The Electrically Trace Heated Blanket: A New Concept for Efficient Subsea Flowline Hydrate Dissociation





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Agenda

- Why developing an ETH-Blanket service ?
- How does it work ?
- ETH-Blanket thermal performances validation
- Hydrate management
- ETH-Blanket service way forward





Patented Solution

Why Developing an ETH-Blanket Service ?

- Ongoing JIP (Phase.I) with SHELL & TOTAL
- <u>Description</u>: Develop a service to allow flowine/pipeline blockage (Hydrate, Wax & Pour Points) dissociation via heating,
- <u>Objectives</u>: On green field, move toward « risk based flow assurance » approach:
 - Reduced OHTC requirements,
 - o Reduced requirements on installation asset,
 - Simplified field architecture (« single line »),
 - Reduced risks of loss of production.

On brown field, significant reduction of loss of production risks,





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How Does it Work ?





Temperature [*C] 77.4 69.2 61.0 52.8 44.6 36.4 28.2 20.0 Velocity (m/s 0.0040 0.0035 0.0030 0.0025 0.0020 0.0015 0.0010 0.0005 0.0000 64.3 58.0 51.7 45.3 39.0 32.7 26.3

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How Does it Work?

- ETH-Blanket components:
 - Fabric: Structural member function,
 - Kitkat: Insulation function,
 - ETH cable: Heating function,
 - Optical cable: Monitoring function (DTS)
- Plug dissociation via heating,
- Heating power = 450kW,
- Heat transfer to flowline/pipeline via conduction & convection,





ETH-Blanket Thermal Performances Validation

- « Full » scale physical model test (Artelia, Grenoble France):
 - 24m long / 8-off kitkat ETH-Blanket,
 - $_{\odot}~$ 2-off pipe OHTC tested: 1.4 & 5.9 W(k.m^2) $\,$
 - Pipe burial depths (OD ref): 50%, 100% & 200%,
 - ETH-Blanket offset: 1.5-off kitkat,





ETH-Blanket Thermal Performances Validation

• 50% pipe sample burial depth & no blanket offset test:





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Hydrate Management

- <u>Objective</u>: Develop ETH-Blanket operating procedure to allow safe hydrate dissociation,
- Hydrate dissociation risk categories:
 - Loss of containement risk,
 - Loss of production risk.





Hydrate Management





ETH-Blanket Service Way Forward

- Completion of ETH-Blanket JIP phase I by July 2018,
- Initiate and complete JIP Phase II program: Engineering of the ETH-Blanket « early » operational version:
 - Engineering of prototype ETH Blanket hardware,
 - o Installation method & lay spread pre-design,
 - Hydrate management procedure & associated design tools,
 - Technology screening and pre-selection of plug detection/location,
 - o Commercial model development.







Ready to start procurement activities for an ETH-Blanket « early » operational version by Q1 2019 (JIP Phase III)



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Thank You – Any Questions ?





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