SAMIR: Semi Autonomous Mooring Inspection Robot

Subsea Expo Conference – Wednesday 6th February 2019
About Ashtead Technology

- The market-leading, independent subsea survey sensor and ROV equipment rental and services group

- Acquired by Buckthorn Partners, APICORP and management in April 2016
  - Acquired TES Survey Equipment Services in March 2017
  - Merged with FET subsea rentals business in January 2018
  - Acquired Welaptega in November 2018

- Providing equipment rental, engineered measurement solutions, personnel, training, calibration and equipment management services
  - Largest equipment pool in the rental sector
  - Experts in equipment logistics and export compliance
  - Market leading IT infrastructure making rentals easier

- Focused on building a wider subsea services group focused on technology and service

121 Staff

Combined rental fleet 19,000
Rental fleet original cost £104m
About Welaptega

- Headquarters in Halifax, Nova Scotia, Canada
- Founded in 1992, The industry leader in in-situ mooring inspection services and technologies

Capabilities:
- Mooring Measurement Campaigns
- Class Compliant Campaigns (Annual, 2.5, and 5-yearly UWILDs)
- Baseline Inspections
- Mooring Life Extensions
- Damage Assessments (Photogrammetry)
- Subsea Cleaning
- Residual Life Engineering Assessments (MFPA/FUMA)

10-year Global Snapshot:
- 180+ Projects completed
- 1000+ Mooring lines inspected
- 100+ Assets worked on
Technology overview

Chain Inspection
- Chain Measurement System (optical)
- Subsea Caliper (mechanical)

Rope Inspection
- Rope Measurement System

Subsea Cleaning
- Subsea Cleaning Tool (brass chains)
- Subsea Cleaning Tool (polymer rods)

Photogrammetry
- 3D model of chain link
- 3D model of dented pipe
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Technology & Development
Magnetic Flux Leakage (MFL): Background

- First patent issued in 1906 to McCann and Colson in Germany (mining)
- Used in-air for crane wire, mining cables, bridge tendons, and pipeline inspections
Magnetic Flux Leakage (MFL): Technology

- Magnetically saturates wire rope to maximum magnetic flux density
- Magnetic flux “leaks” outside the rope in areas with wire defects
- Creates a 3D “unwrapped” image of rope interior using an array of 120 hall sensors
- Essential for identifying location and clusters of wire breaks
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- Buoyancy
- Magnetic sensors
- 4-camera system
- Self-propelled drive wheels
- Hydraulic closing
In-house testing

SAMIR on test wire

SAMIR lowered into pool

SAMIR buoyancy and data collection tests
Factory Acceptance Test (FAT)

- Wire rope without defect
- Single wire defect no patch, mid rope
- Single wire defect Beneath patch, 1.6m from end of rope
Factory Acceptance Test (FAT)

**Wire rope without defect**

No significant variance in magnetic flux indicating a wire rope without defects

**Single wire defect no patch, mid rope**

A distinct decrease in magnetic flux, followed by an increase, can be seen in the graph, indicating a single wire break was found

**Single wire defect Beneath patch, 1.6m from end of rope**

Similar to the results without a patch, a distinct decrease in magnetic flux, followed by an increase, can be seen which indicates a single wire break
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Case studies
Pre-inspection: Cleaning

Rope cleaning system (RMS)

- Removes marine growth by using rollers, brushes, and high-pressure water
- Constructed from materials that will not damage subsea components
- Rope cleaning occurs without impacting production
- Designed in consultation with rope manufacturers, installers and platform operators

Sample results
Case study 1: North Sea FPSO 2016

Key Driver:

- Integrity concerns stemming from damaged wire rope sheathing

Project Overview:

- Welaptega’s SAMIR tool was deployed on all FPSO wire rope segments

- Inspection data was captured on the top and bottom 25m section of each segment

- Cleaning and measurement was performed at the top and bottom of the wire rope on lines 1-5; 25m at the bottom, and 10 meters at the top

Sample Results (Optical Inspection System)
Case study 2: Newfoundland FPSO

Key Driver:
• Class

Project Overview:
• Welaptega’s SAMIR tool was deployed on all FPSO wire rope segments
• Cleaning and measurement was performed on all lines of the FPSO’s catenary mooring system

Sample Results (Optical Inspection System)
Case study 3: North Sea FPSO 2018

Key Driver:
- Follow-up campaign on 2016 inspection

Project Overview:
- Welaptega’s SAMIR tool was deployed on all FPSO wire rope segments.
- Inspection data was captured for the entire length of all wire rope segments

Sample Results (MFL System)

Wave-form observation (vp-p 0.032)
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Questions?

Visit us on booth 125