

Strohm )) Thermoplastic Composite Pipes –  
the HOPE Project  
An industry-first offshore hydrogen  
pipeline

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# Content

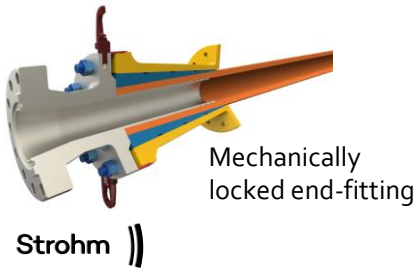
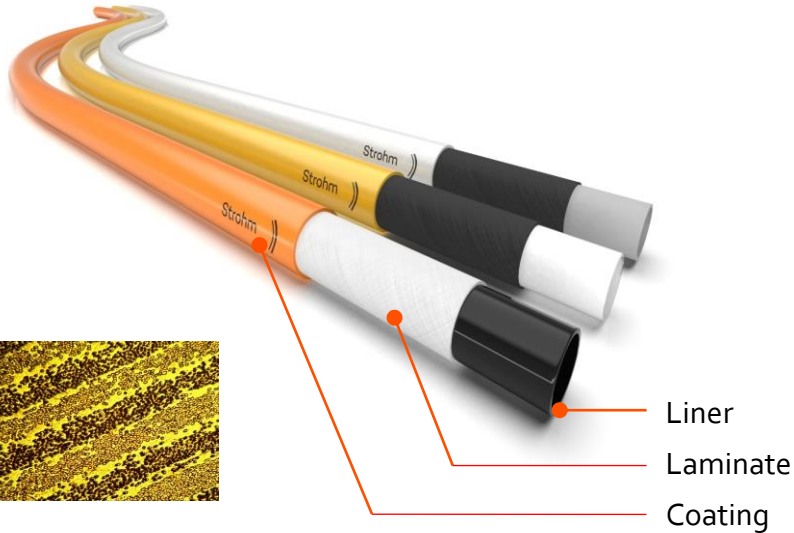
Introduction to Strohm & Thermoplastic Composite Pipe (TCP)

TCP for (offshore) Hydrogen application

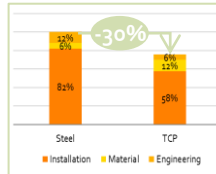
First offshore Hydrogen production opportunity: the HOPE project



# Thermoplastic Composite Pipe concept



- Fully Bonded,
  - Spoolable,
  - Non-Metallic,
  - Smooth Bore
- Pipe for robust offshore and subsea application



## Reduced CAPEX and OPEX:

- Reduced total installed cost
- Significant reduction of maintenance cost



## Smaller CO<sub>2</sub> footprint:

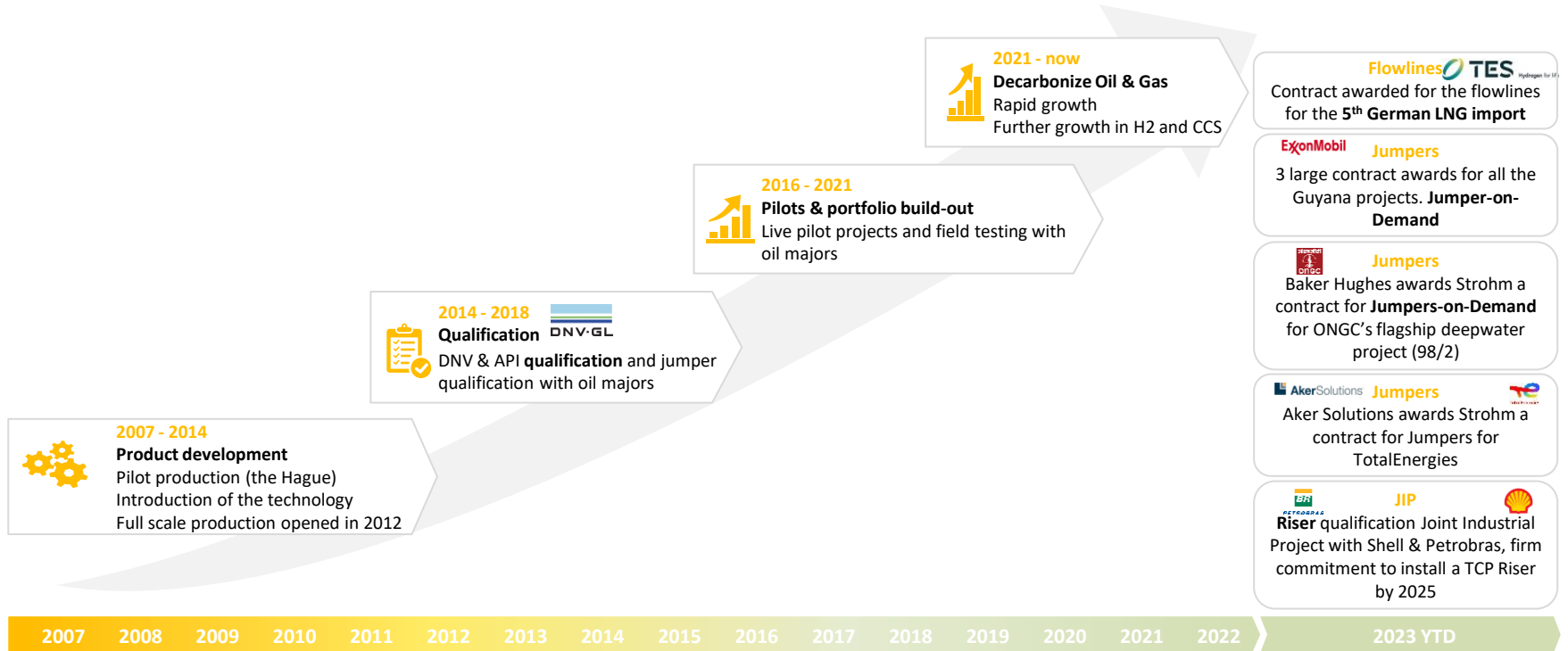
- Strohm is certified carbon neutral as organization
- Proven up to 60% reduction in footprint on as-installed basis



## Largest track record in the world:

- TRL-9 on flowlines and jumpers
- Applications including hydrocarbon production down to chemical, MEG and water injection

# STROHM - First & leading manufacturer of TCP



# Product portfolio

The key benefits maximize value for the end-user in an optimized product portfolio

## Jumper Spools

- No Metrology
- Faster
- Larger target box
- Flexibility
- Lighter manifolds and foundations
- Jumper on Demand



## Flowlines

- Lower total installed cost
- Offshore termination
- Smaller J-tubes
- Horizontal lay installation with small vessels



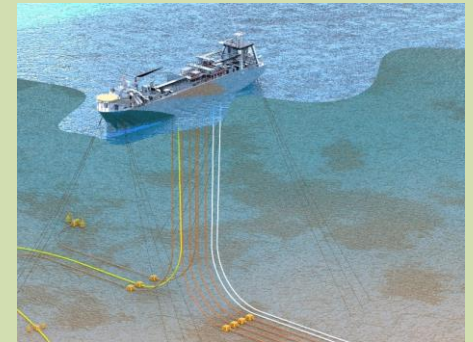
## Dynamic Jumpers Offloading / intervention

- Only non-collapsible high pressure jumper with smooth bore in the market today
- Can handle vacuum & cement for P&A



## Risers

- Free hanging catenary
- No corrosion
- 40% total installed cost reduction
- Lower loading on host



# Content

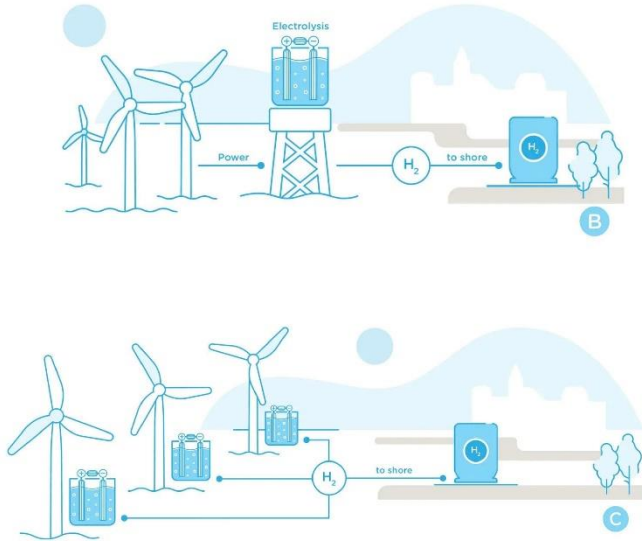
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**TCP for (offshore) Hydrogen application**

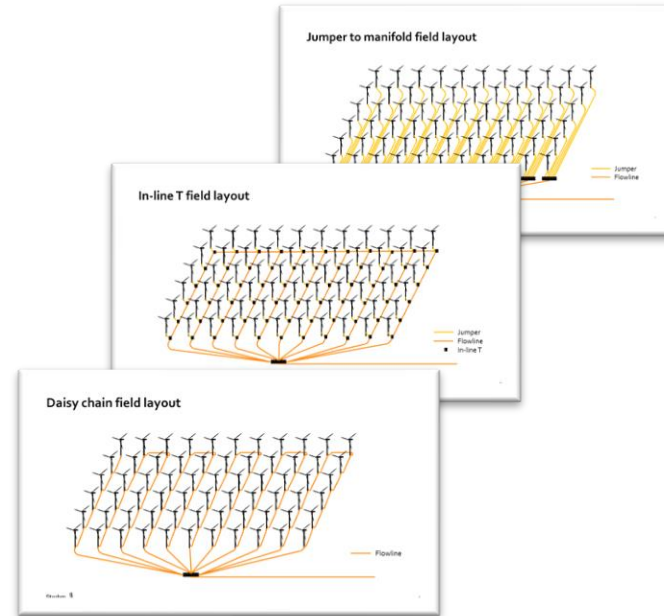
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# H2 Offshore Decentralized Production



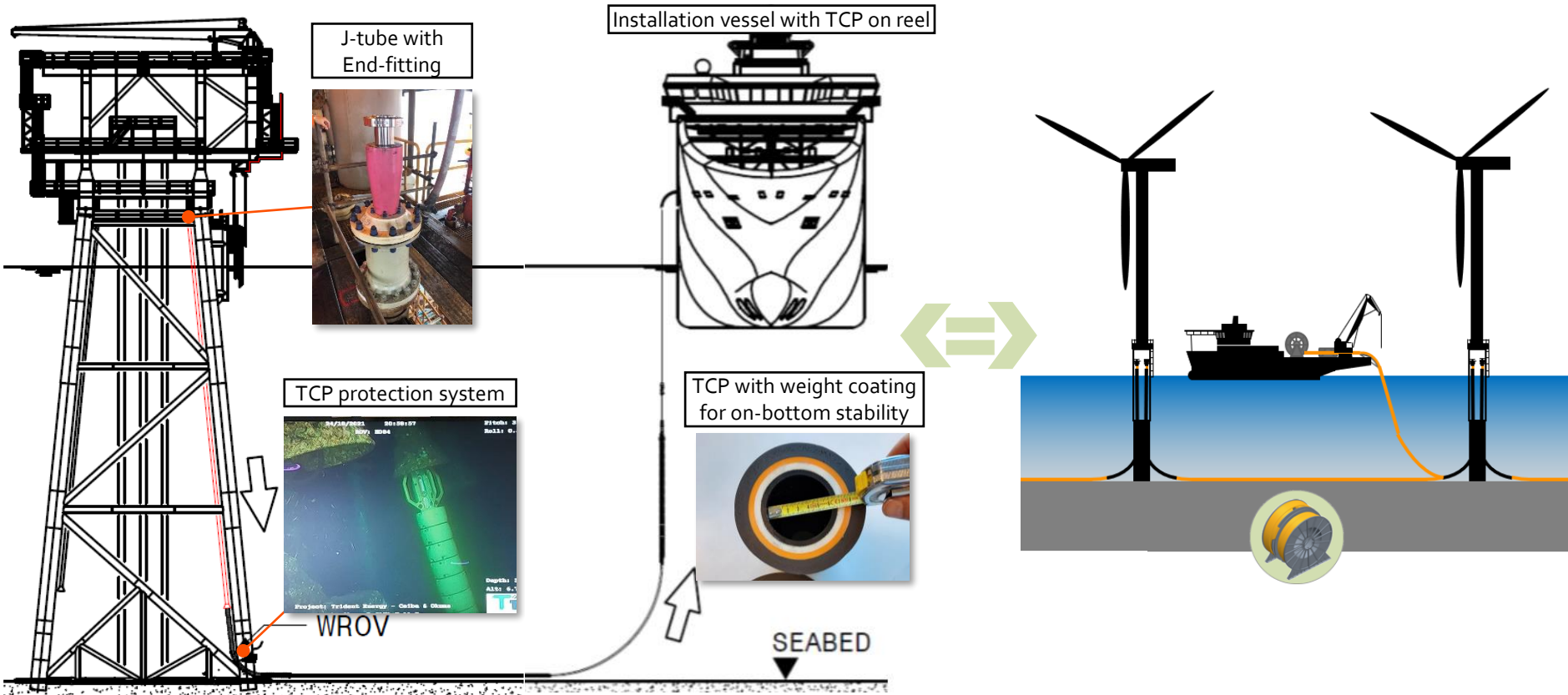
Centralized or Decentralized



Various field layouts lead to different pipe diameter requirements

# Strohm's O&G experience applies directly to offshore hydrogen

Example O&G project – 200 bar gas lift line





# Extension of TCP qualification to Hydrogen service

## Qualifying the existing product for service with hydrogen

TCP is successfully used with many service fluids:

- Production hydrocarbons (incl. H<sub>2</sub>S, CO<sub>2</sub>),
- Water injection,
- Gas lift, gas injection (CH<sub>4</sub>),
- Various chemicals (e.g. methanol, MEG, corrosion and wax inhibitors, emulsifiers),
- Pipeline pre-commissioning (high pressure N<sub>2</sub>, O<sub>2</sub>).

Qualification is now extended for hydrogen, demonstrating:

- ✓ No chemical degradation – Completed
- ✓ No swelling/fluid-uptake - Completed
- ✓ No damage with RGD – Completed
- ✓ Permeation testing - Completed

And qualified for each specific service to DNV FT119:



# Hydrogen permeation/emission – Not an issue with TCP!

Permeation test results confirms extremely low permeation values

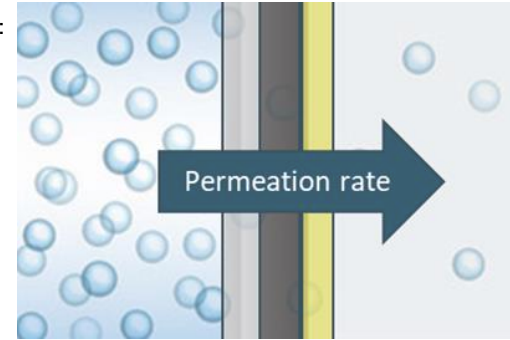
Results from full scale pipe testing at Tüv-Süd in München (4 inch pipe, 50 bar internal pressure @ 20 deg°C):

- Permeation per meter length of pipe:  $1.21 \cdot 10^{-3}$  g/m-day
- Permeation of 1 end-fitting is equal to permeation of ~10 cm of pipe

*What does this test result mean for hydrogen permeation/emission in a real case?*

- A wind farm with hydrogen producing wind turbines generators (WTG's) and TCP inter-array piping
- The wind farm has 50 WTG's of 20 MW (total 1 GW) and 2 km distance between the turbines -> Total TCP length: 100km

Then the total hydrogen loss in the wind farm through 100km of TCP due to permeation **40 kg per year (only)**



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# Hydrogen Offshore Production for Europe (EU)

## Why:

Accelerate the deployment of large-scale offshore hydrogen solutions to contribute to reach the 10 Mt of clean hydrogen produced in Europe by 2030 to decarbonize the European economy and reach our climate goals.

## What:

- Advance technology by developing and testing the **first 10MW offshore green hydrogen production system**,
- Demonstrate the **feasibility of large-scale concepts for deployment in 2028** and beyond.

## Who:

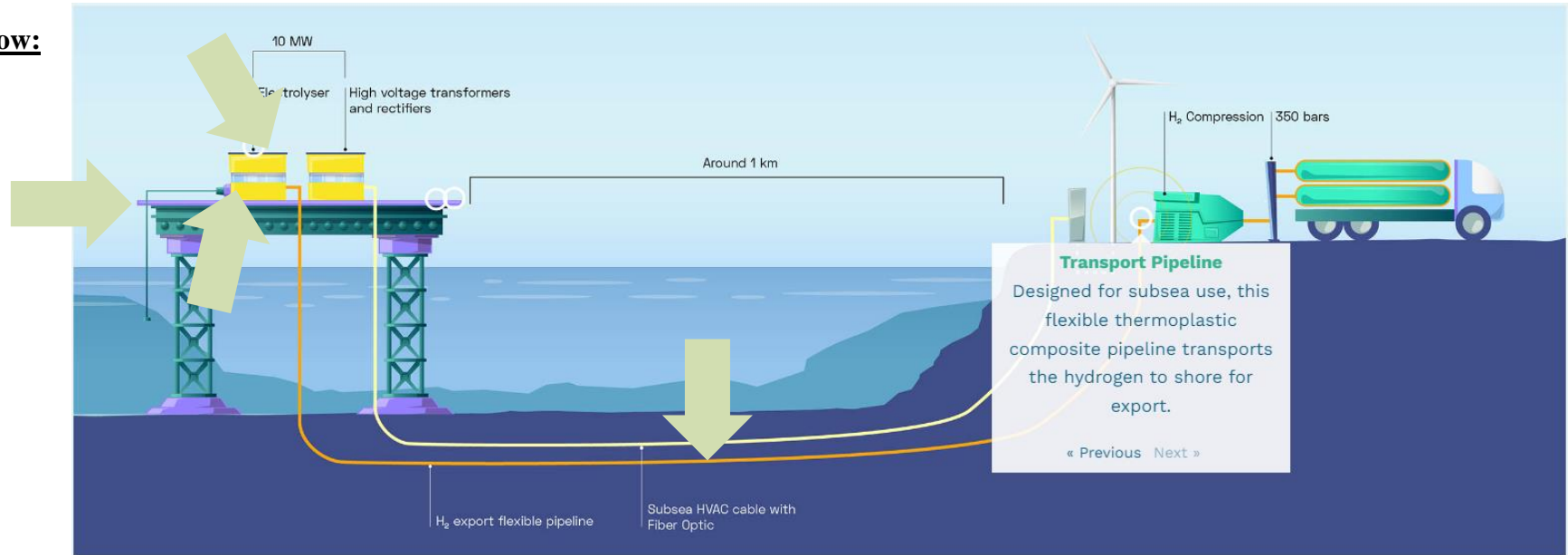


# First H<sub>2</sub> project: Hydrogen Offshore Production for Europe

**When:** start of operation in 2026

**Where:** in an offshore test zone near the port of Oostende in Belgium.

**How:**



No corrosion.

Lower cost.

Less CO<sub>2</sub>.

Strohm ))

Thermoplastic Composite Pipe