Subsea 7 has established a market-leading track record in the design, fabrication and installation of a range of cost-effective Pipe-in-Pipe (PIP) solutions, including flowlines, spools, risers and Pipeline Bundles.

Key benefits:

- Subsea 7 is unique in the industry in offering the full range of installation methods, including reel-lay, tow-out, S-lay and J-lay
- Provides impressive insulation values even in deeper and challenging subsea developments
- DNV qualified use of Electrically Trace Heated Pipe-in-Pipe (ETHP) system offers a very low power requirement solution with significant cost savings.
Product Overview

The PIP product consists of the production pipeline being sleeved into an outer pipe with the annulus being kept dry and filled with a high-performance insulation material configured to meet the project thermal requirements.

The outer pipe is designed to withstand both the hydrostatic pressure dictated by the project water depth and the installation methodology. The inner pipe can be located within the outer pipe by the use of centralisers clamped at discrete intervals along the inner pipeline, or, in the case of Subsea 7's high-performance PIP system, without centralisers. The inner and outer pipe sizings are designed as a single system, which can then be installed by the preferred installation method for each project, such as reel-lay, tow-out, S-lay, or J-lay. The selection of the appropriate installation method depends on the characteristics of the field development and the dimensions of the PIP system.

ITP Izoflex™ insulation is the preferred Subsea 7 insulation material for ETHP, but other systems are also offered and Subsea 7 possesses wide experience with most insulation materials applicable to PIP systems.

Advantages of Pipe-in-Pipe

A key challenge for many new subsea developments is maintaining the appropriate product temperature within the pipeline infrastructure in order to avoid the formation of hydrates, or wax, resulting in the detrimental impact on flow assurance and the possibility of a complete shutdown. To date, the industry has met this challenge by increasing levels of wet insulation coating, heating by the inefficient Direct Electrical Heating (DEH) system, and by higher performance PIP.

Subsea 7's PIP solution offers clients the ability to design and build a cost-effective pipeline system for new, or brown field projects, requiring effective and, when required, world-class insulation.

High-performance Pipe-in-Pipe

Subsea 7's high-performance PIP solution uses field proven ITP Izoflex™ insulation with reduced internal pressure. This offers unequalled performance, with U values of 0.5 W/m2K or better.

Another important benefit is that a smaller annulus is required for a given U value. This has the potential for a smaller outer pipe to be used, resulting in a considerable cost saving.

Electrically Trace Heated Pipe-in-Pipe (ETHP)

This technology offers significantly enhanced flow assurance properties. ETHP, technology developed with ITP, can be built with an efficient passive system featuring a 'no touch' time of 72 hours. An active system designed to maintain the flowline above WAT or HAT, with a typical power consumption of five to 10 W/m for hydrate mitigation. The heat traced technology can be applied to all types of pipe metallurgies at high temperatures and during permanent operation. The system offers significantly lower power requirements and costs when compared to DEH systems. The technology is qualified for reel-lay through a range of full-scale and laboratory tests. The electrical heating system is composed of an individual three phase wiring triplet configured in a star arrangement.

The space available within the annulus enables a number of circuits to be installed, thereby providing a high level of redundancy.
High-Performance Pipe-in-Pipe

Track record
A selection of Subsea 7’s ETHP projects include:
- Statoil Svalin project (installed by reel-lay)
- Hess South Arne project (installed by Pipeline Bundle method)
- ConocoPhillips Jasmine project (installed by Pipeline Bundle method)
- Total CLOV project (installed by J-lay).

Subsea 7 possesses an extensive proven track record, built up over 30 years, in performing the full design, procurement, fabrication and installation of ETHP systems. Subsea 7 has successfully completed more than 50 PIP systems by either Bundle methods, S-lay or J-lay and reel-lay installation methods including:
- Size range from 5-inch/8-inch to 16-inch/20-inch PIP
- Overall heat transfer coefficients down to 0.55 W/m2K
- Design temperature range up to 155°C
- Passive and active heating systems
- Water depths from 40m up to 1,400m.

Swaged End Connection
Subsea 7 has recently added an additional component, ITP’s Swaged End connection made to the reeled ETHP system.

The reelable Swaged End Connections provide a:
- Leak-tight seal for draw-down of pressure within the annulus
- Barrier to act as a water stop in the event the outer pipe is breached
- Means of mechanical connection between the flowline and outer sleeve pipe
- High-integrity field joint.

The Swaged End Connection has been used extensively in operation on J-lay and S-lay PIP systems.

Qualification programme
As well as our extensive track record of installing ETHP systems, Subsea 7’s standard, ETHP technology and Swaged End Connection have been fully qualified ‘fit for service’ by DNV in compliance with DNV-RP-A203.

Comprehensive trials have validated both the heat transfer models and a range of insulation material properties suitable for PIP applications.

For further information contact
Olivier Lodeho, Project Engineering Manager
olivier.lodeho@subsea7.com

www.subsea7.com
© Subsea 7, 2015. Information correct at time of going to press.