Agenda

• DOF Subsea Introduction

Current Trends

IMR Vessels
- IMR Vessel Current Trends
- MPSV Vessel Current Trends

Current Technology
- FPSO Mooring Repair Trends
- AUV Pipeline Inspection

Future Trends

• IMR Vessels of the Future

• FPSO Mooring Repair Trends
• Single Pass AUV with Non-Contact CP
• Hover Mode AUV’s
• IMR Data Analysis
IMR Vessels and Technology – What’s Trending Today
IMR Vessel Current Trends – Vessel Toolkit

Skandi Hercules – Heavy IMR Vessel

Skandi Singapore - Dive Support Vessel

Geoholm – Light IMR Vessel

Skandi Darwin MPSV (Shell Australia)

Skandi Hawk MPSV (Shell Malampaya)
Current Technology
Pipeline Inspection Current Trends

- Single Pass Pipeline Inspection
- Improved Data Quality
- Cost effective without impacting integrity management
- Streamlined Database Deliverables
AUV Pipeline Inspection

[Images of pipeline inspections and details]
AUV Single Pass Data
AUV vs ROV Pipeline Inspection

**ROV**
- 0.5 knots or ~22 km/day
- 1 Pass
- Acquisition = ~109 hrs (4.5 days)

**AUV**
- 3.7 knots or ~100 km/day
- 1 Pass
- Acquisition = ~20 hrs (1 day)
FPSO Mooring Repairs Current Trends

- ACCD Subsea Connection Tool
- Live Field (Uninterrupted Production)
- ‘Like for Like’ Replacement
- Adaptable to suit project specific requirements
Future Technology
• Increased Mooring Capacity > 300-400Te
• Subsea Handshakes (connecting moorings for anchor/pile replacement)
• Cross Tensioning
• Pipeline Walking Anchors
AUV Technology – Future Trends

• Non Contact CP
• CH4 (Methane Sniffer) – leak detection
• Laser Imagery – Micro Bathymetry
• Hover Capability
• Permanent In-field
IMR Vessel of the Future
IMR Vessels – Future Trends

- Dual Fuel / Battery options
- IMR Vessel Toolkit Remains
- Potential for larger Crane Size and Module Handling
- Regulatory Requirements Driving Vessel Design for working in a Hydrocarbon Environment

Skandi Gamma
Data Processing
IMR Data Volumes

- AUV/ROV Data Volumes
  - Increased resolution
  - Larger Datasets
  - Increased Processing
  - Increased Storage
  - Increased Cost?

One Hundred 3.5-inch Floppy Disks
Tomorrow’s Solution Yesterday

- Going Back a few years
- Increased data and manpower for processing was already an issue

Solutions
- Onshore Processing
- Large Data Centers
- Reduced Cost

Limitations
- Remote from project
- Bandwidth costs
Tomorrow’s Solution Today

• AI in Your Pocket
  • Processing occurs today at rapid rates
  • AI has developed with software learning operating in vast data centers via the cloud
  • Transmission delays response time
  • Apps are being developed to remove delays
  • FB already uses deep learning to capture, analyse and process pixels / Google developer’s now build AI into apps

• Deep Learning and Machine Learning is already being used to automate subsea data processing.
Summary

• Technology needs to deliver improved safety and reduced cost

• IMR Vessel Toolkit remains and needs to expand

• Vessels will come with alternative power sources

• Autonomy has a major role to play (Surface / Subsea / Processing)

• Technology is changing to meet the needs of huge consumer markets. The O&G industry is not centric to these drivers but we stand to benefit massively as a result.
Thank you!