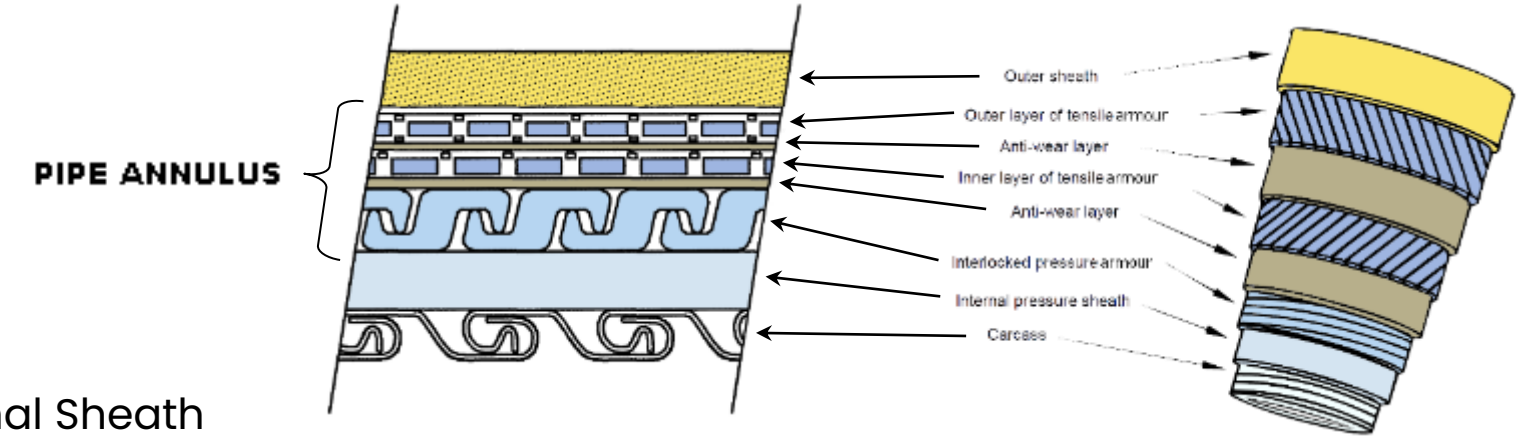
# Inspection and Cleaning of Flexible Riser Annulus Vent Ports

Gilles Gardner and Adam Armstrong

# Introduction – Unbonded Flexible Pipe

Composite of Layered Materials

- Steel and Polymer
- Each Layer Plays Part
- External Sheath Integrity Key
- External Environment Barrier
- Pipe Annulus
- Space Between External and Internal Sheath




**Pressure Retaining Conduit**



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# Introduction – Unbonded Flexible Pipe

Annulus Vent Ports

- Located on Each End Fitting
- Path for Permeated Gas and Liquid
- Reduces Risk of Buildup – Outer Sheath Damage
- Key Component of Riser Venting System
- Connected to Venting System - Sometimes
- Vent Independently
- May Include Release Valve Set to Release at Pressure

Riser Venting System



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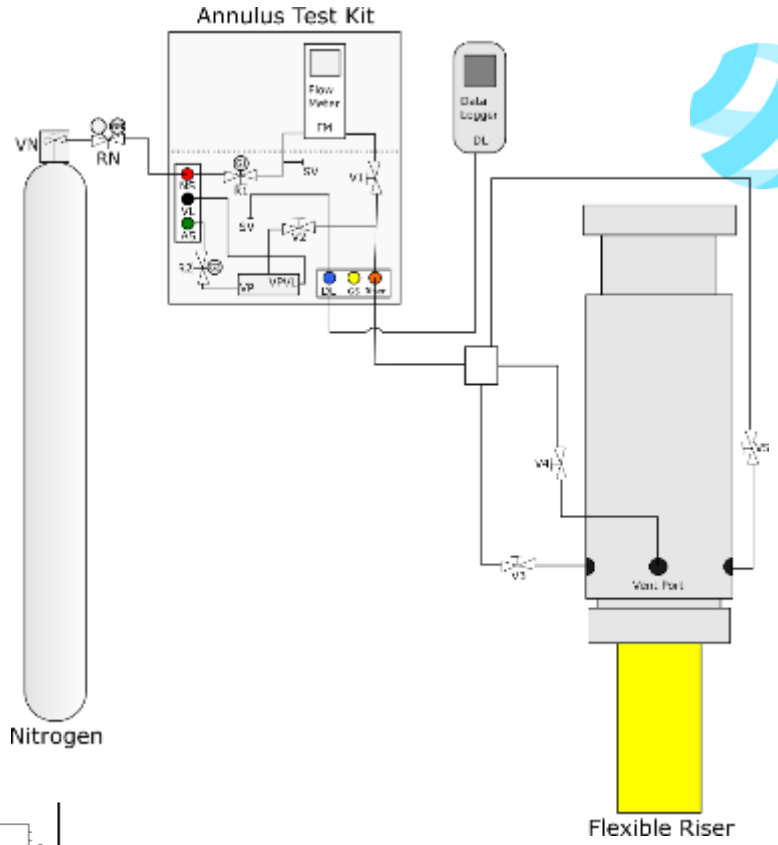
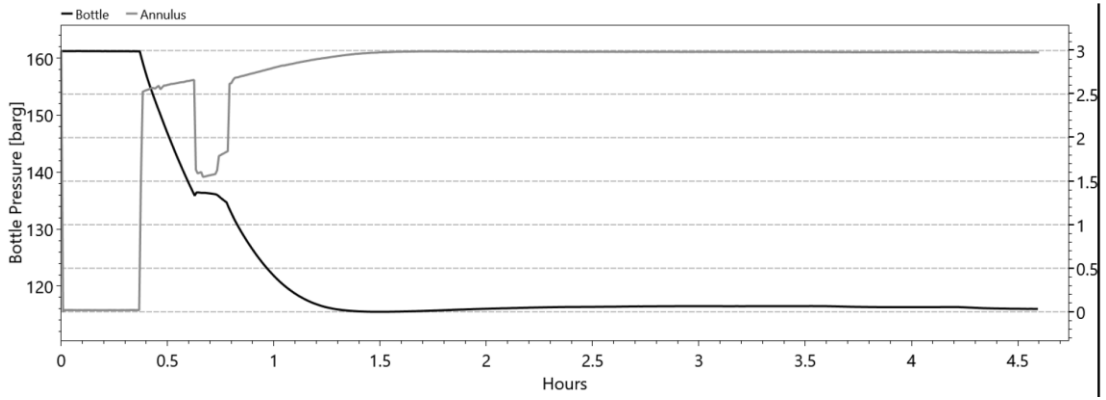
# Introduction – Riser Integrity

Annulus Testing

- API 17B Recommended Practice for Flexible Pipe
- Method to Determine Integrity of Sheath
- Positive Pressure (3bar) or
- Vacuum
- Vent Port Flow Test to Determine Blockage
- Gas Sampling




Annulus Testing



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# Introduction – Integrity Issue

Annulus Vent Ports Can Become Fouled

- Condensation and Precipitates
- Manufacturing Debris
- Filled Vent Ports
- Poor Vent Port Design
- Prevent Backflow of Liquids
- Prevent Backflow of Corrosive Gases

**Proper Operation Critical**



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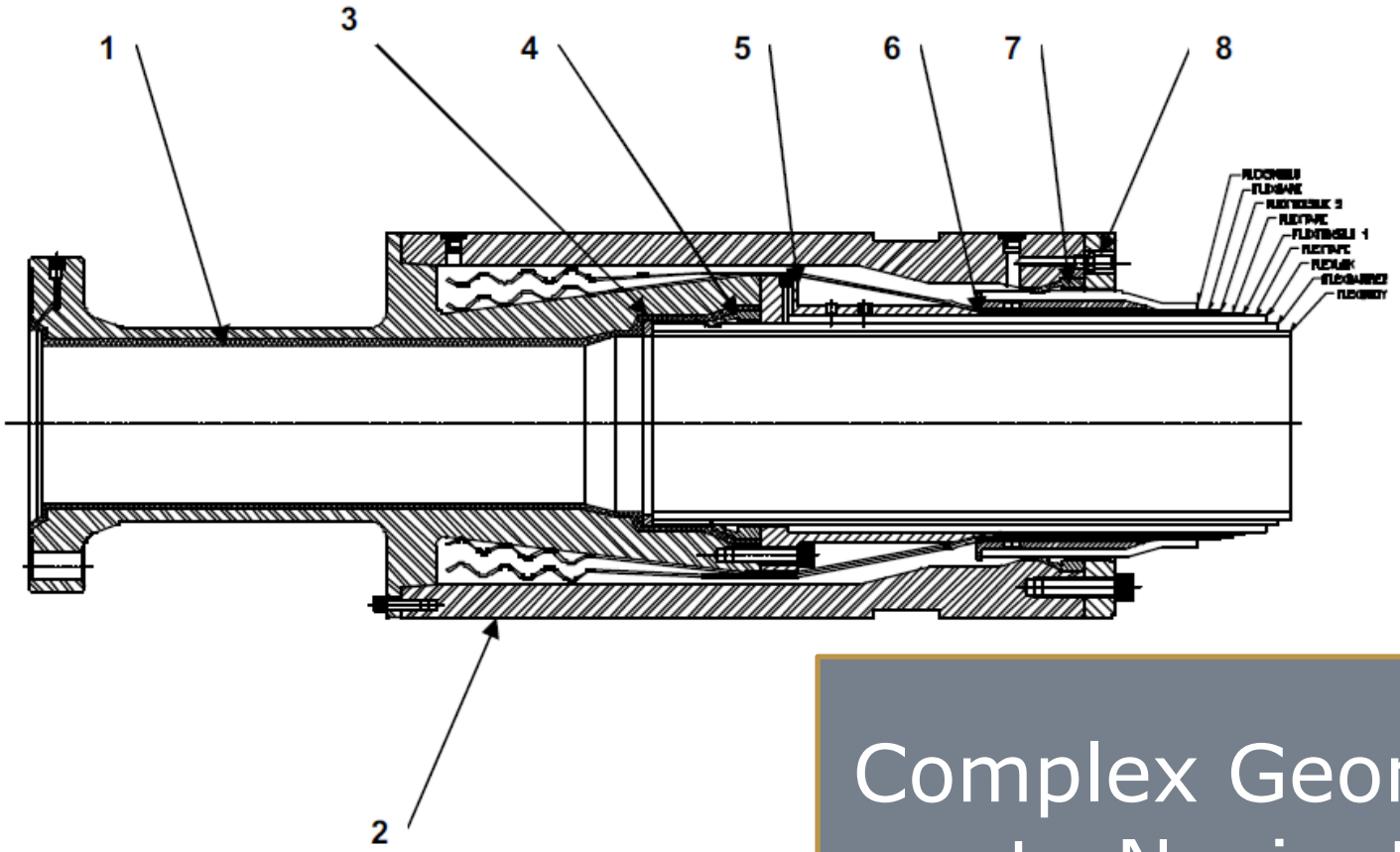
# Challenge

Annulus Vent Port

- Small Bore Tubing
- Tubing Bends
- Access
- Not Designed for Inspection




**Complex Geometry to Navigate**



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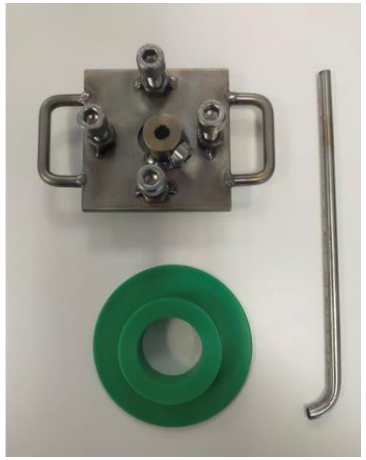
# Development – Inspection and Cleaning Tool

Articulating Videoscope Camera

- Guide Fixture
- Alignment
- Testing

Guiding and Alignment

# Development – Inspection and Cleaning Tool

Cleaning of Debris or Precipitates

- Mechanical Cleaning
- Rotational by Hand Drill
- Vacuum Removal




Displace and Remove

# Case Study

Riser

- Free Venting
- Lack of Vent Valves
- Inspection of Vent Port Tubing
- Poor Vent Flow
- Potential Blockages

Configuration of Venting Arrangement



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# Case Study

Goals of Inspection

- Inspect the Venting Arrangement for Blockages
- Clean Precipitates
- Is Corrosion Present?
- Visually inspect on a regular basis to assess accelerated corrosion
- Understand Type of Corrosion
- Check for Structural Damage e.g. Broken Wires

**Visual inspection of critical components**



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# Case Study

Offshore – Adapting to As Built Conditions

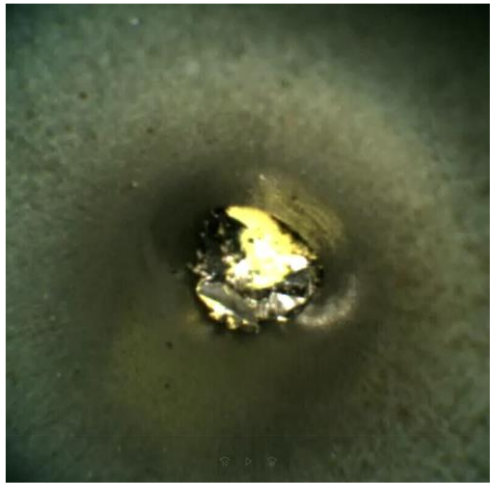
- Access Created Limitations
- Alignment Spacer Dimensions Clashed with Collar
- Simplified Setup
- Alignment Fixture Aligned with Flange
- Each Hangoff Position Was Different

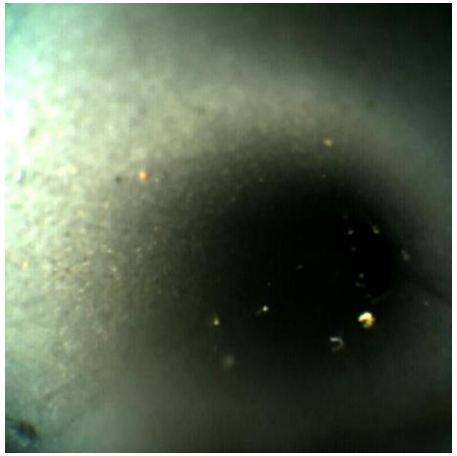
**Be Prepared to Make Changes**

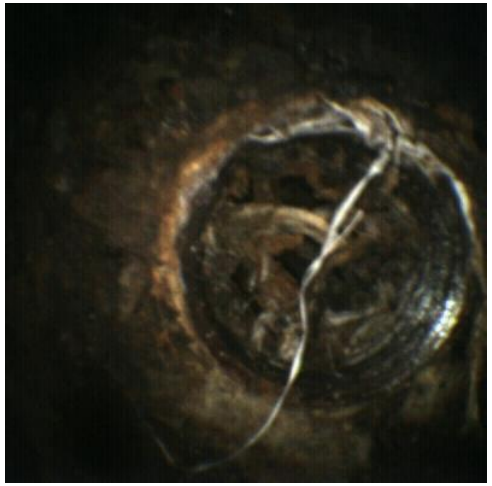
# Case Study

Vent Tubing

- Excellent Images
- Assess Condition of Vent Port Tubing
- Access Issues
- Burring and Debris







Tubing Condition



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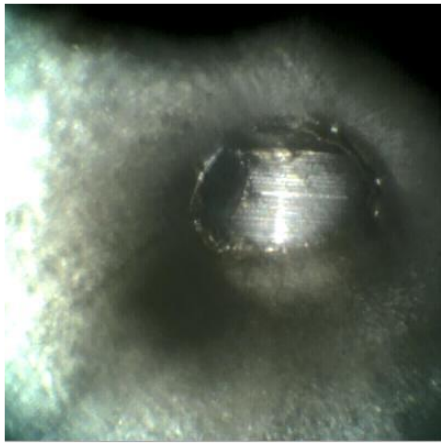
# Case Study

Annulus Findings

- Some Signs of Degradation
- Oxidation
- Cracking
- Discolouration



Structural Component Condition



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# Conclusion

Findings

- Inspection Tool Performed Well
- Images Provide Valuable Insight
- Medium Levels of Corrosion Found
- Carcass Oxidisation, Cracking and Discolouration
- Vent Tubing  - Superficial Corrosion
- Corrosion Caused by High Moisture/Oxygen Levels in Annulus

Recommendations

- Poorly Vented Risers – Annulus Open to Environment
- Vent Valve or One-Way Valve Critical (API 17B Recommended)

**Good Practice to Isolate Annulus with Valve**



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# Questions - Discussion

Thank you