in a PVDF polymer matrix with an integrated weight coating. Today, we are executing a comprehensive qualification programme in Brazil, supported by our partners.

## Renewable energy

Since its founding in 2007, Strohm has been at the forefront of bringing disruptive, enabling TCP technology to the marketplace.

### For the past two decades, Strohm has been at the forefront of innovation.

Strohm is the first company to have developed TCP and introduced it to the offshore industry. We have the longest track record in the industry, consisting of over a decade of performance data and more than 120 delivered pipeline systems with zero recorded failures.



TCP pipelines are field proven in the harshest offshore environments in the world. As a totally corrosion-free solution, with a 30-year design life and a proven smaller carbon footprint compared to steel, TCP is highly suitable for carbon capture utilisation and storage, hydrogen, and other applications.



## Hydrogen

### Hydrogen, especially green hydrogen, holds a great promise in the energy transition:

- When burning, it produces water rather than CO<sub>2</sub>
- It is an energy carrier which can be stored
- It can be used to decarbonise industries that are hard to electrify

Hydrogen transportation using steel pipelines can be challenging due to fatigue, as hydrogen embrittlement increases steel's vulnerability to crack propagation.

### TCP is well suited for hydrogen transport:

- TCP qualifications already cover hydrogen exposure and as such is qualified for hydrogen transport
- TCP is insensitive to hydrogen embrittlement
- The flexibility of TCP and ease of installation through horizontal lay provide a step change in cost reduction for use on offshore hydrogen creation
- The carbon footprint associated to TCP in scopes 1, 2 and 3 results in significant footprint reduction benefits

Strohm works with several parties on studies for offshore hydrogen generation, including bottom fixed turbines and floating wind. Contact us for more information.



## Carbon capture, utilisation and storage

Carbon capture, utilisation and storage (CCUS) is one of the primary methods to achieve the objectives of the Paris Agreement and remove carbon dioxide (CO<sub>2</sub>) from the atmosphere. The solution can be implemented quickly and it is cost effective, as long as the corrosion issue is tackled.

### CCUS is an important element of the roadmap to achieve the climate objectives as laid down in Paris Agreement:

- It has the potential to remove large quantities of CO<sub>2</sub> from the environment
- It can be implemented in the short term
- It is cost effective

The drawback of CO<sub>2</sub> is that, especially when combined with seawater, it is extremely corrosive. In addition, CO<sub>2</sub> in dense phase can cause running ductile fractures in steel; both issues are unknown to TCP.

### TCP therefore is well suited for CO<sub>2</sub> transport:

- Strohm's current TCP qualifications already cover CO<sub>2</sub> exposure and as such is qualified for CO<sub>2</sub> transport already
- TCP is insensitive to CO<sub>2</sub> – even in combination with seawater, a lethal mix for conventional flexibles and steel and steel. This means that, when using TCP, the CO<sub>2</sub> does not require purification
- TCP when installed offshore reduces total installed cost and the system's carbon footprint
- TCP can be pulled through existing pipelines and J-tubes, avoiding expensive shore approaches or platform modifications

# Track record, end fittings and manufacturing

## Track record

To date, Strohm has supplied TCP around the globe for hydrocarbon production, water injection, gas lift, methanol injection and chemical well treatment. The company has many records including the world's first TCP for hydrocarbon service, and the deepest operating TCP in 2,140 meters water depth.

For more information on Strohm's track record, visit the website: [strohm.eu](http://strohm.eu)

## End fittings

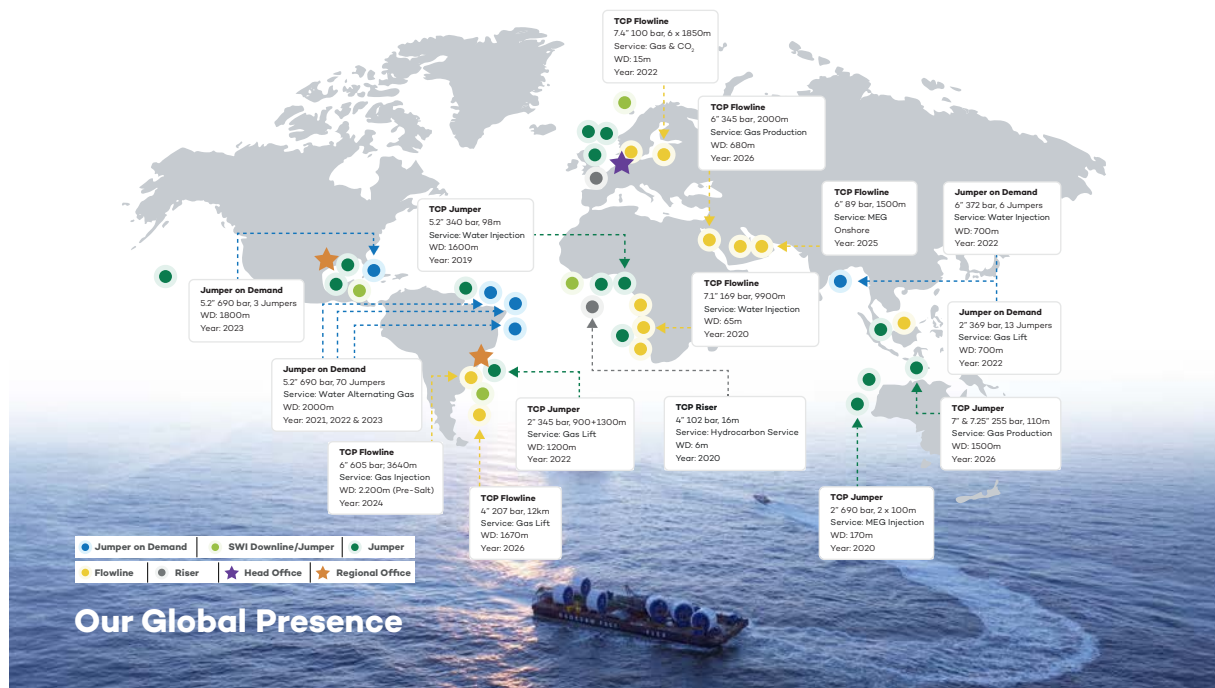
Strohm's end fitting design excels in simplicity. Due to the fully bonded construction of TCP, there are no individual reinforcement layers that require complicated termination.

Instead, it relies on proven mechanical clamping and sealing methods, which allow termination at any length, both in the field and in the company's manufacturing facility.

Additionally, the company can supply all relevant ancillary items, such as bend restrictors, bend stiffeners, buoyancy modules, etc.

## Manufacturing

Strohm's manufacturing facility is based in IJmuiden (Port of Amsterdam), The Netherlands. The manufacturing facility has direct sea access and the spoolable TCP products can be loaded directly on the clients' vessels. The quay has a length of 330 m with a water depth of 9.5 m.



✉ [info@strohm.eu](mailto:info@strohm.eu) 🌐 [www.strohm.eu](http://www.strohm.eu)

The Netherlands head office

**Strohm**  
 Monnickendamkade 1  
 1976 EC IJmuiden  
 The Netherlands  
 ☎ +31(0)25 5763500

USA regional office

**Strohm LLC**  
 16225 Park Ten Place |  
 Suite 500  
 Houston, Texas 77084, USA  
 ☎ +1 34 69 32 92 28

Brazil regional office

**Strohm Brasil**  
 Rua Humaitá, 275,  
 60 e 70 andares, Humaitá,  
 Rio de Janeiro RJ 22.261-005  
 ☎ +55 21 99559 2879