Advances in Subsea Integrity Monitoring Systems

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AMS – Where the conversation started

• AMS used successfully on over 30 projects in the last 3 years on installation of subsea manifolds, templates, PLETs, suction piles, buoyancy modules, wind turbine foundations, etc.

• Clients recognised the potential capabilities of the system

• Generation of new enquiries with diverse applications and associated requirements

• Ashtead recognition that a step change was needed in the provision of complete solutions for subsea installation and life of asset monitoring
AMS – Typical suction pile application

• AMS applied to mooring suction pile installation monitoring on the Centrica Ivory field at around 1,400m

• Communications via Kongsberg C-Node system operating with on-vessel HiPap system

• Simultaneous positioning and telemetry on USBL

• ROV retrievable system
Installation – Critical issues to manage

Whilst subsea structures look massive and are designed to last decades, they can be easily damaged during installation and incorrect orientation can also lead to stress on flowlines and jumpers.

- Torsional stress on main structure
- Bending/torsional stress on pile interface
- Collapse of pile due to excessive pressure differential
- Attitude, heading and position of installed structure
- Bending moment on main structure
- Working at heights risk during launch
Structure installation project life cycle

1. Pre Mobilisation and FAT
2. Mobilisation and Dimensional Control
3. Structure Tow Out and Over Side Deployment
4. Structure Descent and Land Out
5. Structure Pull Down
6. Final Report
Why develop an Integrated Monitoring System

Based on customer feedback we aimed through ease of use to:

- improve operational efficiency
- reduce operational risk

- Application Configuration
- Operation
- Data Management & Visualisation
- Flexibility within subsea operations
Increased demands for smarter data
Scalability system philosophy

Diver operated AMS flowline spool measurement package

Attitude monitoring system with acoustic communications

AMS buoyancy module installation monitoring package with acoustic and umbilical links

DMS subsea structure installation monitoring system with acoustic and ROV links
Redundancy / scalability through simple configuration

- Use of only common hardware and software building blocks
- No design changes

- Key consideration - rapid configuration to allow complex systems to be configured
- Objective – removal of technology development risk
Flexibility of subsea communications

- **Key consideration** – integration with all common subsea communications methods

- Ability to work *efficiently* within existing LBL and USBL array topologies

- Ability to operate with existing vessel acoustic systems

**Optimised for use with:**
- K-S Hipap/Seapap & Cymbal
- Sonardyne 6G wideband
- Benthos 900 series modems
- Any transparent modem link
Real-time control and visualisation

• **Key objective** - to provide an intuitive control and visualisation environment

• Use of visualisation tools to allow interpretation of data quickly and reliably

• Drag and drop objects to configure displays

• Elimination of project specific software
Dimensional control and mobilisation

Reduced risk working at height

- System calibrated remotely using an integral RF control and data telemetry link
- Elimination of deck cables and climbing on structure

Faster Data Collection & Calibration

- Integrated data management systems allow simultaneous data collection and associated calibration to the structure during dimensional control operations
Structure descent and land-out

Maximise operational reliability

- Minimise acoustic blind spots during subsea installation
- Eliminate the potential of acoustic interference between systems

Maximise operational efficiency

- Operating mode set to structure attitude, heading
- Fast update for key structure data
Structure pull down

**Maximise operational efficiency**

- Operating mode set to structure deflection
- Fast update for key structure data

**Maximise operational control**

- Node inclinometers used to indicate structure twist and out of plane suction pile

**Minimise installation risk**

- Intuitive graphical displays provide easier and faster installation condition monitoring
VIV monitoring application

- Ashtead’s integrated systems philosophy has also been applied to vortex induced vibration monitoring for flowlines and risers

- Short duration stand-alone and long term monitoring options

- Option for event triggered from turbulence or Doppler velocity

- On-board mass data storage for long term logging

- Retrievable data storage module
Ashtead’s integrated systems applications

Ashtead Technology Integrated Systems

- Structure installation
- Flowline hook-up and commissioning
- Jacket installation
- Wind turbine installation
- Asset integrity monitoring
- Subsea intervention control
Download the white paper from our website:
www.ashtead-technology.com