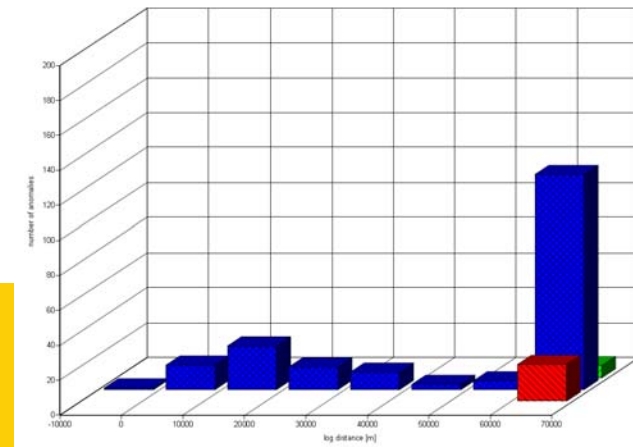




Challenging Inspections of Offshore Pipelines by Intelligent Pig

Society for Underwater Technology
Pipeline Management
21st June 2017

Presenter:
Adrian Griffiths





Introduction

Shell UK have completed many pipeline inspections as part of their ongoing Pipeline Integrity Management System (PIMS).

A number of these can be considered routine, but many can be considered as falling into the category “Difficult to Pig”, the focus of this presentation.

- The “Pipeline Integrity Project (PIP)” was formed to bring together a team to execute a number of these pipelines that had Inspection Due Dates (IDD) falling in close succession, all of which needed an element of subsea intervention.



PIP Basis for Inspection

Shell use a Risked Based Inspection (RBI) process to generate an appropriate Inspection Due Date.

Over the span of the PIP, 10 individual pipelines have been considered with IDD's covering a few years. The final result was the inspection of 6 of these pipelines.

Givens:

- Quality inspection data delivered without harm to people or the environment.
- System to be left in the same condition as found ready for flawless start up by the Asset

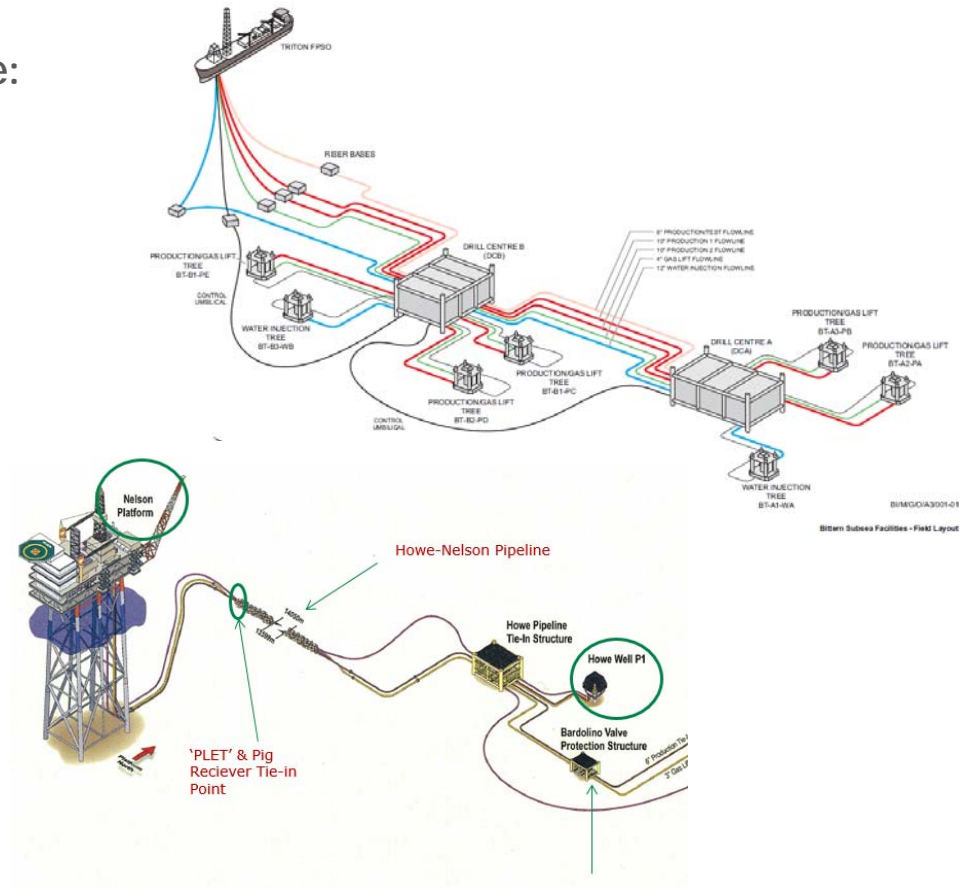
PIP Workscope

The pipelines that were inspected by the PIP were:

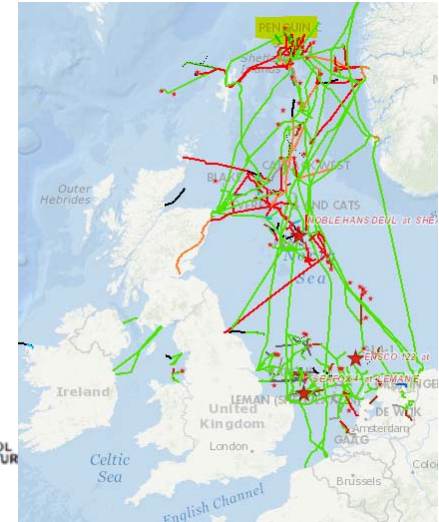
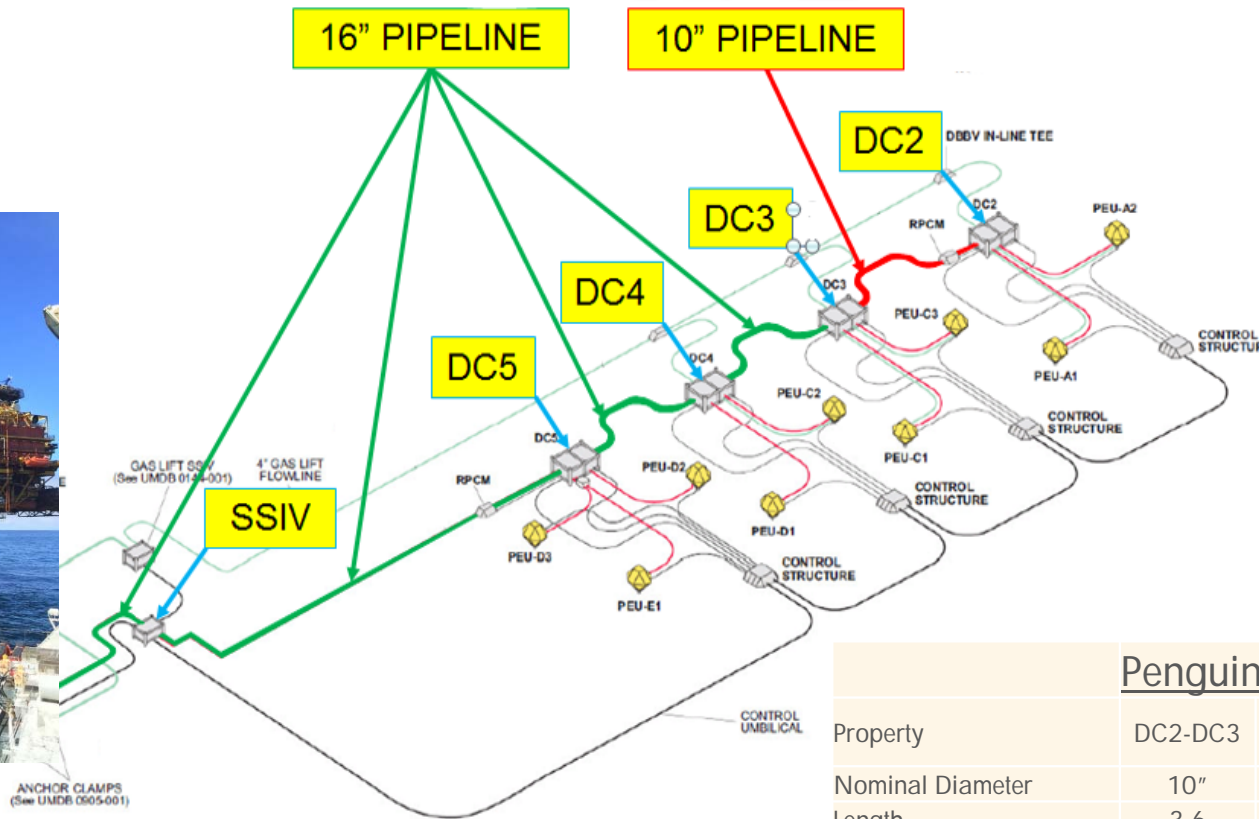
Bittern, 2 x 10", 1 x 8", 22km.
Subsea to Subsea

Howe, 8", PiP, 14km.
Subsea to Subsea

Penguins, to follow.....



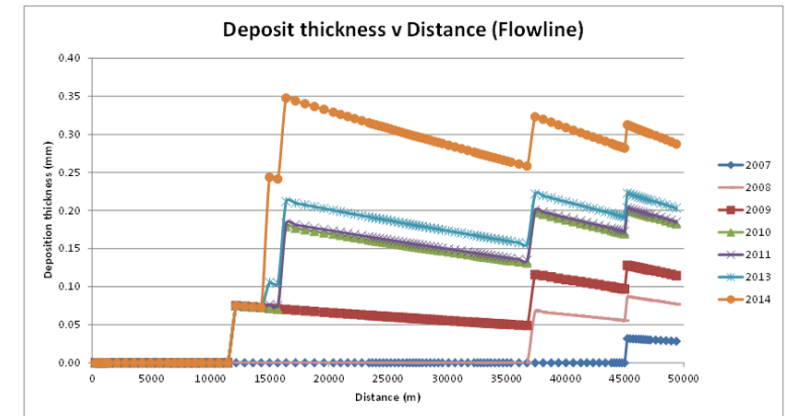
Penguins to Brent C Field Layout



Penguins Data				
Property	DC2-DC3	DC3-DC4	DC4-DC5	DC5-BRENT C
Nominal Diameter	10"	16"	16"	16"
Length	3.6	5.7	4.8	52.1
Service	Multiphase Oil			

Inspection Philosophy

- Integrated Project with the Asset and Project Team.
- Utilise the previous vendors and USC team for continuity.
- Maximum Debris Assessment, Corrosion Products, sand & wax.
- Wax deposition modelling.
- Tool selection for best data.
- Progressive pigging.
- Re-start pre-commissioning.
- Incorporate previous lessons learned from Bittern and Howe.
- Wet store campaign in 2015 to assisting in the proposed winter pigging campaign w.r.t over boarding in swell limitations.
- Upfront testing of Brent C receiver for ops.
- Load receiving cassette.
- Execution delayed to align with TAR & reduce deferment.

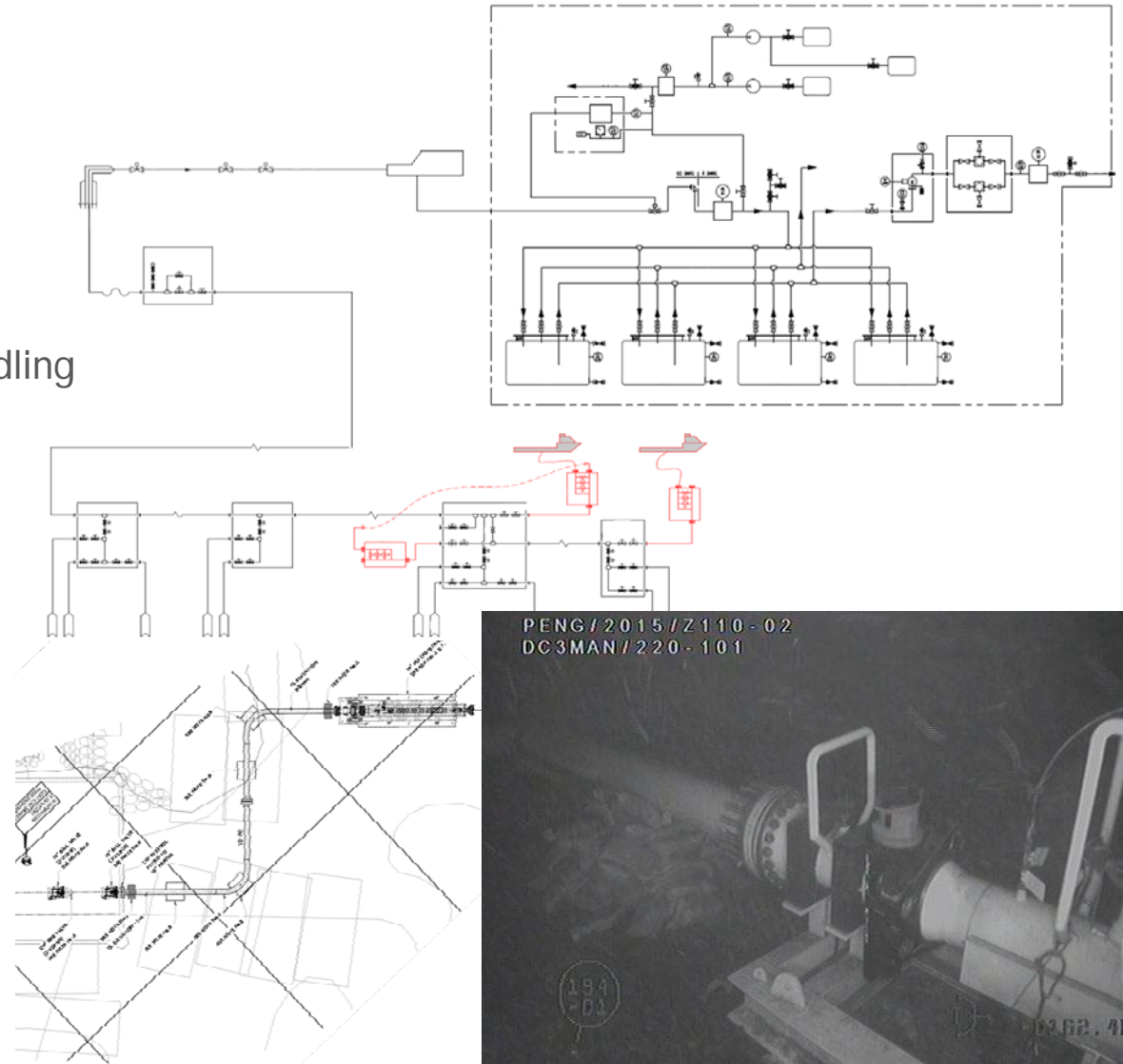
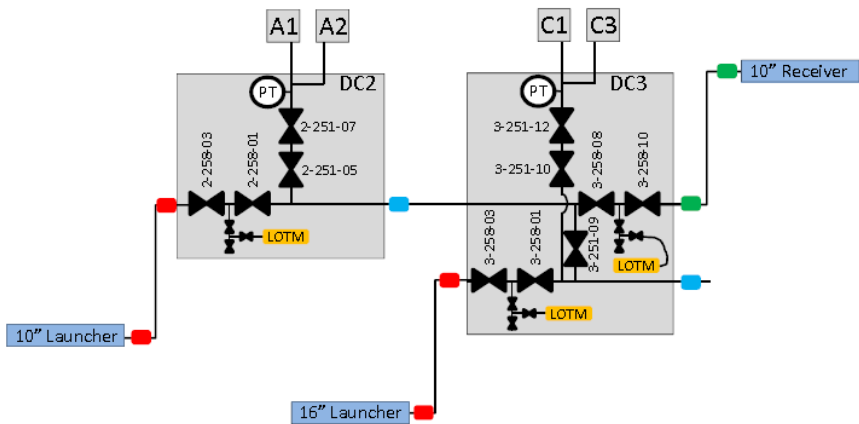


Tool Technology Selection

- Quality data was the primary objective for the PIP.
- Evaluate all primary inspection technologies, UT, MFL, SIC, DMR.
- UT – Best Primary technology but requires high levels of cleanliness.
- MFL – Acceptable technology, influence by pipe in pipe, heavy wall thickness.
- SIC – only good for internal corrosion defects. Secondary technique.
- DMR – Secondary technology for internal wall information only.
- Shell Framework agreement options were:
 - UT – MFL – SIC – Combo.
- UT-MFL combo selected to give the best chance of quality data in a single run.

Isolation and Construction

- Verified SSIV open and closing
- Isolate and test all 4 drill centres
- Significant topside package for debris handling
- Installation of spoolpieces
- Installation of signallers
 - Mechanical & magnetic



De-oiling and Cleaning

- De-oil 10" into 16" using 10" pathfinder pigs
- De-oil 16" to Brent C process using gel pigs
- Switch to temporary debris handling package
- Run debris pick up gel
- Load chemical soak train
- Clean 10" & Inspect 10"
- Run 16" pathfinders
- Clean 16" & Inspect 16"



De-watering & Restart

- 10" dewatering completed with MEG/Water mix supplied from the DSV.
- 16" dewatering completed with a pig train left in pipeline.
- Platform successfully re-started the Penguins Field following completion of the turnaround.





Inspection Results

Both 16" & 10" Pipelines in excellent conditions with no internal corrosion. There were a number of mill anomalies, weld anomalies and laminations.

Previous inspections from the PIP on the other pipelines had revealed both pipelines in pristine condition and those that were in a worse condition with many defects of differing corrosion types.

No pipeline was exactly in the condition predicted.

FIND WHAT YOU INSPECT NOT WHAT YOU EXPECT!

Lessons Learned – Examples

- Swapped out Flange connection to ROV destec connection on the 16" PLR, HSE and schedule advantages.
- Even the latest 4G communication system may have comms problems, back ups worked.
- Awareness of platform personnel operation roles (they have a day job as well).
- FAT/SIT including loading/unloading, pumping, signalling may prove very useful as much of this equipment is still not 100% reliable or compatible.
- Industrial action, weather, flight delays, cranes etc. can all trip you up.
- DSV held IRM work incase of platform based delays.
- Planning flexibility – worked with TAR, Flotel, Rig activation, P&L campaign.
- Use all steps to gain data on pipeline condition, visual, equipment gauges, historical databooks, the more knowledge you have, the better armed you are

PIP Conclusion

- The Pipeline Integrity Project successfully completed 3 inspection campaigns, safely, on time and on budget.
- Looking back over 5 years of work, we had an initial plan to do on a campaign style over two years, doing one pipeline after another. Even with the dedicated multi-discipline team the subsea aspects of the scope deemed this impossible without a significantly larger team. Never be afraid to take a step back and re-evaluate to ensure you deliver the promises you make.
- The additional complexity of including a subsea launch or receive aspect should not be underestimated.
- Need to be supported from the top down and bottom up, ONE TEAM.
- Early heads up and engagement with any Partners is essential.
- Although inspecting these pipelines is difficult and expensive, it was considerably cheaper than replacement.

