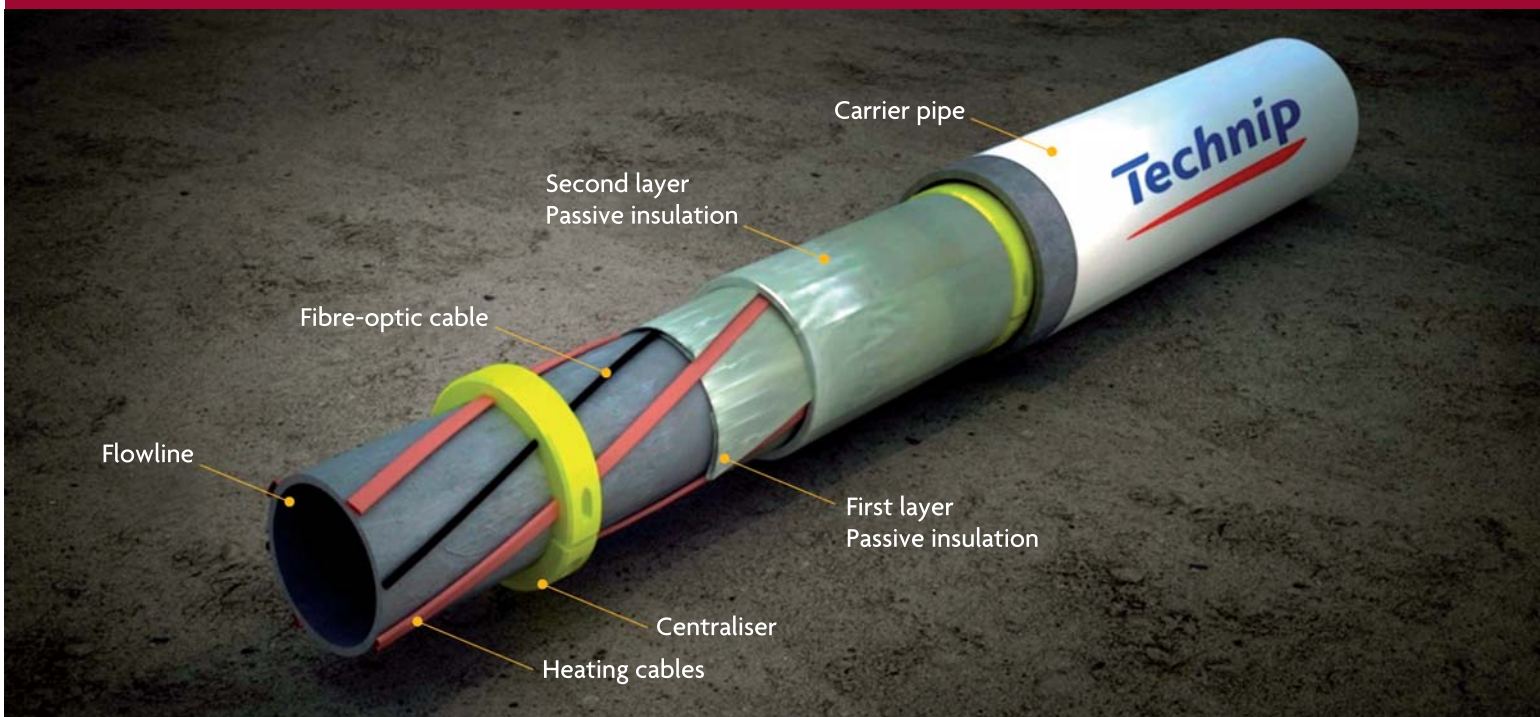




# Electrically Trace Heated Pipe-In-Pipe

How electrical tracing provides field Operators with an adaptable means of optimising production and reducing risks of fluid blockage



# An innovative solution with first installation in Summer 2011

Electrically Trace Heating-Pipe-in-Pipe (ETH-PIP) is a qualified system for design temperatures up to 120°C. Its first application will be in the UK North Sea, on behalf of a major oil & gas operator. The offshore installation is scheduled for the Summer 2011.

## A logical evolution

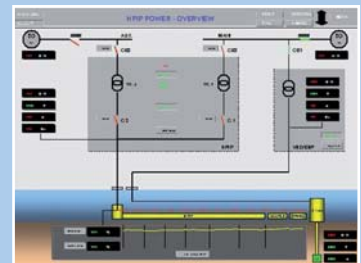
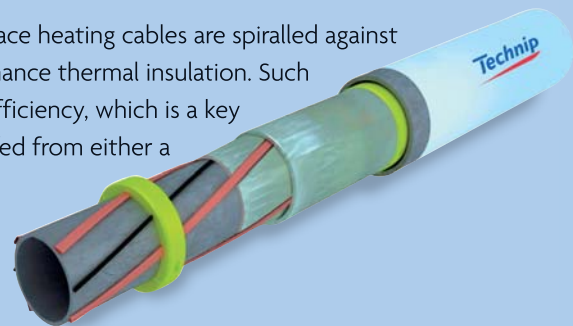
Technip has an extensive track record in the design, manufacture and installation of high performance reelable pipe-in-pipes (PiP) for static flowline and steel catenary riser (SCR) applications. PiP has become a well established technology to prevent hydrate and wax plugging in long subsea tiebacks and deepwater field developments.

Technip's Electrically Trace Heated Pipe-in-pipe (ETH-PiP) is the next generation of PiP technology, which enables field operators to optimise production and to reduce risks of blockage. This flexibility of operation can be further enhanced by the inclusion of optical fibre technology, for real time temperature profile monitoring of the flowline.

## The ETH-PiP concept

In Technip's ETH-PiP, flat shaped trace heating cables are spiralled against the inner pipe, under high performance thermal insulation. Such configuration maximises heating efficiency, which is a key differentiator. Electrical power is fed from either a power umbilical or an Integrated Production Bundle (IPB) to the connection Tee-piece, located at one end of ETH-PiP.

The design philosophy of the system focuses on providing a high level of reliability, taking into account the long term field life required. It maximises the usage of standard, off the shelf components, with existing track record for similar or more stringent industrial applications.

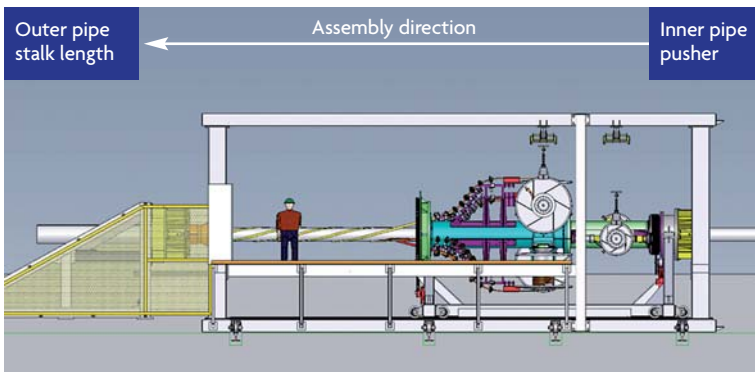


## ETH-PiP manufacturing process

The manufacturing process of ETH-PiP is very similar to that of PiP. PiP stalks, typically 1 to 1.5 km long, are assembled by insertion of the inner flowline inside the outer pipe. Technip designed and manufactured a spiralling machine for trace heating cables and optical fibre application, which aligned with the insertion process. This machine is largely inspired from Technip flexible pipe and umbilical manufacturing process.

The advantages of reel-lay are that the manufacturing process is carried out on the local onshore plant, in factory like conditions, away from the critical path and that the frequency of in-line connections is limited to one every stalk length, as opposed to every double or quad joint lengths for other installation methods.





Spiralling machine arrangement schematic (located between the outer pipe stalk length and the inner pipe length pushing machine)



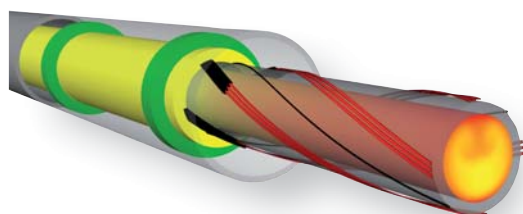
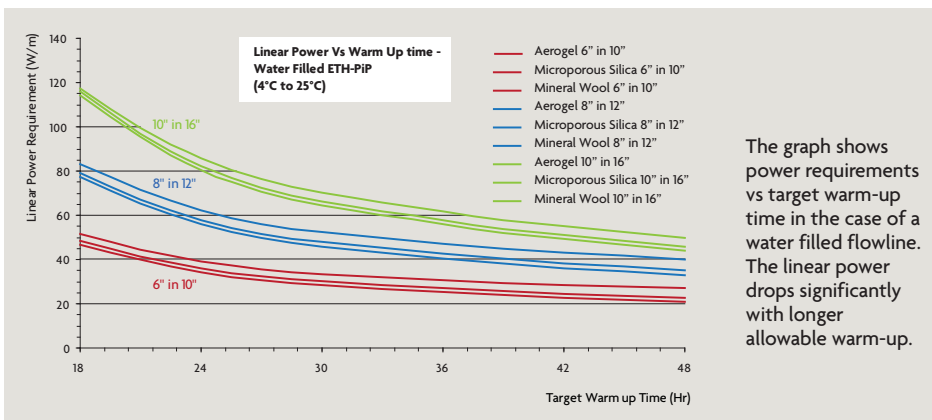
## ETH-PiP thermal performance

Technip's ETH-PiP shows exceptional passive insulation and temperature maintenance capabilities, making it an economically viable solution.

Typical characteristics of the system are presented below.

PiP dimensions	6" in 10" to 12" in 18"
OHTC performances	Down to 0.5 W/m <sup>2</sup> .K
Qualified cable phase voltage	2000 V
Power requirement – T maintain	10 to 30 W/m
Power requirement – Warm up	30 to 100 W/m
Max. length single cable heating*	15 km

\* Typical power 30 W/m - Length can be increased by adding cables



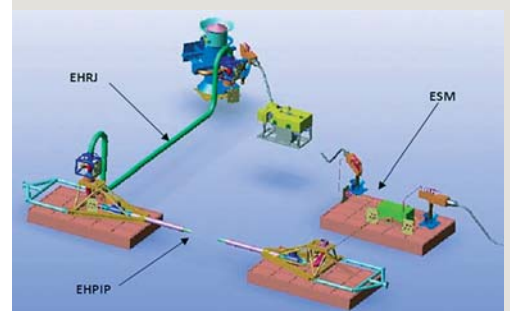
## ETH-PiP design tools

Technip calibrated CFD models of ETH-PiP against the results from two thermal test programmes carried out on full scale test pieces. Such CFD tools enable accurate modelling of ETH-PiP performance and of flow assurance scenarios.

## Commercial advantages

Technip's ETH-PiP brings many benefits to Operators:

- ETH-PiP technology can be implemented to both flowline resting on the seabed or steel catenary risers (SCR).
- ETH-PiP is particularly well suited to long tie-back or heavy oil field applications because of its low power consumption, which reduces both OPEX and topside CAPEX costs.
- ETH-PiP allows an Operator to minimise non-productive shut down times.
- Optical fibres enable flowline temperature monitoring, using either the Distributed Temperature Sensing (DTS) or the Fibre Bragg Grating (FBG) techniques.
- ETH-PiP is compatible with an IPB.
- There is no need for a return umbilical.
- ETH-PiP can be used in parallel with a down-hole electrical submersible pump (ESP), to divert the pump's power supply to pipeline heating during a shut down phase.



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