The Use of Real Time Monitoring to Extend the Operating Life of Offshore Platforms

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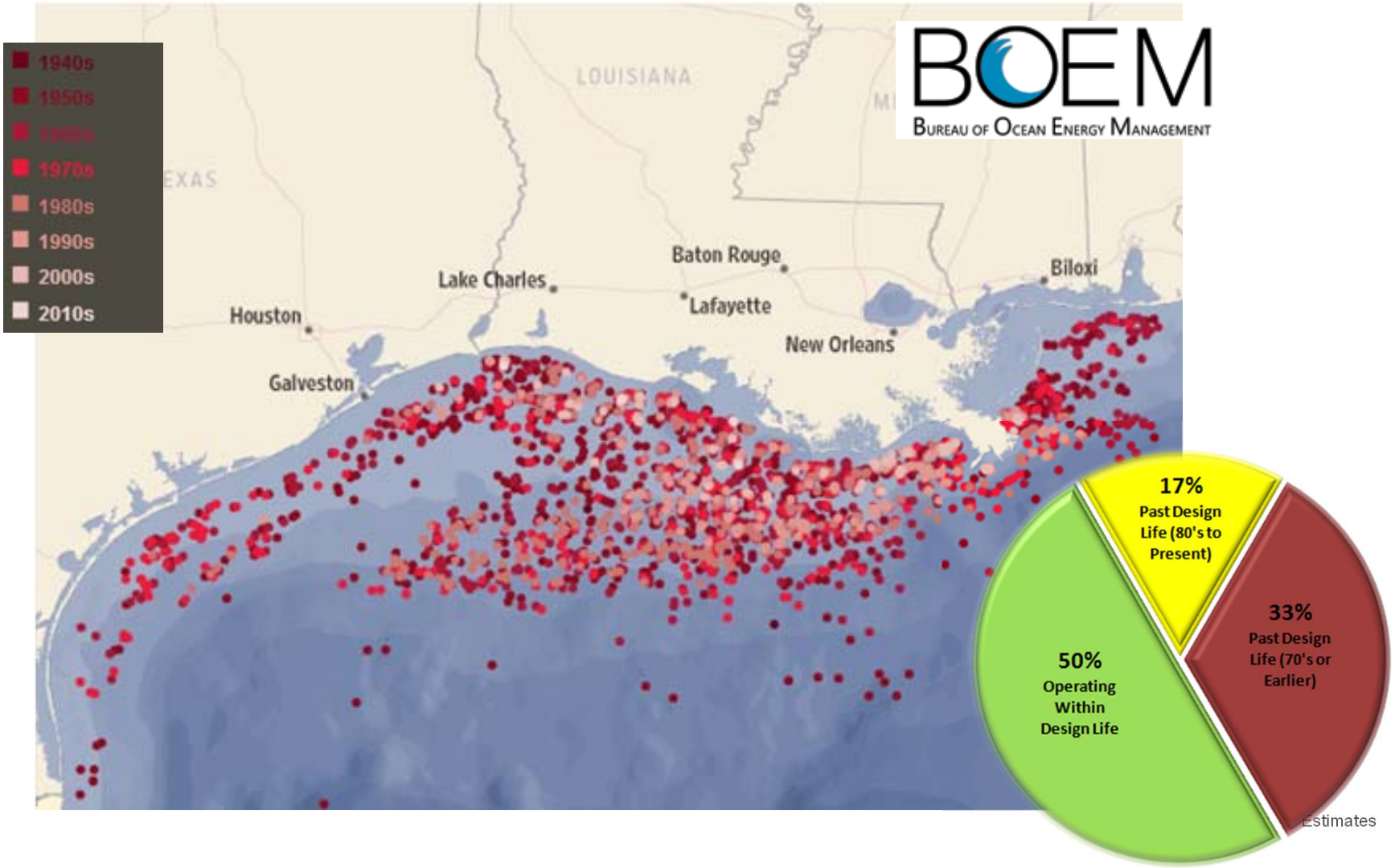
an ACTEON company

Agenda

- Introduction
- Challenges
- Why Monitor?
- Monitoring Technologies
- Case Study: Valemon
  - Project Overview
  - Client Objectives
  - Monitoring System
  - Data and Results
- Conclusion

Introduction

Platform Age: A Visual Representation



Challenges

Offshore Platforms

Design | Environment | Fatigue | Corrosion | Impacts







Challenges

Ageing Platforms

- Design
  - Platform loading / wave relationship
  - Natural frequency
  - Foundation stiffness
- Lack of historical data
  - Design criteria
  - Inspection History
  - Repairs
- Regulations and Design Codes
  - API, NORSOK, etc.

Operating Past Design Life

Why?

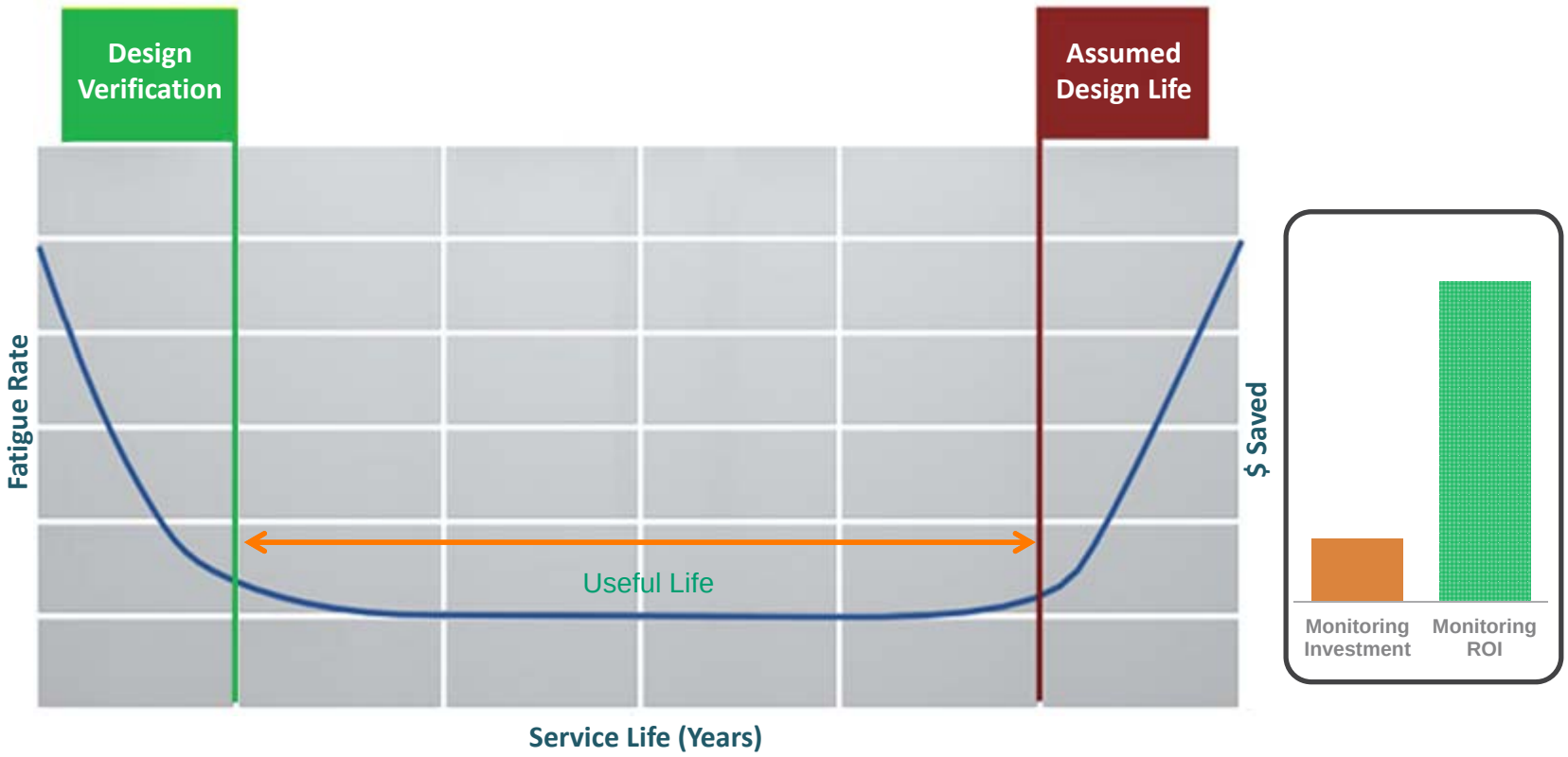
- Asset life extension being driven by:
  - Technological Advancements
  - High price of oil
  - Increasing use of subsea tiebacks
  - Operator focus on cutting costs

Why are Clients Monitoring?

- Extending operating life
- Structural Integrity (Storm Events)
- Early warning systems (Structural or Foundational)
- Optimising inspection programs
- Increasing deck mass
- Adding conductors / risers
- Assessing Repairs
- Collision detection
- Design verification (New Installations)

Why Monitor?

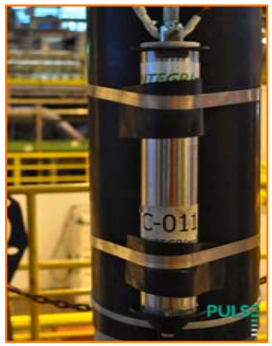
Reliability Engineering Life Cycle



Monitoring Technologies

Equipment Used

Accelerometers
Inclinometers



Strain Gauges

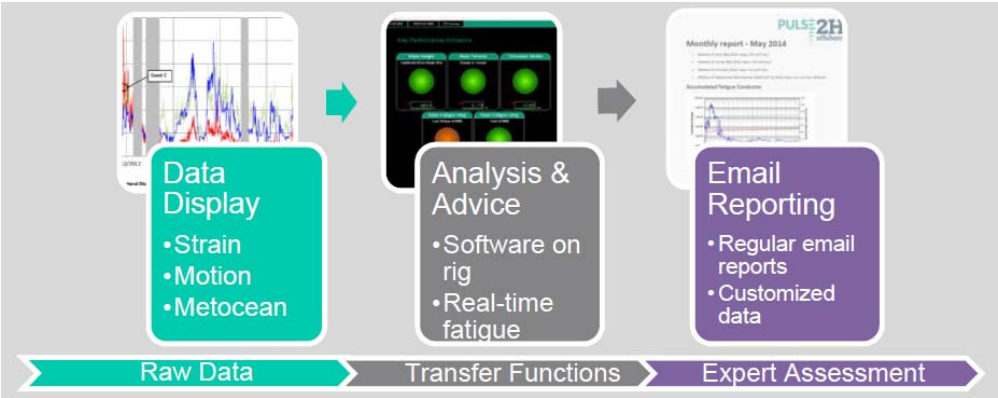
Environmental
(Wave Radar & ADCP)

Monitoring Technologies

Software and Data Management

Monitoring Technologies

Data Processing and Reporting

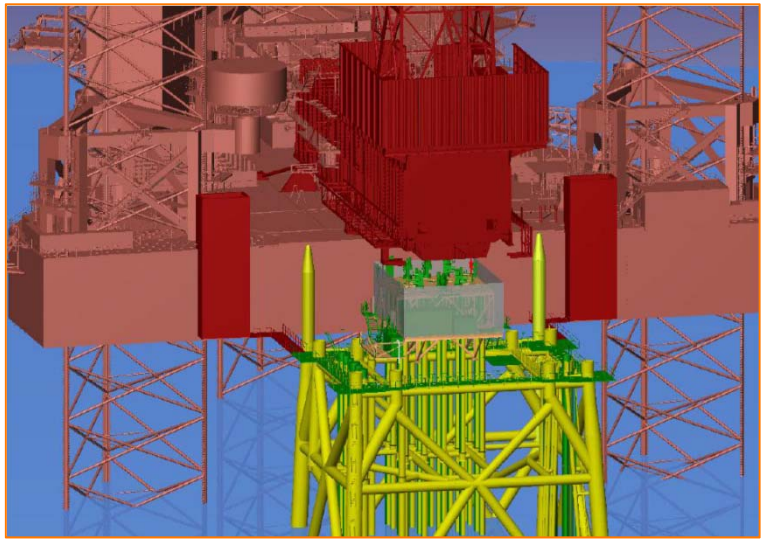


- Spectrum of the motion data (Acceleration versus Freq)
- Natural frequency determination
- Integration of time series (Displacement)
- Wave information (Wave height, Period or directions)
- Screens of anomalies
- Repair / modification verification
  - Decrease of displacement

Valemon Jacket Monitoring

Introduction

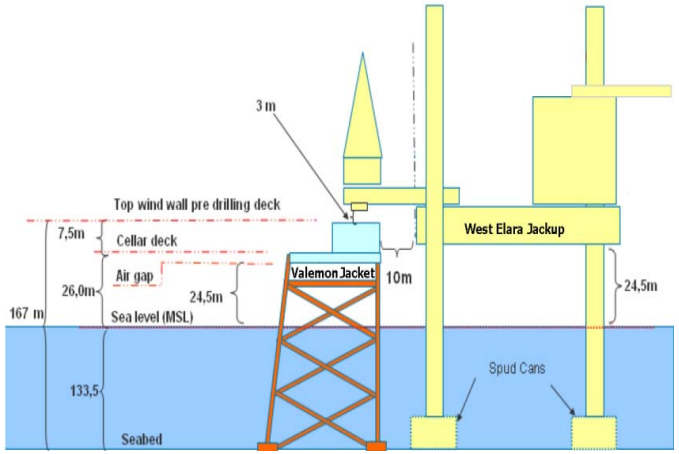
- Location: Norwegian North Sea
- Water Depth: 135m
- Valemon jacket
  - 9,000 tonne
  - 20 slot capacity
- Monitoring Campaign: 2012/13



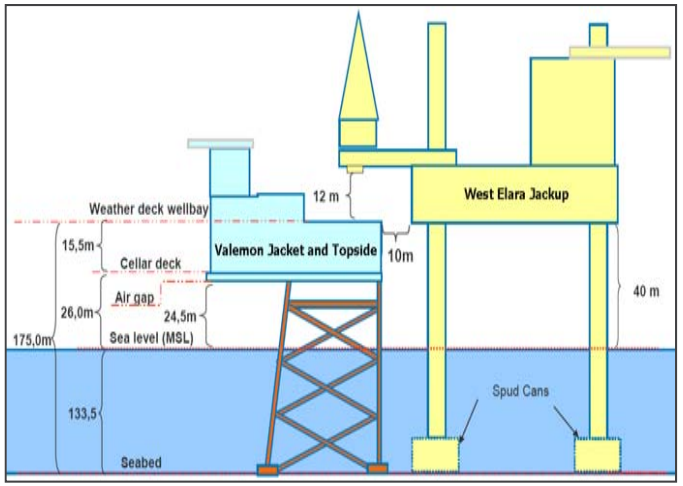
Valemon Jacket Monitoring

Client requirements

- Monitor pre-drilling phase:
  - Monitor deflections of jacket and jackup
- Confirm that equipment is operated within design limits:
  - Confirm that jacket deflections remained within expected levels
- Validate & calibrate simulation models:
  - Compare measured and predicted responses to improve models for future operations

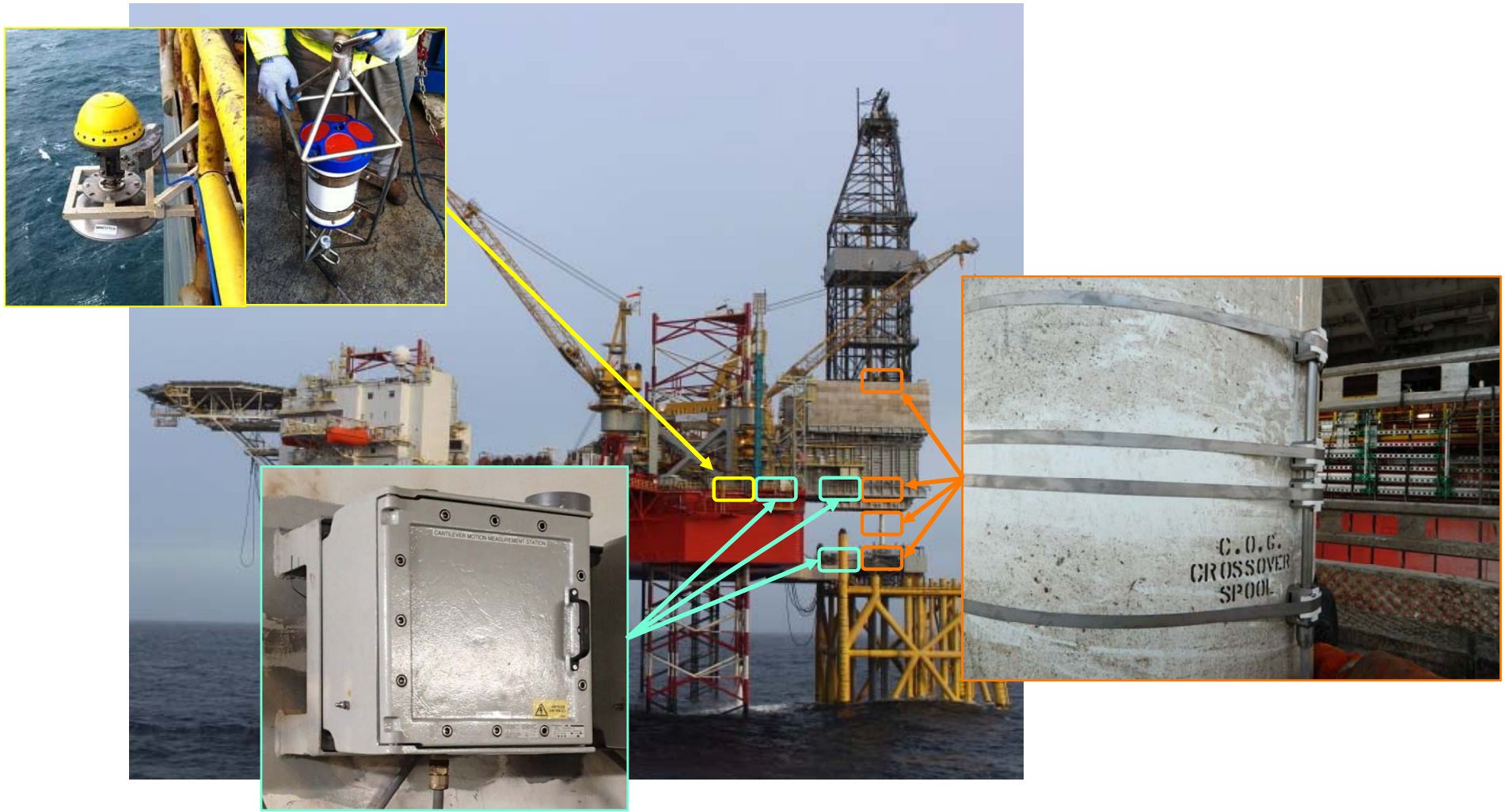


Increased motion after jacking up



Valemon Jacket Monitoring

Monitoring system



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Valemon Jacket Monitoring

Loggers

- 3 axis precision accelerometers
- Installed in Eexd- rated housings
- Hardwired back to central control room using armoured cable

Valemon Jacket Monitoring

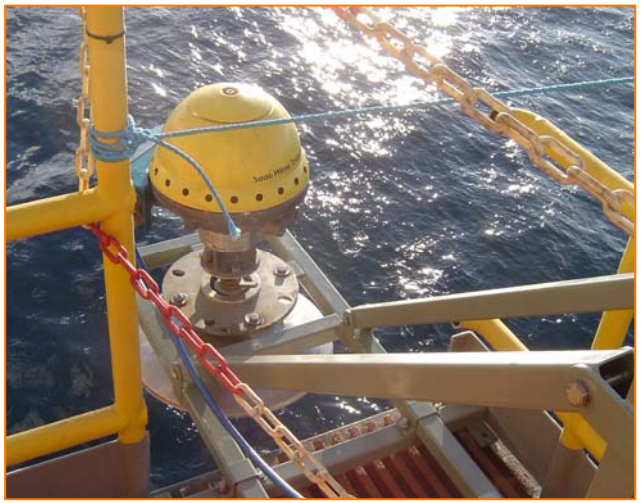
Strain sticks

- Strain sticks installed in 3 locations
- Measuring curvature of the riser
- Each stick linked to an EExd logger

Valemon Jacket Monitoring

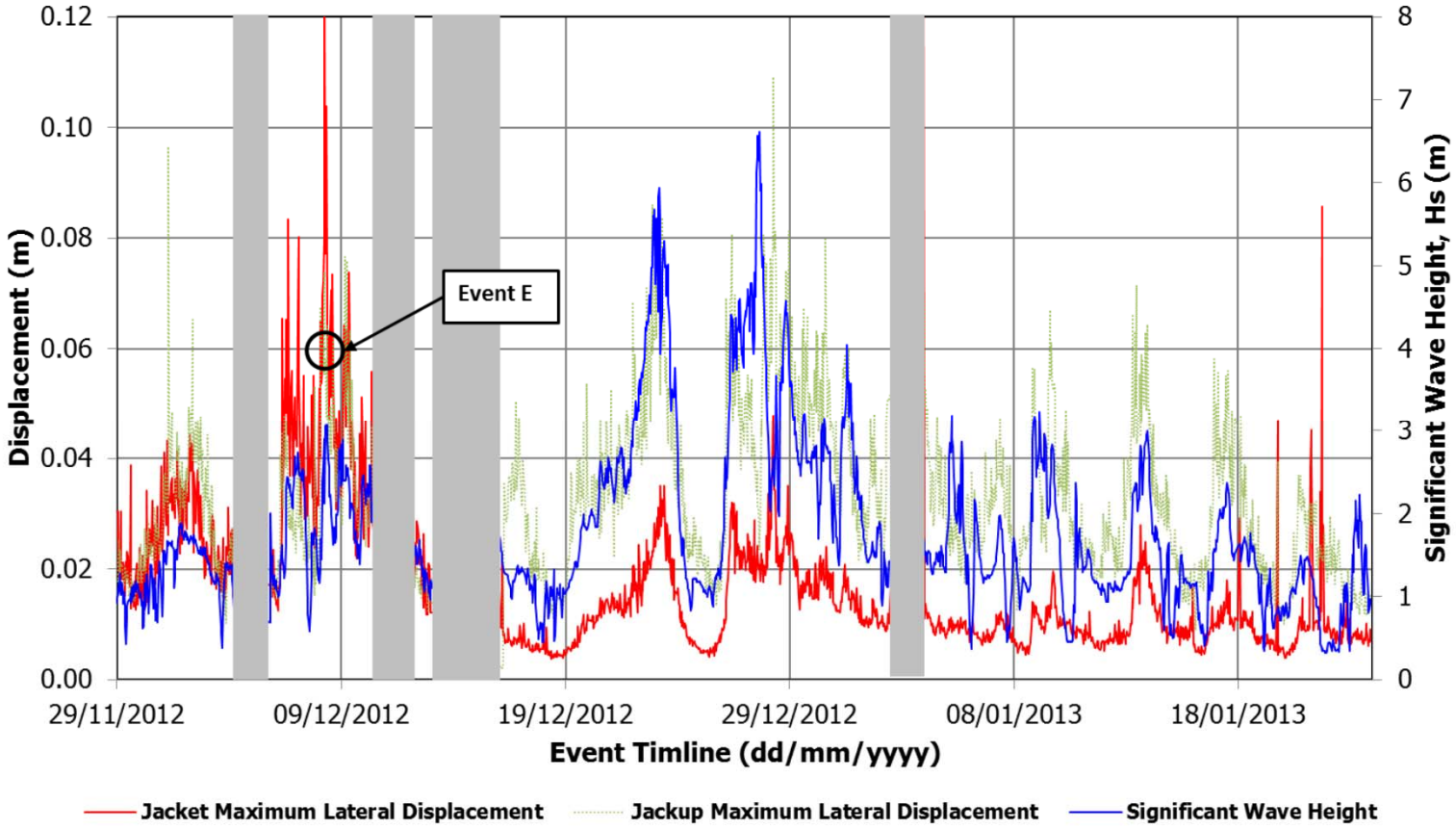
Environmental sensors

- Air-gap wave radar installed
- Measuring wave height and period
- ADCP- measuring current speed and direction through depth



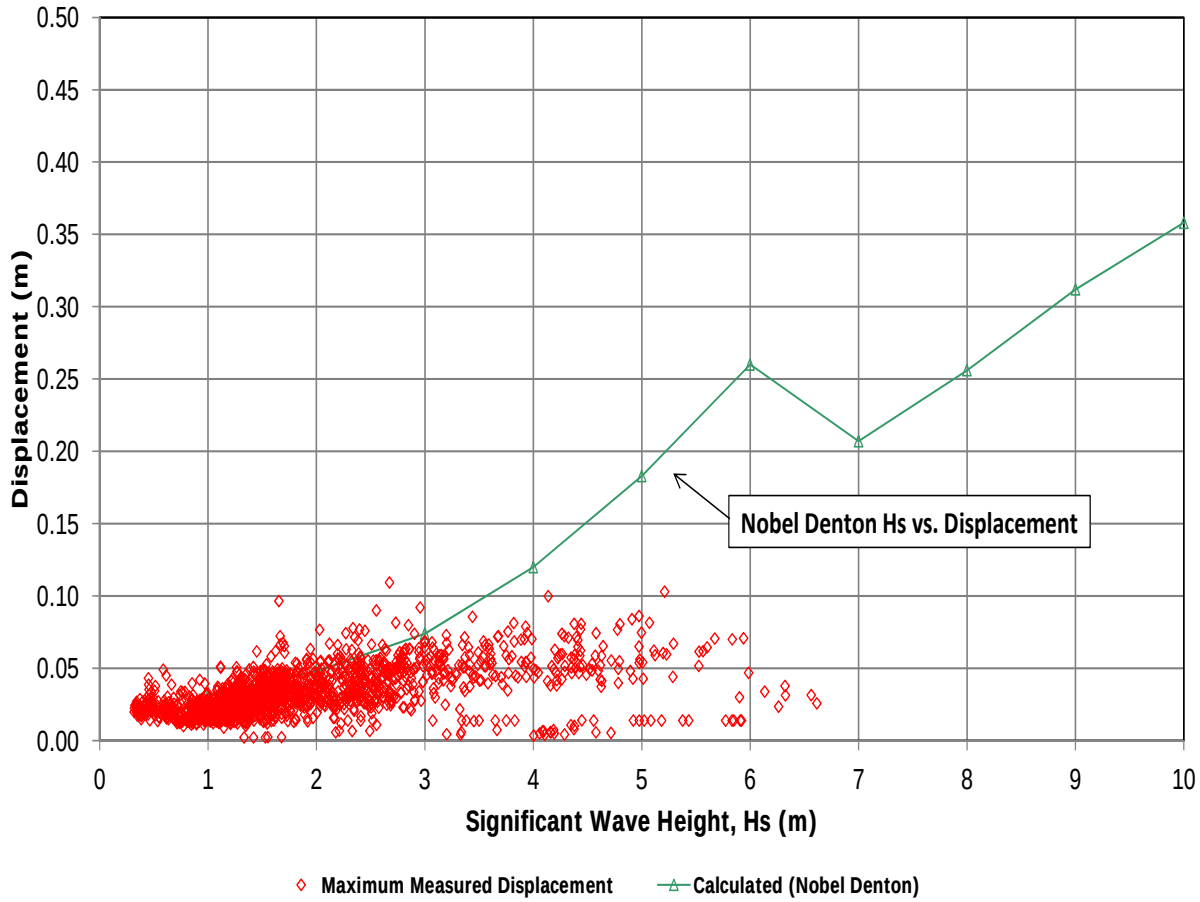
Valemon Jacket Monitoring

Data – Displacement



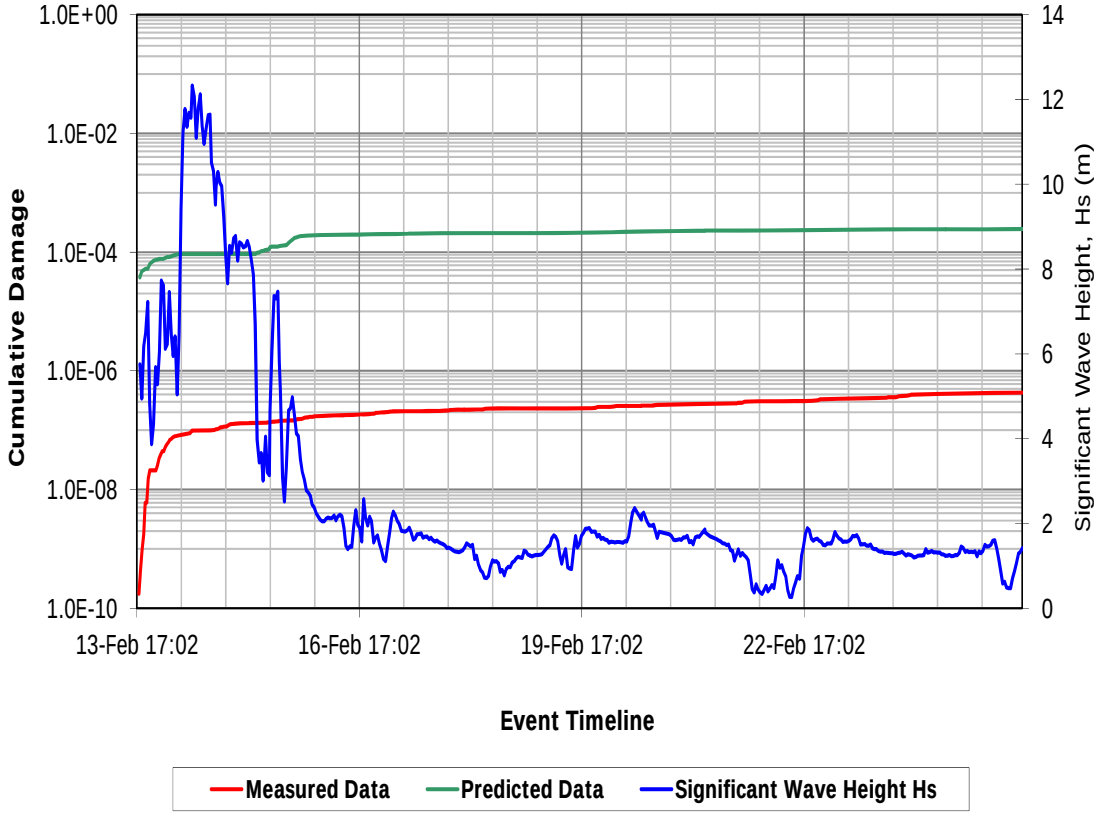
Valemon Jacket Monitoring

Data – Valemon Jacket Motion / Wave Height



Valemon Jacket Monitoring

Data - Jacket Motion Fatigue



Valemon Jacket Monitoring

Outcome

- Monitoring systems demonstrated responses of critical equipment remained within design limits during campaign length
- The jacket moves 25-33% as much as jackup
- Complex responses of the jackup to wave loading observed
- Preliminary model calibration achieved, but difficult to fully calibrate at this stage
  - Sensitive to many parameters
  - Effect of jacket
  - Assumptions lead to uncertainty

Conclusion

Conclusion

- Platform monitoring is integral to the IM Strategy of offshore platforms
- Online Monitoring is used to measure actual response vs predicted responses to validate design and improve models for future operations
- Data used to make informed decisions on life extension of assets

Questions?