Future Subsea Inspection
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Main Discussion Points

Why do we inspect?

How do we inspect now?

Challenges for the future

Technology

Scenarios

Summary/Conclusions
Inspection - Necessary Evil or Value for Money?
Why Do We Inspect

- Asset integrity
- Legislation (e.g. HSE compliance)
- Insurance
- Maintain production
- Environmental
- Protection of image
Routine & Critical Interventions
How Do We Inspect Now?

Mostly with ROV and divers
Topside v Subsea – the same but different
What Do We Inspect?

- Steel Jackets
- Concrete Gravity Structures
- Rigid and Flexible Risers
- Pipelines
- Connection Systems
What Do We Inspect?

- FPSO’s
- Wellheads/Xmas Trees
- Manifolds
- Controls Systems
- Umbilicals
What are we looking for?

Looking for:
- Gross Damage
- Leaks
- Debris
- Spans
- Cracks
- Condition of Coatings
- Corrosion
- Lack of Integrity
- Flooded Members
- Design Flaws
- Cathodic Protection
- Scour
- And many more......
Challenges

Cost

Very remote locations

Environment

Beyond ultra deep

Limitations on current inspection technology

Conservative thinking

Exponential increase in data
The Areas of Future Subsea Development
Change is the Challenge to us all

Cost

Efficiency

Effectiveness

Voluminous reporting

Data delays

Can we do it differently?
Balance of Future Operations

- **Past**
  - Inspection
  - Reactive; occasional
  - (boats, ROVs, discrete tools/technologies)

- **Future**
  - Condition Monitoring
  - Proactive; continuous
  - (fewer boats/ROVs, sensors, comms and analytics)

- **Today**

- **Future State**
Learn from other Industries
Future Technologies / Techniques

Autonomous technology

Automation

Remote sensors

Wireless comms underwater

Data harvesting

Data delivery
Autonomous Technology

The next evolutionary step

Well established in other industries

Image recognition

Simple interface for planning

Extended range

Cost effective
Remote Sensors

- Established thinking
- Mainly production related
- Localised monitoring
- Embedded sensors
- Corrosion / Erosion
- Stress / Strain
- Temperature / Pressure
Wireless Comms Underwater

- Positioning
- Transfer of data
- Interrogation of sensors
- Increased range
- No umbilical!
Data Harvesting

- ROV/AIV compatible
- Direct to host structure
- 24/7/365 collection
- Greater trend analysis
- More data available
- Retrofit to brown field sites
Hosted Systems

- Brings technologies together
- Independent of mother ship
- Ad hoc availability
- Vastly increased range
- Direct interaction with hardware
- Real or Near time analysis
Data Growth

The Unstructured Data Explosion
- Growing 100X every 10 years
- Requires a new approach

New Data
- HI-Res: 50,000,000 KB / object
- Video: 5,000,000 KB / movie
- Audio: 5,000 KB / song
- Images: 1,000 KB / picture

Traditional Data
- Numbers: 5 KB / record
- Text: 500 KB / record

The quick brown fox jumped over the lazy brown dog.
Hosted Data Systems

- Cost effective
- Extremely efficient
- 365/24/7 availability
- Removal of silos
- Handling huge data sets
- Multi user access
- Multiple file types ingested
Data Delivery

Dashboard

GIS

Web access

Concise is best

Media types

Metadata concept

Multiple formats
Future Delivery

Mosaic

- Allows video and stills data to be pieced together to give a expanded view of the scene
- Better visualisation, time saving and reduced storage requirements, data accessibility, new ways of working, efficient alternative to video
Future Delivery

Machine Vision / Learning

- Extensively used in process automation in production factories – established track record
- Utilise machines to review / compare previous years inspections.
- Expectation of high %age efficiency gains, cost reductions and introduction of new methods and differentiators.
Flexible Delivery
Conclusions

Definitely a step change period

Embrace new & existing technologies from other industries

Reappraisal of inspection philosophy

Stakeholder buy in required
Summary

Challenge the status quo

Remove the vessel

Learn from other industry experience

CAPEX/OPEX collaboration

Real time data

Integrated Data Analysis

Join the google generation
ANY QUESTIONS?

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