Case studies for Inspection of 'unpiggable' offshore pipelines

Edwin Rosier
Intero Integrity Services
Niek Bruijnestijn

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Company introduction

Intero Integrity Services

- Formerly A.Hak Industrial Services
- Founded in 1985
- Since 2018 owned by PE: First Reserve
- 380 people around the world

Global provider of advanced Inspection and Integrity Services

Presence in South America: São Paulo, Brasil
Company introduction

Fields of activity

- Specialist for “unpiggable” pipelines
- Provision of supporting equipment
- Proven PIMS system and services provider
- Major player in furnace inspection industry
- Pioneer in field of on-line robotic tank inspection
- Experienced Technology Centre
Company introduction

Technology Center, The Netherlands

- Research & Development
- Tool manufacturing, testing and validation
- Testing and solution engineering
- Personnel training
- Client demonstration and classes
Intero’s Piglet® Inspection tools

Ultrasound Inspection

- Compact, robust and scalable tool
- (Ultra)-high resolution
- Bi-directional, low pressure, small radius bend, dual diameter
- Wall thickness measurement, geometry and XYZ mapping in a single run
- Ultrasonic principle allows inspection of CS, SS, Duplex, (HD)PE, etc.
Company introduction

Interο’s Piglet® Inspection tools

• Rotating mirror allows compact configuration, wide variety of integration
• Centralized measuring head makes accurate geometry measurements possible
• Sends and stores full A-scan, allowing detailed data analysis and defect assessment
• Focusing mirror allows small ultrasonic footprint,
• Infinite measuring grid realizes ultra high resolution
Case studies

Inspection of “unpiggable” offshore pipelines

• 18” offshore gas production pipeline
  Bi-directional inspection against network pressure

• 8” pipeline from a subsea manifold to the platform
  Turnkey project with pre-loaded launcher approach

• ‘standard’ 4” pipeline with heavy wall thickness bends
  Engineering to adapt to unforeseen circumstances

• 12” riser in a dry caisson
  Winch-operated internal bulkhead inspection

• 8”-12” dual diameter interfield pipeline
  Coping with challenges - worldwide
Case study 1

18” offshore gas production pipeline

Scope of work:

- Cleaning, gauging and inspection up to PLEM
- Length of inspection: 1350ft / 450m
- Installation to remain in production, branch taken out of production

Specific challenges:

- Bi-directional operation, launching and returning on platform
- Ultrasonic inspection against compressed gas pressure
- Modifying tool to meet operational conditions
- Prevent “overshoot” (Wye-piece in PLEM)
Case study 1

18” offshore gas production pipeline

Project approach:

- Procedure development, job planning, equipment preparation
- Gaugerun and inspection in isolated section against compressed gas
- Separate time windows for gauging and inspection during quick turnaround, minimum impact on board activities
- Pig transmitter detection for emergencies

Preparation:

- Test inspection pig for 1160psi / 80bar operation
- Realtime data feed
- Bi-directional setup
Case study 1

18” offshore gas production pipeline

Project execution:

1. Gaugerun cancelled: isolation proved impossible
2. Review of project plan:
   • Runs to be executed against system pressure
   • On-line data monitoring critical

Re-execution:

3. Gaugerun based on pumped volume
4. Bi-directional inspection in batch gasoil up to PLEM
5. Total execution time: 4 days

Small operational footprint
Case study 2

8” between a subsea manifold and platform

Scope of work:

• Cleaning, gauging, inspection and dewatering of 8” pipeline
• ‘Single entry’ production pipeline
• Heavy wall riser, high resolution inspection of splash zone
• Using biocide additive in water
• Project engineering and simultaneous operations

Specific challenges:

• Multiple cleaning runs from subsea launcher to platform
• Bi-directional inspection, launching and returning on platform
• 24-hrs rotation scheme
Case study 2

8” between a subsea manifold and platform

Project approach:

• Detailed step-by-step project engineering
• Pre-loaded cleaning tools in subsea launcher
• One by one launch pigs by ROV valve manipulation
• Manufacturing of certified 2500# subsea launching facility
• Chemical and mechanical cleaning
Case study 2

8” between a subsea manifold and platform

Detailed project plan:
Case study 2

8” between a subsea manifold and platform

Mobilized temporary equipment:

• Water pumps, filters, storage tanks, analyzing equipment
• Subsea launching facility
• Pig launcher/receiver on platform with hoses, flowmeter, etc.
• Chemical injection pumps for water treatment
• Nitrogen tank and vaporizer
• Cleaning pigs, gauging dummy pig
• Ultrasound inspection equipment
Case study 2

8” between a subsea manifold and platform

Project execution:

1. Installation of:
   • subsea pig launching facilities with 5 preloaded pigs
   • temporary pig launcher/receiver on platform
   • water, chemical and nitrogen pumping spread on dive-support vessel
2. Run of 4 cleaning pigs with cleaning agent, water analyzed and to storage tanks
3. Gauging run bi-directional from platform to subsea facility and back
4. Inspection run bi-directional, high resolution coverage of splash zone
5. Verify inspection success using on-line data
6. Return pig in batch containing biocide
7. Launch final preloaded pig with nitrogen
8. Reinstall pipeline for operation after purging
Case study 3

‘standard’ 4” with heavy wall thickness bends

Project origin:

- Project started as ‘regular’ offshore inspection of 3 production pipelines
- Scope: displacement, gauging, inspection and dewatering
- During initial project, dummy pig was received heavily damaged
- Operation cancelled until more info became available
- Divers confirmed heavy wall subsea bend
- Geometry confirmed by caliper
Case study 3

‘standard’ 4” with heavy wall thickness bends

Specific challenges:

• 1.5D bends on topside (sch 80-120)
• Heavy wall 3D bends subsea (ID: 3” / 77.5 mm)
Case study 3

‘standard’ 4” with heavy wall thickness bends

1. Redesign of tool
2. Test-setup to prove configuration
3. Preserve tool characteristics:
   • Bi-directional capabilities
   • Free swimming data storage
   • Realtime data monitoring
   • Pig transmitter integrated
Case study 3

‘standard’ 4” with heavy wall thickness bends

Final outcome:

• Remobilization after client witness of mock-up test
• Successful inspection of all three pipelines
Case study 4

12” water injection riser in a dry caisson

Scope of work:

• UT inspection on the risers’ status
• Pumping operation not possible, isolated subsea
• Inconel cladded bulkhead design
Case study 4

12” water injection riser in a dry caisson

Project challenges:

- Project engineering
- Winch operated set-up, dry testing required
- Offshore operations under winter conditions
Case study 4

12” water injection riser in a dry caisson

Execution:

- Lower tools by winch to desired depth (online data verification)
- Pass area of interest multiple times at lowest possible speed
- Complete entire riser inspection in controlled return run
Case study 5

8” – 12” Dual Diameter interfield pipeline

Project challenges:

- Platform to platform pipelines
- 12” risers with 8” subsealines
- Subsealine to be inspected through 12” risers
Case study 5

8” – 12” Dual Diameter interfield pipeline

Execution:

• 8” Piglet® with 12” pulling body configuration
• 12” risers inspected bi-directional pumping
Conclusion

- Offshore pipelines among the most challenging
- Wall thickness and diameter changes common
- Solutions require insight and creativity
- Project execution requires thorough preparation, adaptation requires experience
- Piglet® compact form factor allows diverse applications in challenging environments
  - so most pipelines currently considered ‘unpiggable’ can be inspected

**Intero Integrity manages to combine the operational experience and the tool’s diverse application range to get the job done.**
Thank you.

For more information:
Erika Miyakoshi
Sales Engineer
D +55 11 2429 3477
M +55 11 99805-3137
E erika.miyakoshi@intero-integrity.com

Intero Integrity Services Brasil EIRELI
Av. Edison Benedito Andreazza, 71
Parque São Camilo
Itu, São Paulo 13309-800
E brasil@intero-integrity.com