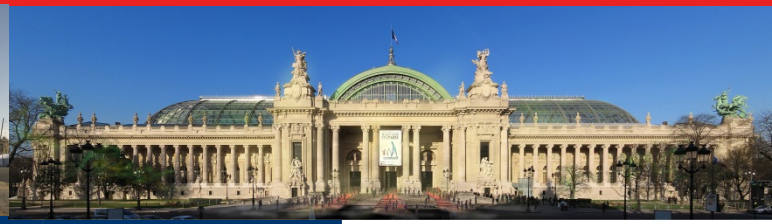
26th World Gas Conference

1 – 5 June 2015, Paris, France



FOLD project: Pipeline Monitoring, Fibre Optic gas Leak Detection

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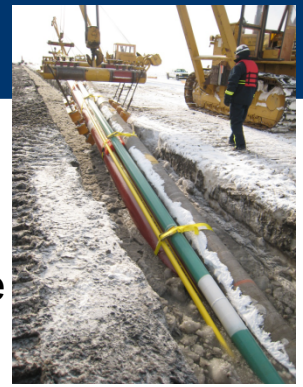
WGCPARIS2015
WORLD GAS CONFERENCE

Project aim



- State of the art: leak detection systems
  - Computational techniques limited to 2-3% detection limit (of pipeline full bore flow-rate) and need for metering skid at the pipeline inlet and outlet
  - Dynamic pressure based leak detection systems have limited performances for non stabilized fluids and irregular flows (E&P specificity)

- Project objectives
  - Quantify FO LDS performances in term of detection time and detectable leakage rate
  - Optimize implementation and provide project decision data
  - Compare systems performances with project specific risk analysis

TOTAL
COMMITTED TO BETTER ENERGY

Why this project? Operations Feedback

- Indecision during construction phase on fibre optic cable installation for leak detection



- Rational for deciding whether or not to install fibre optic (communication and leak detection purposes) at project phase
- Decision to invest on Engineering for cable deployment along subsea flow-lines for leak detection.

TOTAL
COMMITTED TO BETTER ENERGY

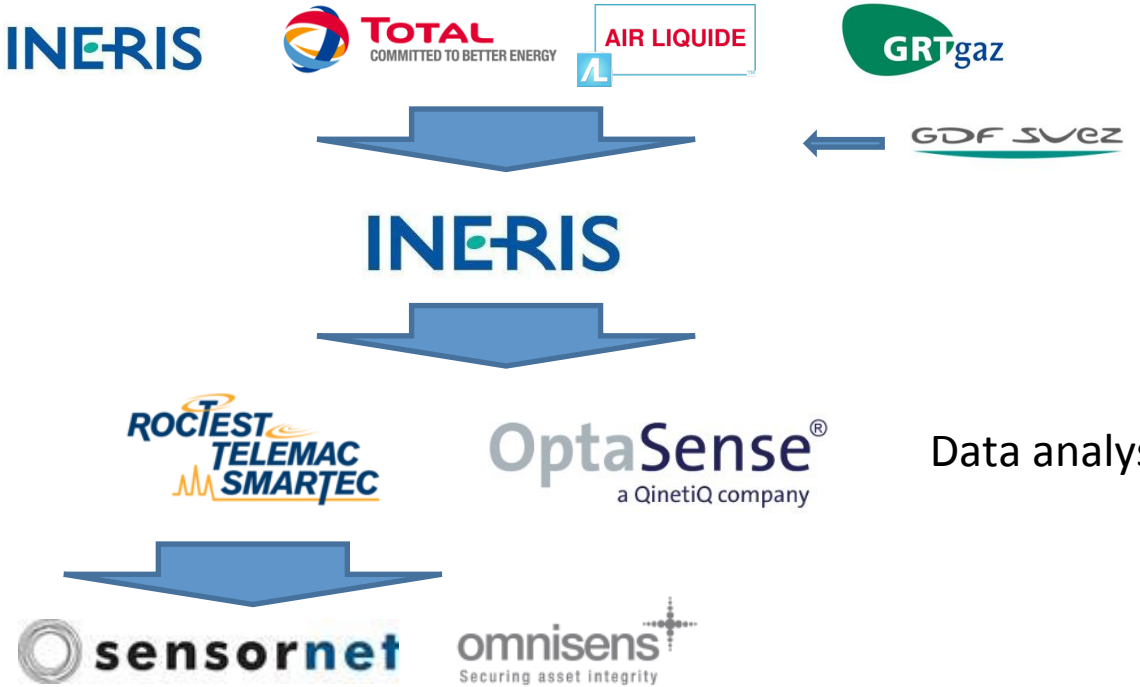
Project overall organisation

Partners

Contractors

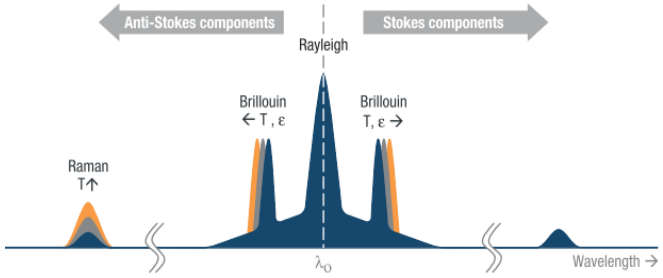
INS integrators
or service suppliers

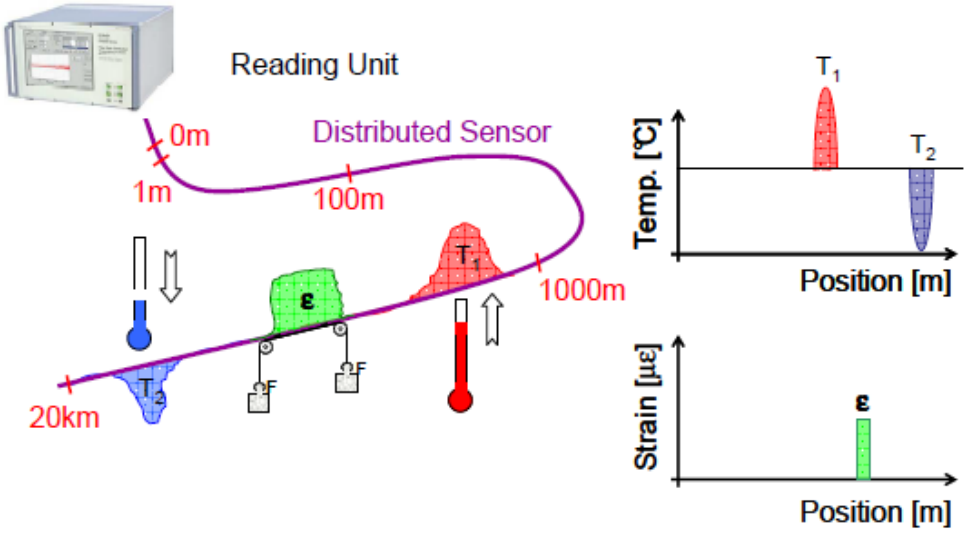
Manufacturers



Data analysis

Fibre optic distributed sensing





TOTAL
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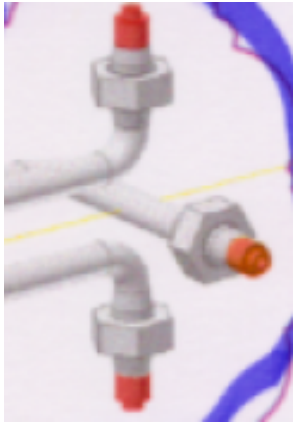
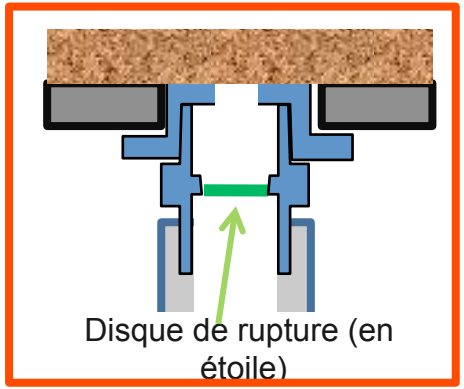
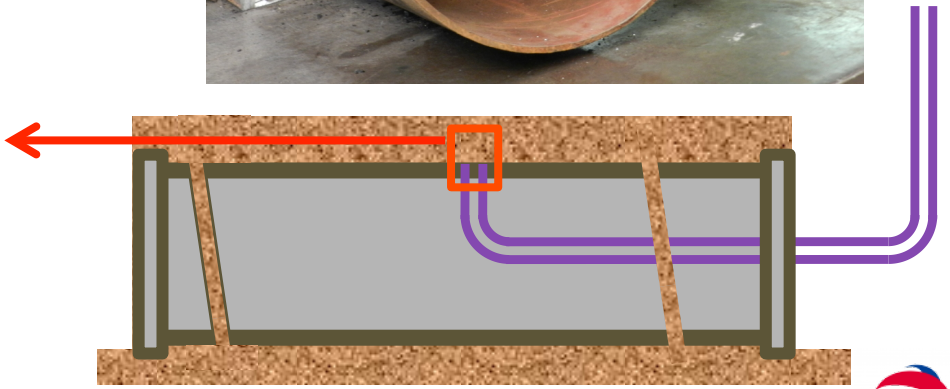
Leakage from the buried pipeline

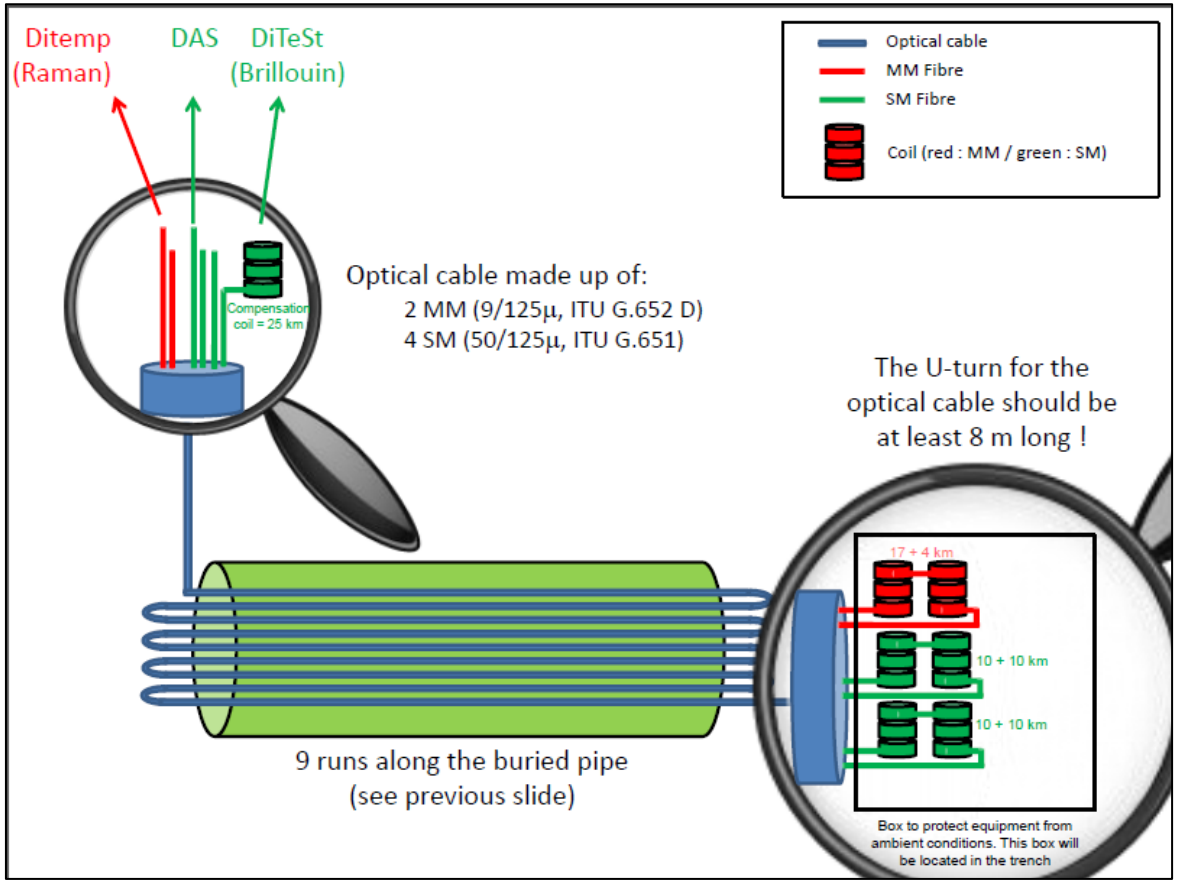
- Rupture disks and calibrated holes





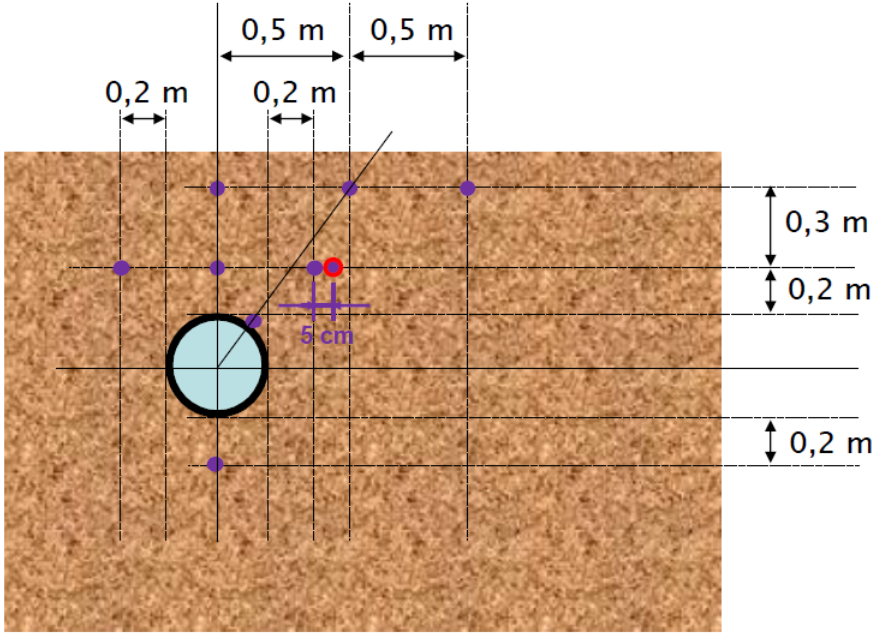


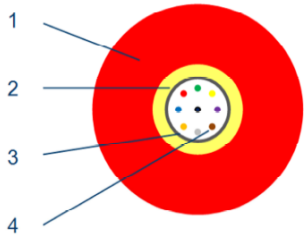
Tests bench: General arrangement



Fibre optic cable deployment

- Practical locations during pipe installation
- Directly buried or in a conduit





1 HDPE outer sheath
2 Glass fibers with water blocking tape
3 Stainless stell loose tube, 316l
4 Bend insensitive optical fibers

TOTAL
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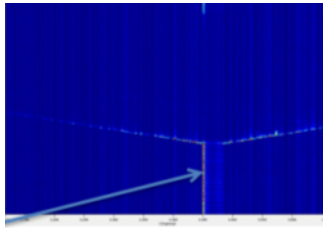
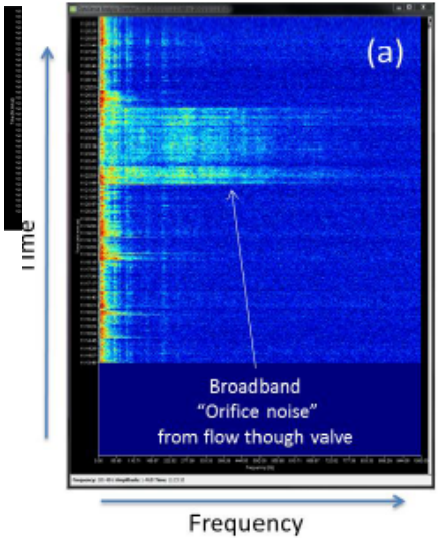
FO leak detection principle

Based on different physical parameters indicating a leak

Leakage noise detection / negative pressure pulse with distributed acoustic sensing (DAS)



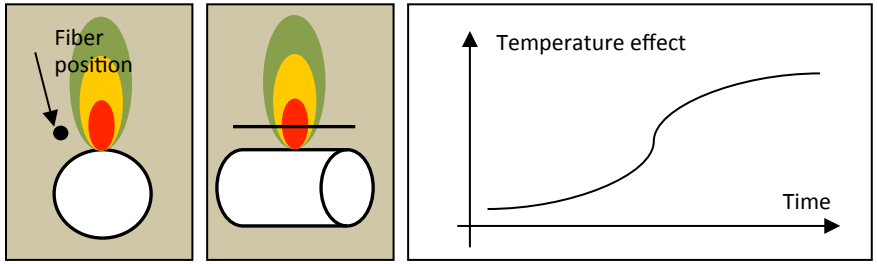


Environment baseline changes:

Ground movement and crater formation due to a leak

Small changes temperature

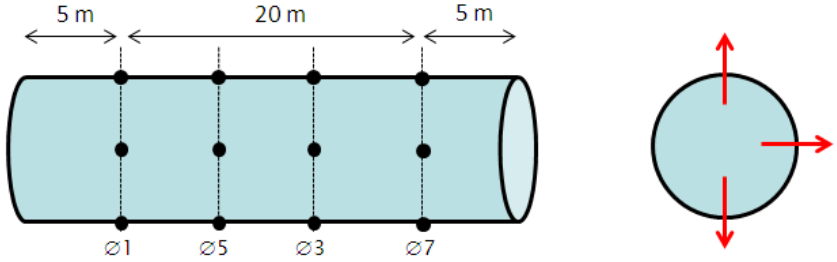
Distributed temperature sensing (DTS) of gas decompression temperature drop or hot fluid leakage within the ground



Test Matrix

- Test parameters

Calibrated orifice Ø	Rupture disk	Gas	Fluid Pressure	Leak positions	Soil type
1, 3, 5 & 7 mm	With or without	CH4 & H2	40, 70 & 100 bars	12:00, 3:00 & 6:00	Sand or clay



Test bench construction update

Conclusions

- Results to be delivered before October 2015
- Realistic test bench for technology acceptance within projects
- Realistic expectations from systems and adaptation to specific risk assessments