2H offshore

Riser & Conductor Engineering

Houston | Rio de Janeiro | Aberdeen | London | Kuala Lumpur | Perth | Beijing

Understanding Conductor Integrity and Extending Life of Jacket Platforms

Christopher Li

14th March 2019

Agenda

- Conductor Failure Mechanisms
- Case Studies
- Repair Considerations
- Conclusions

Introduction

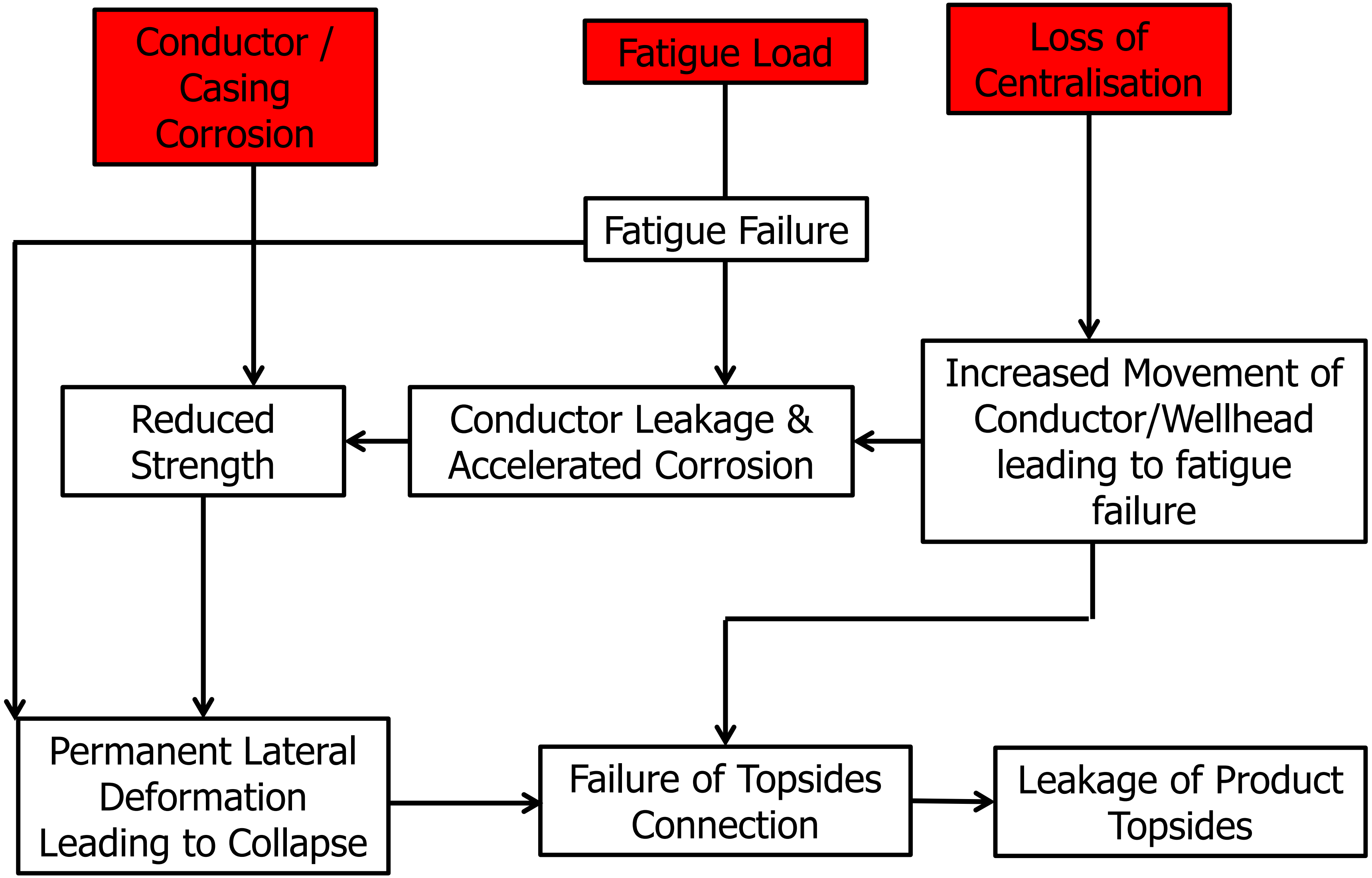
- Multiple jacket structures offshore WA operating over two decades

- Life extension increases likelihood of:
  - Corrosion
  - Fatigue due to waves & currents
  - Strength failure in structural member
  - Earthquake Loading

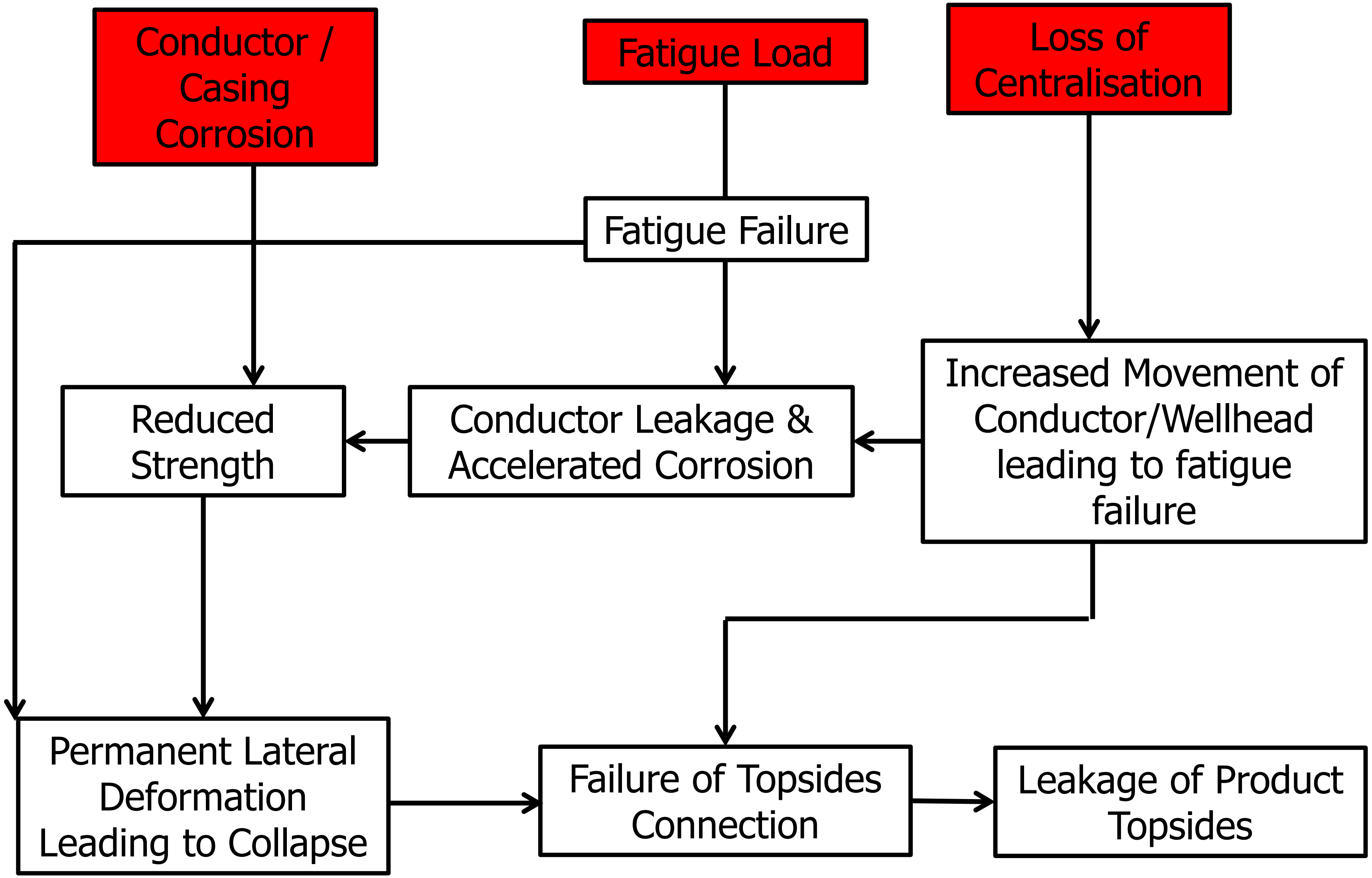
- Integrity assessment, inspections and (if required) remedial measures are necessary

What can Happen…

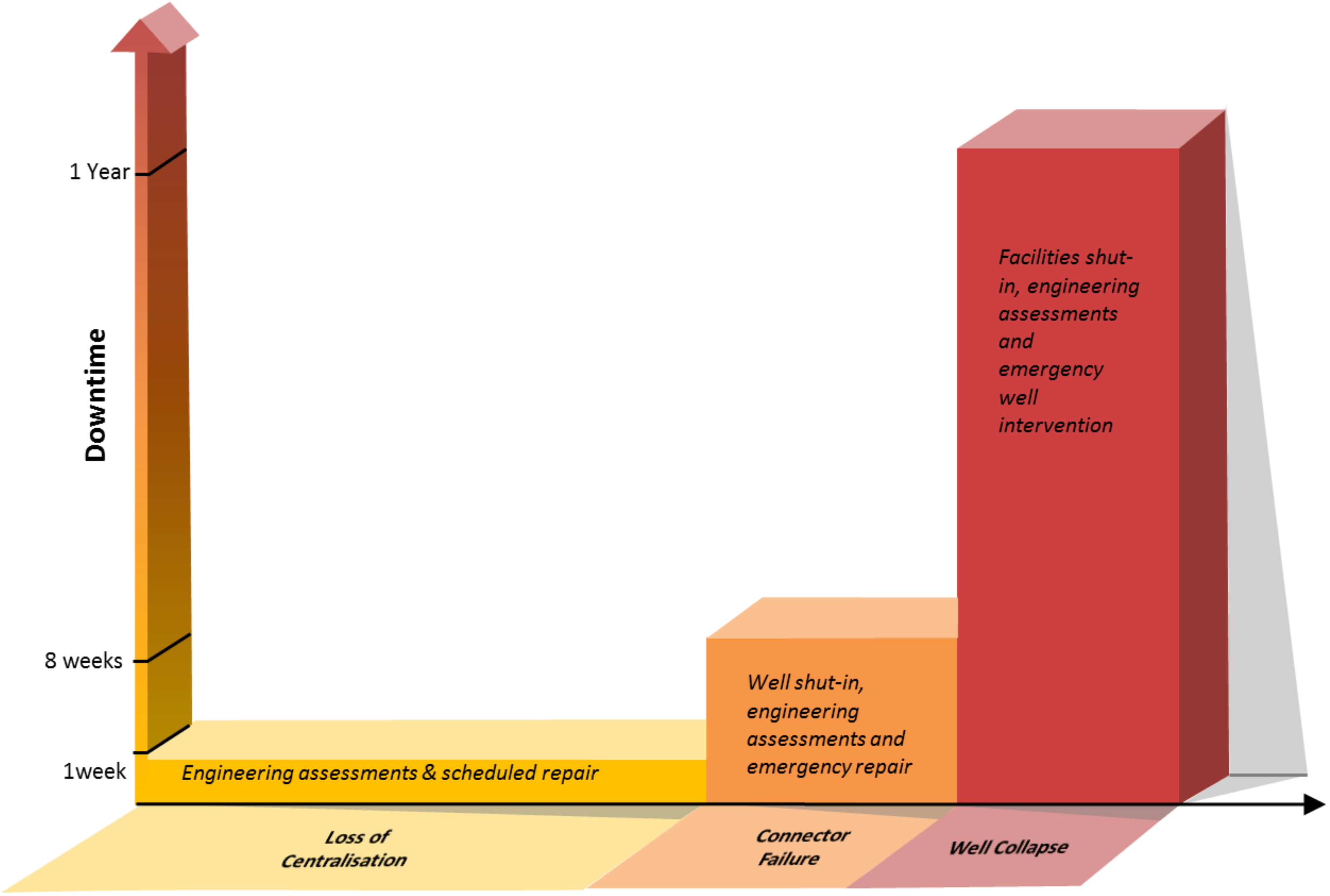
Conductor Failure Mechanisms



Conductor Failure Mechanisms

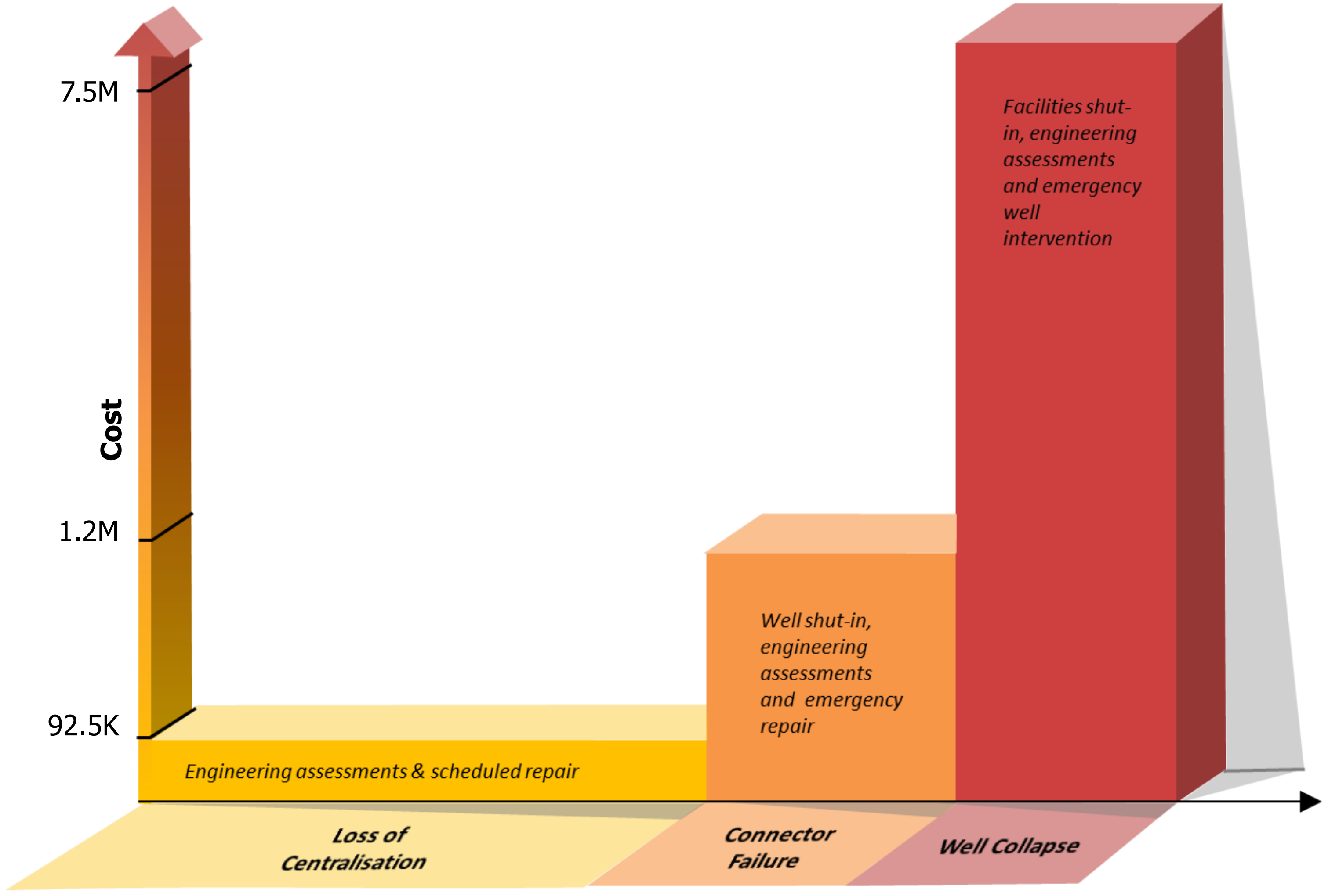


Structural Failure - Well Downtime



Downtime - Considers numbers of days of well needs to be offline for repair/remediation operations

Structural Failure - Cost Effect

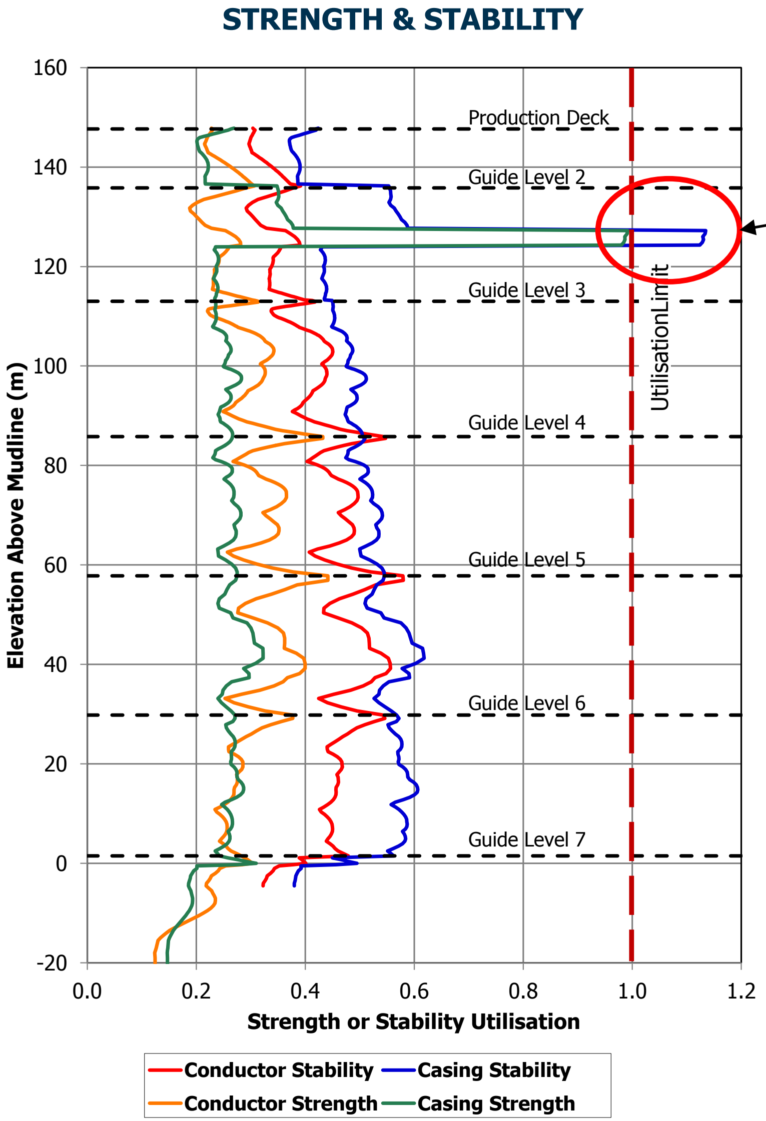


Cost includes engineering assessment, design and installation of repair equipment, deferred production and rig time

Case Study #1 – Corrosion

- Corrosion observed on several conductors
- Each well assessed using measured wall thickness for corresponding well loads
- Stress utilisation exceeds allowable in corroded sections

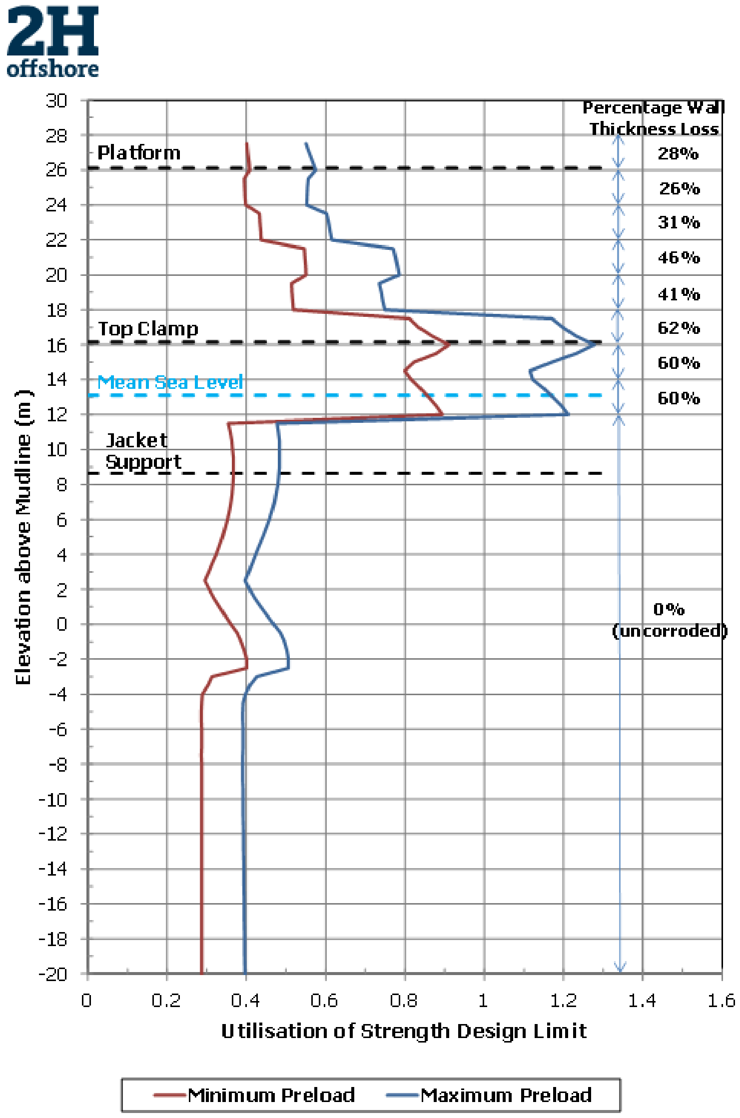
Case Study #1 Findings



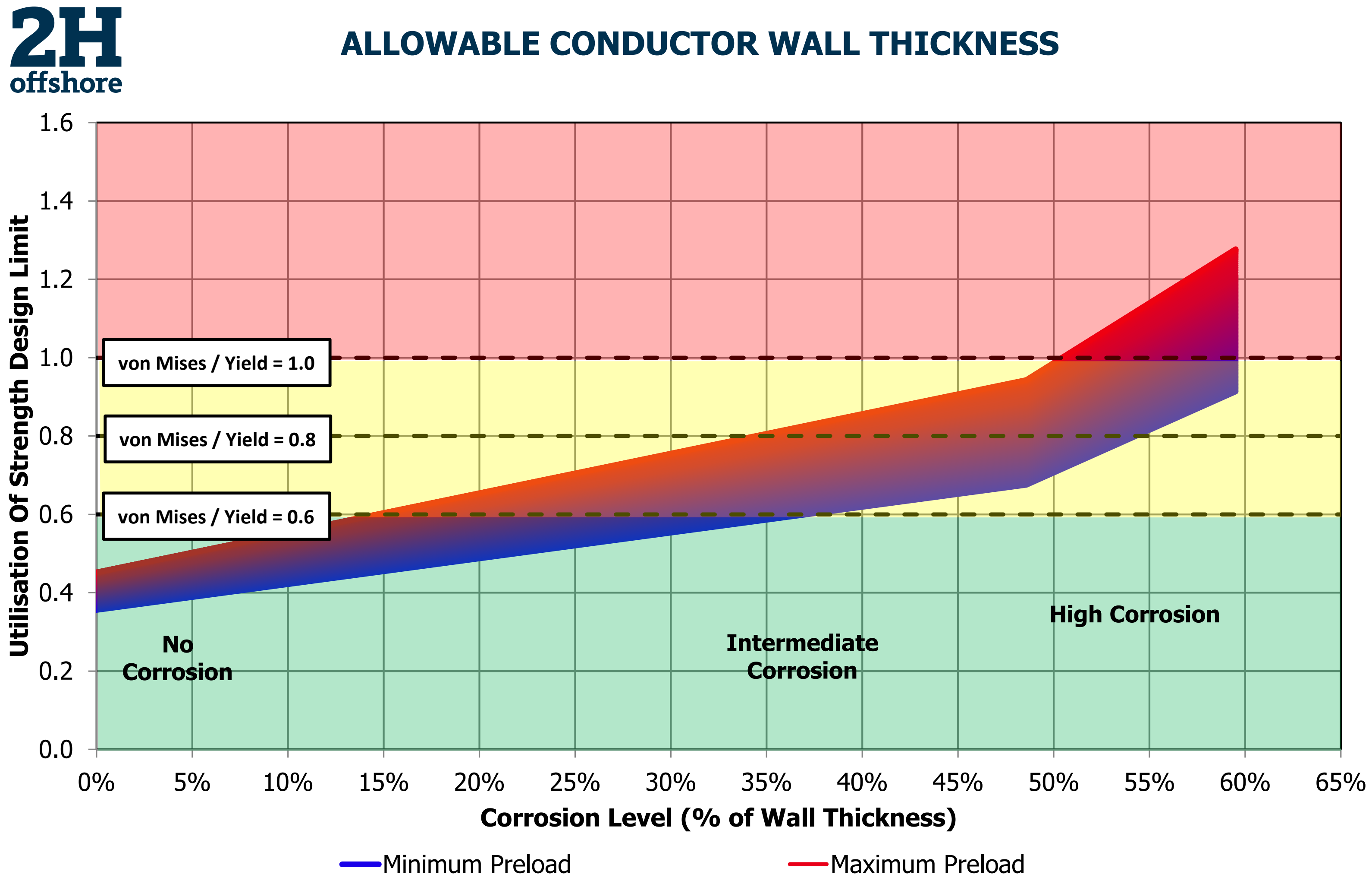
Strength and stability utilisation exceeded in cyclonic storm condition or earthquake

Assessment Tools

- Product of strength and stability assessment
- Allow well data to be used to determine integrity
  - Well construction design/type
  - Cement levels
  - Preload
- Define integrity guidelines
  - Define critical component/location
  - Identify allowable corrosion limits



How Much Corrosion is Allowed?



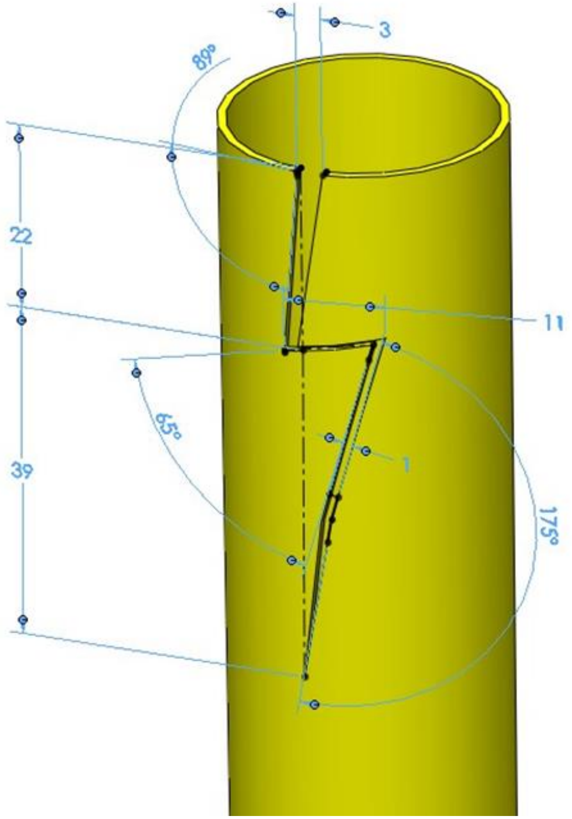
Grouting

- Grouting for strength (reducing buckling risk)
- Injection of high strength grout from the bottom

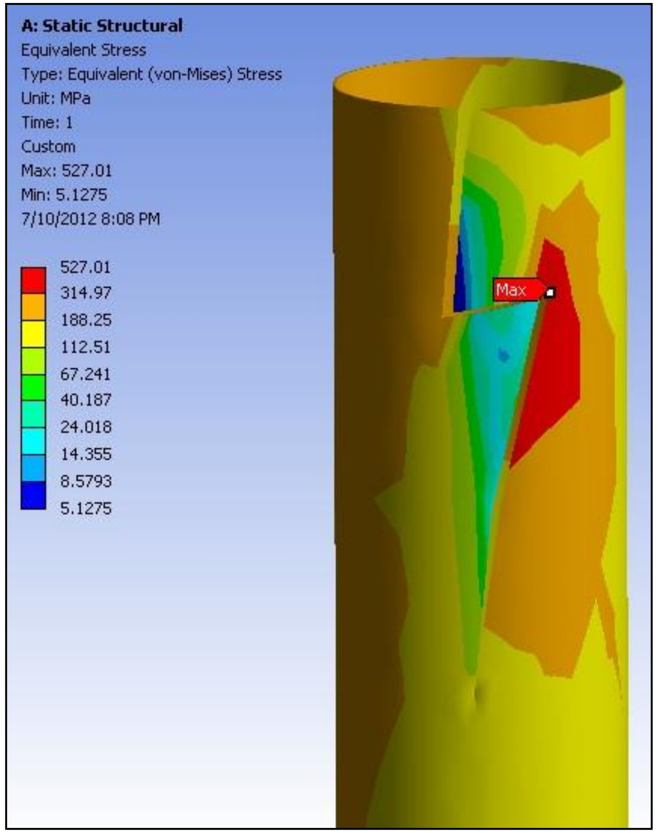


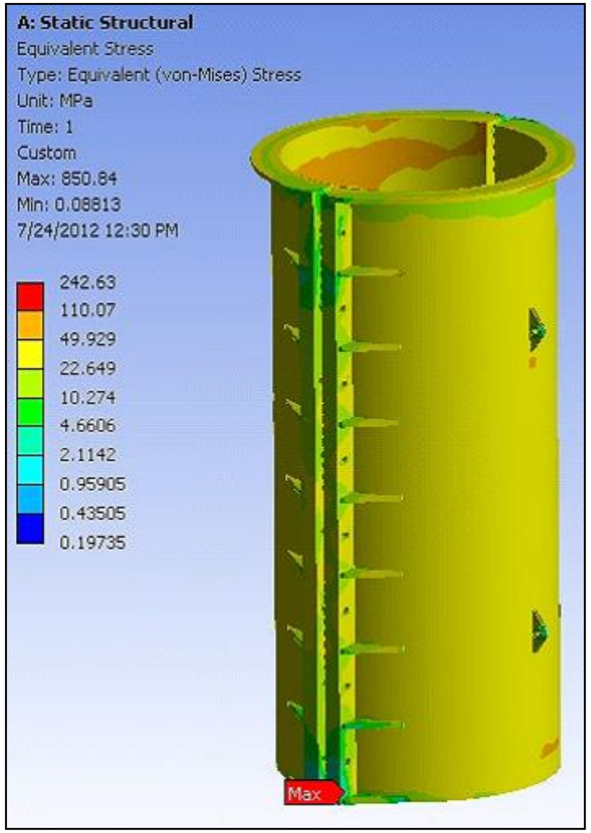
Case Study #2 – Conductor Crack Repair

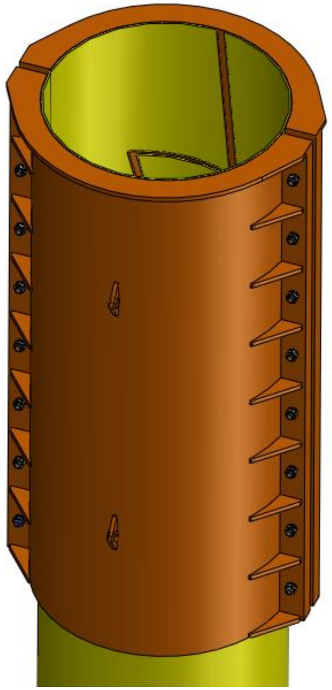
- Crack on conductor above sub-cellar deck observed
- FEA Model Analysis
- Sleeve repair to prevent crack propagation



FEA of Conductor Crack







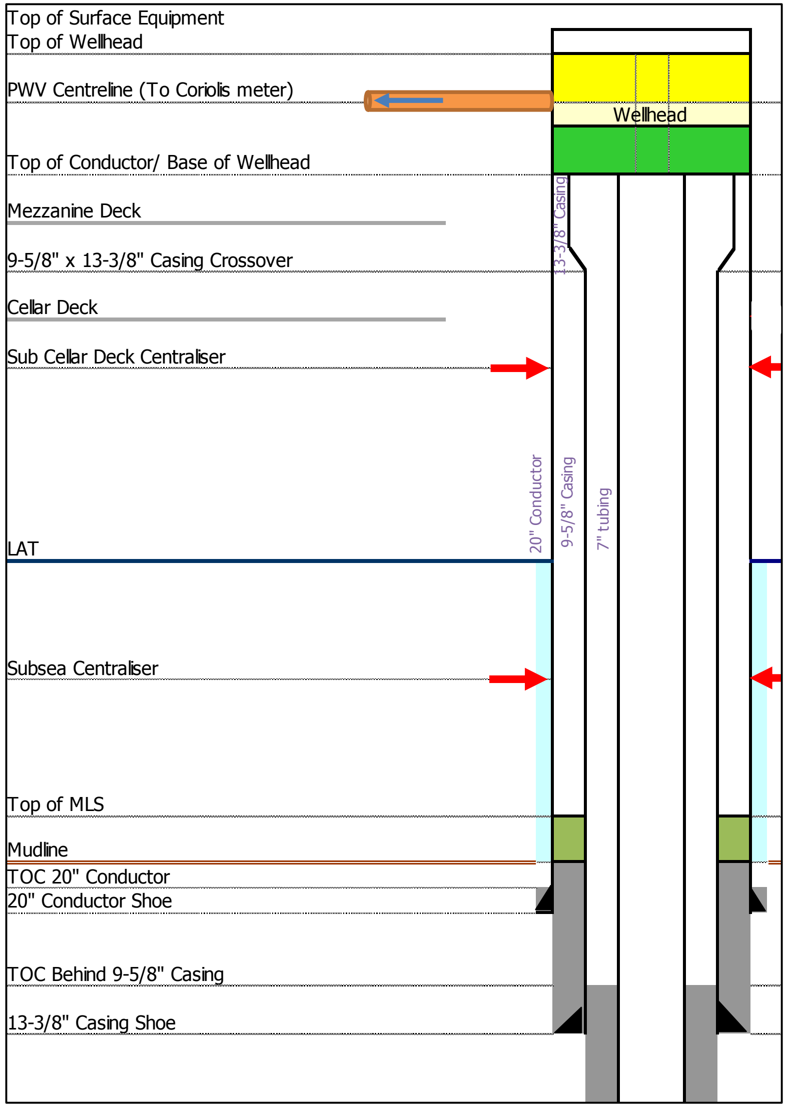
Case Study #3 – Loss of Centraliser

- Reduced conductor lateral support at sub-cellar deck

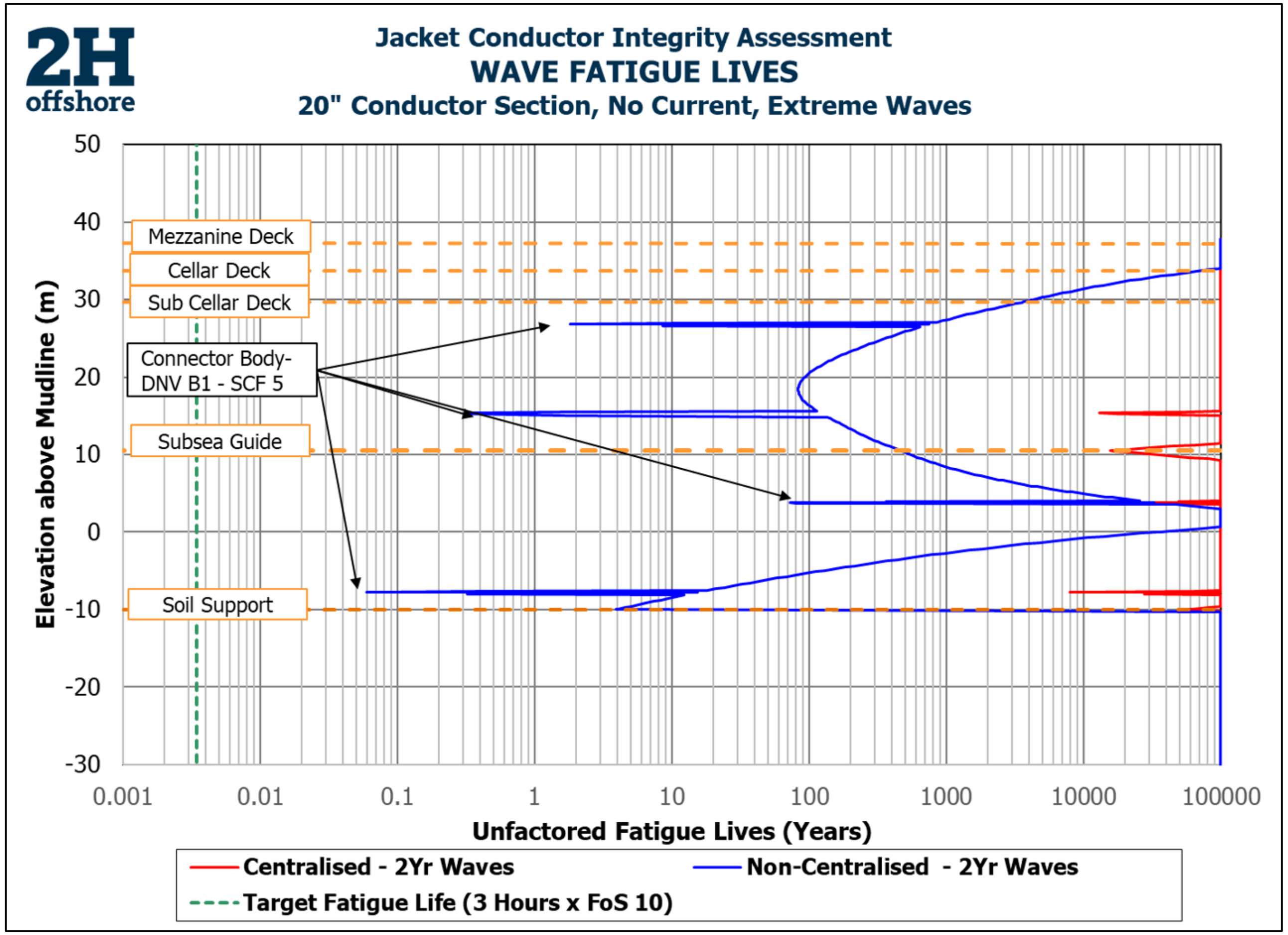
- Lateral motion of 20” conductor observed causing crack in production flowline weld

- Significant reduction in fatigue life with no centraliser around conductor

- Mitigation: retrofit centraliser



Case Study #3 – Loss of Centraliser

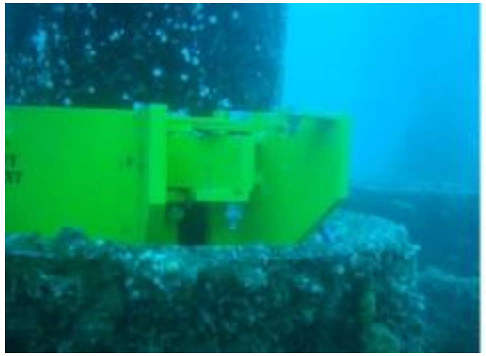


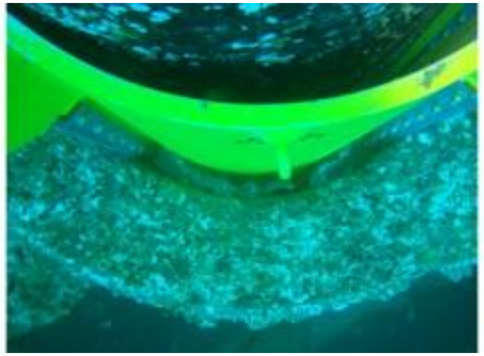
With no centralisers, conductor fatigue life 5 x more severe

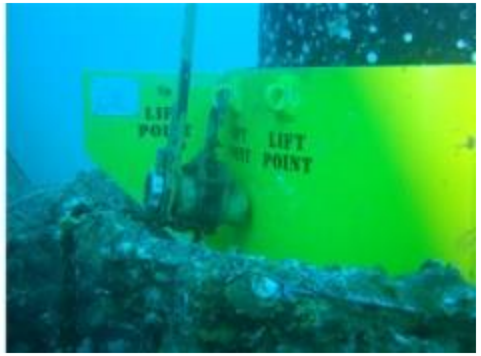
2H offshore

Retrofit Centralisers

claxton

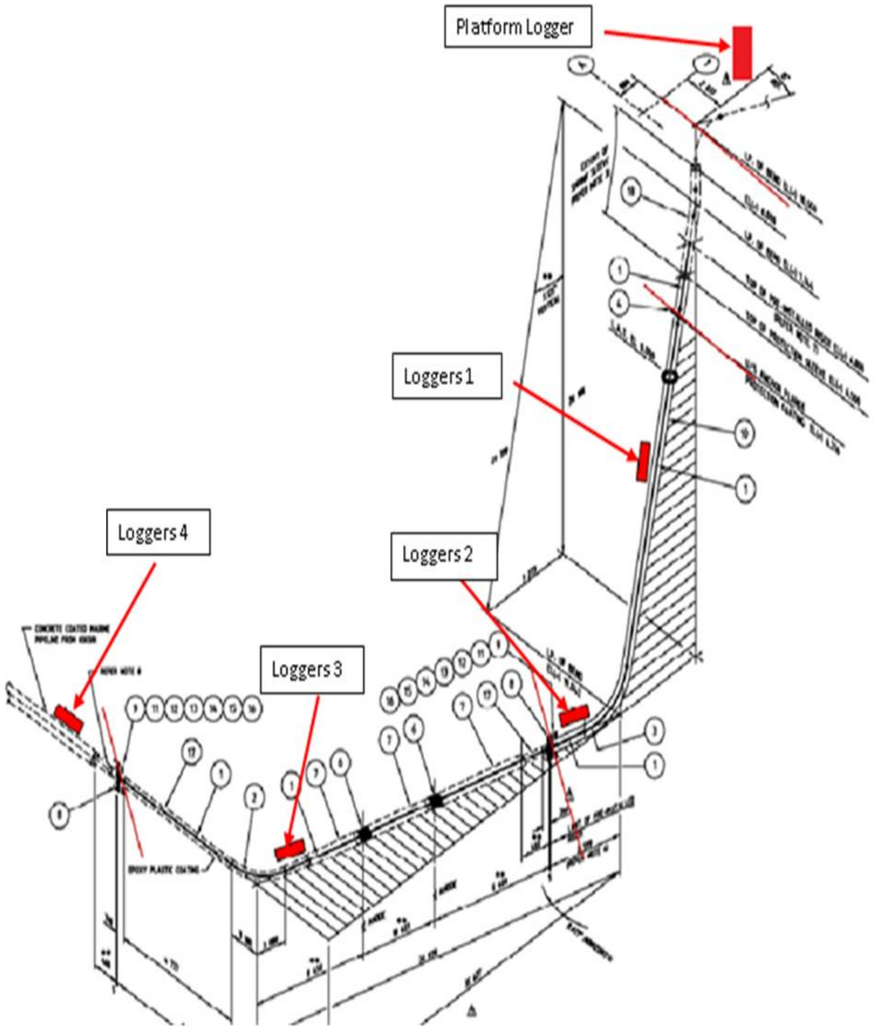




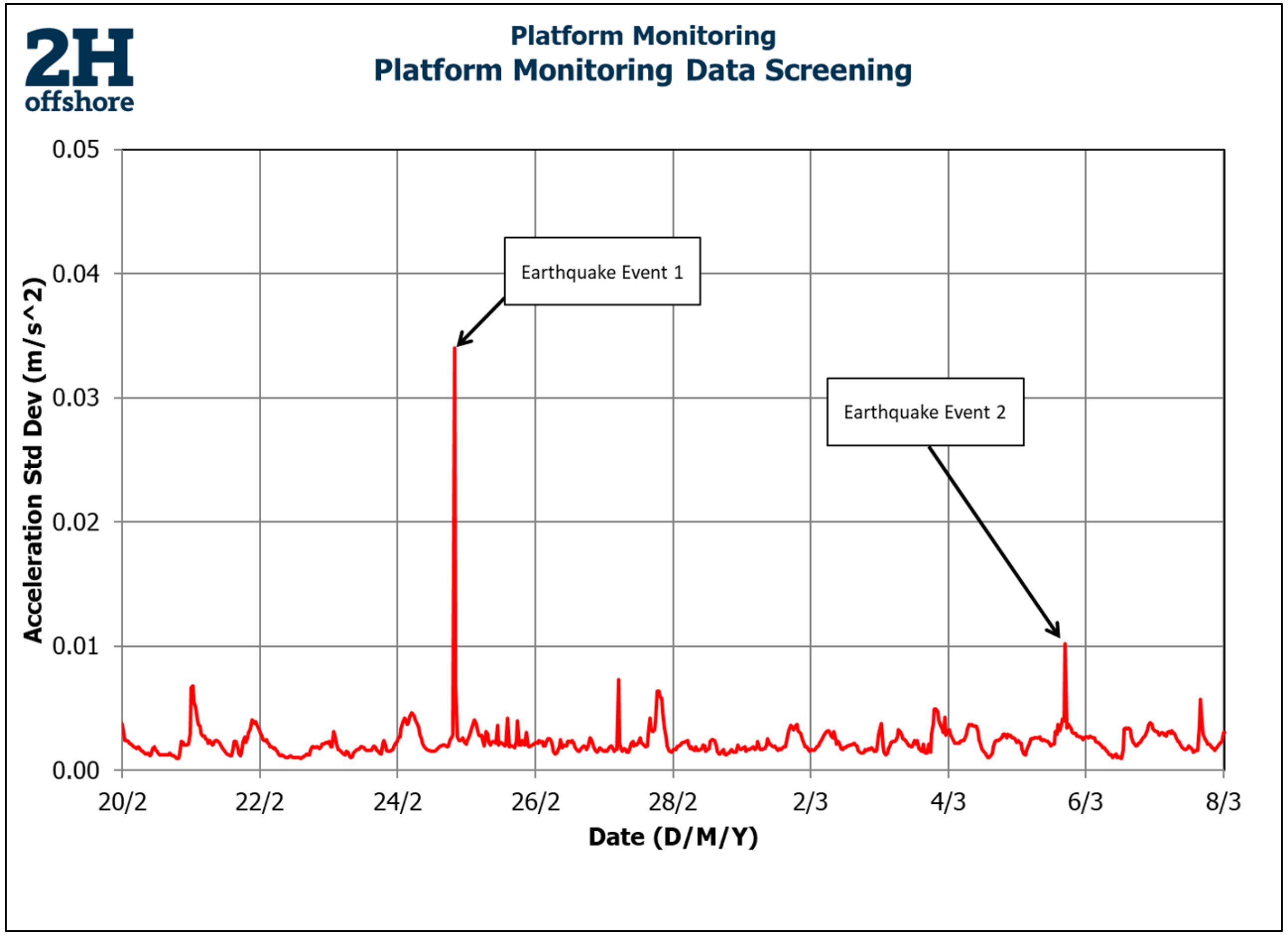


Case Study #4 - Earthquakes

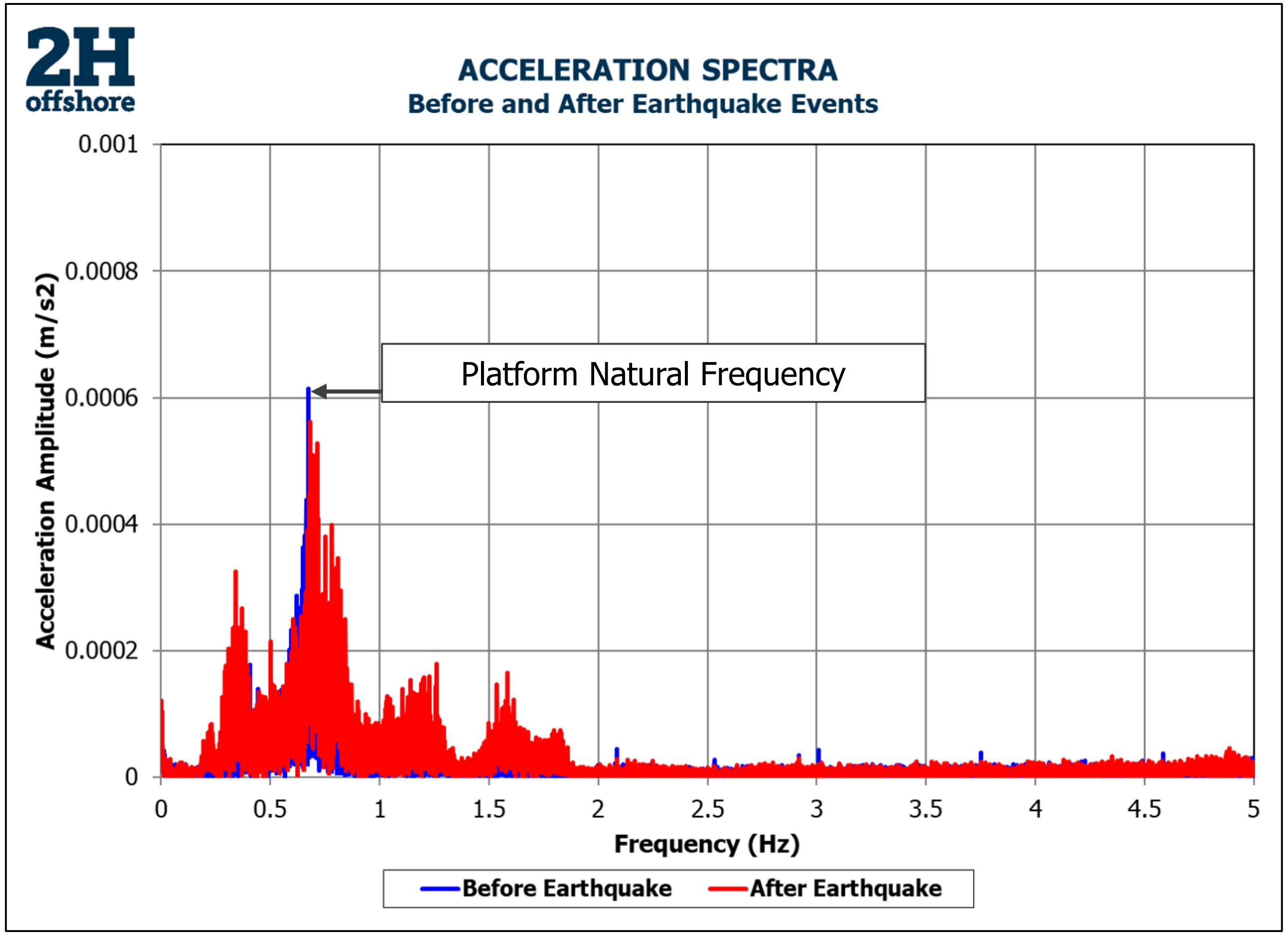
- Hardwired real-time motion monitoring on jacket platform
- Monitors installed to check for VIV or wave-induced fatigue
- 2 severe earthquake events - Requirement to assess motions of system
- Recorded displacement due to earthquake loads are 17 x higher than wave loads



Case Study #4 - Earthquakes



Case Study #4 - Earthquakes



Platform natural frequency did not change pre and post earthquake

Repair Considerations

- Present conductor condition & remaining life
- Objective of repair
    - Halt corrosion
    - Restore strength and reduce buckling risk
    - Extend fatigue life
- Scheduling and Clustering
    - Urgency of repair
    - Clustering repair of similar conductors
- Practicalities of repair
    - Cost
    - Accessible for repair? (i.e. splash zone or at a guide)
    - Level of future monitoring and inspection?

2H offshore

Conclusions

- Fitness for purpose of conductors must be demonstrated to allow life extension
- Challenges come from loads not accounted in design:
  - Corrosion
  - Loss in centraliser
  - Earthquakes
- Ongoing inspections, monitoring, analysis evaluates need for repair – cost reduction
- Remedial options include retrofit centraliser, grouting, repair sleeve

Questions?

Thank you

2H offshore

www.2hoffshore.com

Case Study #3 – Loss of Centraliser