Subsea Expo Conference 2017 - Springboard session

“Electrically Heat Traced Flowline” (EHTF) improving cost and reliability for new developments

By A. Reveilloux (03-Feb-2017)
Industry challenges

- Improving access to reserves and very long tie-backs
- Transporting fluid over long distances from seabed to surface
- Preserving the integrity of pipelines all over the field operating life
- Preventing pipeline blockage due to hydrate or wax formation
Subsea 7: Diverse pipeline products

- Former usual passive insulation technologies
  - Wet insulated pipes
  - Flexible pipes
  - Bundles
  - PiP

- Step change to integrate active heating technologies

DEH

EHTF PiP
“Electrically Heat Traced Flowline” (EHTF) – A key enabler

EHTF – Projects area of interest (Power \( \approx 10 \text{W/m} \))

DEH – Projects area of interest (Power > 100\text{W/m})

- Pipe-in-Pipe
- Wet insulated pipe
- Flexible pipes
EHTF system overview

• Heat a pipeline section between two structures using Joule effect created by current passing in wires triplets

• Powered from topside via umbilical from inlet entry point(s)

• Versatile operational philosophy, enhanced redundancy & reliability

• Limited power consumption as a consequence of high performance insulation product (Izoflex + vacuum, ITP InTerPipe owned technology)
Installation

- Per conventional reeling pipelay and bundle methodologies
- Standard subsea wet-mateable connection of electrical and optical systems
EHTF cross section – Schematic

- Typ. 12 wires arranged in 4 triplets, each one individually operated, offering most suitable solution:
  - Redundancy
  - Reliability
  - Flexibility

- Outer pipe (carrier pipe)
- Inner pipe (flowline pipe)
- Pipe-in-Pipe
- Izoflex© - dry insulation material
- Air gap at reduced gas pressure (typ. 15mbars)
- 3 independent wires forming a triplet
- FO cable (opt. for distributed temperature monitoring system)
EHTF cross section

- Wiring helix arrangement + Centralisers + Soft wrapping sheet
  → Successfully tested in June-2015
System reliability performances
(Comparing other market arrangements)

- **No spare case**
- **Other arrangement per “system”**
  - (“1 (out of 3) system”, 1 system = 12 wires)
- **EHTF Arrangement per “triplet”**
  - (“4 (out of 12) triplets”)

After X years
EHTF modular arrangements

- Can tailor any field arrangement
- Can accommodate almost any length / number of lines
- Extend operability of field by controlling individually heating of a flowline section (if needed)

Config#1

Config#2

Config#1 + Config#2

Tailored as required ...
EHTF PiP: An enabling technology for operators

- A technical enabler: improved access to reserves and very long tie-backs
- An economic enabler with lower CAPEX & OPEX
- An economic enabler with improved production
- Efficient and environment friendly system:
  - Preservation with EHTF is easier and cheaper than classical preservation architectures
  - Allow for very long tie-back with no looping requirement
  - Access to fluid highly thermally demanding with permanent heating
  - Reduce or eliminate the need for chemical flow assurance alternatives
Example of SURF-SPS-Topside optimisation with new technology for Angolan tie-back

**Standard hybrid loop case**

- Service line
- Production line
- Manifold
- Riser
- EHT PIP
- Well injection line

**Optimised architecture using EHTF**

**Saving 500Musd circa**
- Avoidance of a 1000t topside modification
- No manifolds (controls integrated in inline-ties and wellheads)
- No service line
- Connection to existing lines (no risers)

**EHTF integrated within global approach through optimised field architecture studies**
EHTF system performance highlights

- EHTF is a market ready solution
- EHTF PiP technology by Subsea 7 provides superior performance compared to other technologies on the market:
  - Easy operable system (all triplets individually piloted)
  - Improved redundancy & reliability
  - Flexibility for system configuration
  - Modularity with access to very long tie-backs
  - Electrical system technical simplicity enabled by low power/low voltage technology (order of 10 W/m; ie. <500kW on a field)
- Technology accessible to both reeling and bundle installation methods
- Availability of components through large sourcing of key components