Diverless Bending Stiffener Connector

Karim Jan (BSW)
Richard Beesley (CRP)
Who are CRP and BSW?

- CRP Group Ltd
  - ISO-9000 : 2000 qualified
  - 450+ employees
  - International group
  - Providers of:
    - Bespoke solutions
    - Engineered mouldings
    - Buoyancy solutions
    - Thermal insulation

- BSW in Lancaster
  - ISO-9000 : 2000 qualified
  - 20+ employees
  - Providers of: -
    - Mooring system connections
    - Pipeline recovery systems
    - Coiled tubing connectors
    - Deployment + recovery tools
WHY use a diverless connector?

- Diver safety
- Installation window
- Installation speed
WHAT is a DBSC?

- I-Tube / Bellmouth / receptacle
- Diverless connector
- Bending stiffener
- Removable installation clamp
- Fixed backup clamps (not shown)
WHAT were technical challenges to be addressed?

- Field life connection integrity
- Interface suitability
- Design longevity - Fatigue
- Design longevity - Corrosion
- Connection/disconnection procedure
Field Life Connection Integrity

• Ballgrab “ball and taper” technology
  – Balls in contact during pull-in
  – Load release activates balls
  – Rolling friction less than sliding friction

• Self energising

• Long term field proven

HOW did we address........
Interface Suitability

- Existing I-tube or new female interface?
- Diametric clearance/tolerances
- Condition/Marine Growth
- Loading capability
Design Longevity - Fatigue

• Ballgrab tool has very simple load paths
  – Analysis to BS 7608
  – Classical & FEA analysis
• Multiple contact points
  – Redundancy in design
• Third party fatigue testing
Design Longevity - Corrosion

• Corrosion evaluation
  – Material optimisation
  – Coatings
HOW did we address……..

Connection/Disconnection Procedure

- Pull - in
- Connector lock out and pre-load
- Riser release
- Disconnection hydraulic clamp
Pull-In

Connector ball cage (balls recessed)
Connector Lock Out and Pre-Load

Connector ball cage (balls retract) during installation

Connector ball cage (balls engaged) once installed

Locking pin removed
Riser Release

Removable clamp removed

Pull-in process is continued
Removal

- Backup clamp takes weight of bend stiffener / connector during removal
- Removal tool is used to collapse the ball cage.
- Complete assembly can then be removed
COOPERATION?

- CRP want to sell more bending stiffeners
- BSW want to sell more ballgrab connectors
- J.V. agreement was made
Thank-you for your attention from

CRP & BSW