INSTITUTE OF CORROSION

MARINE CORROSION FORUM

FOR ALL WET CORROSION ISSUES

Welcome to MCF – Marine Corrosion Forum / ICorr – Institute of Corrosion 2020 Summer Webinars.

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Institute of Corrosion partnering with

Andrew Woodward and Christopher Matthews

of Connector Subsea Solutions Ltd.

10th July 2020

“Use Of CRA’s in Mechanical Connectors for CRA Clad or Lined pipe repairs”

Andrew Woodward and Christopher Matthews

10th July 2020

About Us

- Andrew Woodward
- Andrew has a BEng and an MSc in Mechanical Engineering from Aston University. Andrew has over 10 years experience in Technical Sales and Estimation in Specialist Applications and joined the MORGRIP team in 2016. Andrew is now the Market Manager for Subsea Products including MORGRIP at Connector Subsea Solutions.

- Chris Matthews
- Chris joined the MORGRIP team in 2014 shortly after finishing a BEng in Aerospace Systems Engineering at Coventry University. After short period working with standard products Chris was engaged in a high profile project for Mechanical Connectors for Deep Water Repairs which lasted 2 years. After that Chris was a leading figure on the engineering team developing the new MORGRIP CLiP Connectors which are the subject of today's presentation.

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Q&A

Selection of Questions to **Andrew Woodward and Chris Matthews,**

Post-Presentation 10/07/2020

Questions and Answers – MCF / ICorr Joint Event Aberdeen – July.2020

- **Q.** What are the limitations? Size, pressure, temperature and material?.
- **A.** *The MORGRIP® CLiP Connector design is designed and DNVGL Type Approved for 10” to 26” pipes in carbon steel with a corrosion resistant alloy liner in maximum working pressures up to 364bar, temperatures -40 to 149 degrees. These limits were set by the JIP partners based on their requirements. Applications outside of this range of size, temperature and pressure can be considered if required as the base technology is adaptable and scalable.*

Questions and Answers – MCF / ICorr Joint Event Aberdeen – July.2020

- **Q.** Is it suitable for fatigue applications?
- **A.** *Fatigue properties are in line with a good quality welded connection. Fatigue testing undertaken under an earlier DNVGL Type Approval for MORGRIP® Connectors and was accepted by the JIP partners and DNVGL as applicable to this connector variant.*

Questions and Answers – MCF / ICorr Joint Event Aberdeen – July.2020

- **Q.** Is there any code to refer these connectors?
- **A.** *The MORGRIP® CLiP Connectors are DNVGL Type approved to DNVGL-ST-F101 for Submarine Pipelines and DNVGL-RP-F113 recommended practices for pipeline repair. Other standards can be considered if required.*

Questions and Answers – MCF / ICorr Joint Event Aberdeen – July.2020

- **Q.** Do you recommend to do stress analysis check on pipework where it is being used, in terms of sustained loads?
- **A.** *We provide a design basis document detailing the gripping and sealing forces generated on the pipe by MORGRIP® connector activation. Any additional stress analysis eg for the weight of a connector if deployed in a freespan condition is to be undertaken by the operator or their appointed engineering contractor. We can provide relevant inputs such as weight of the connector to assist in these analyses as required.*

Questions and Answers – MCF / ICorr Joint Event Aberdeen – July.2020

- **Q.** Would you not have a galvanic corrosion issue with the graphite and a clad water injection pipeline?.
- **A.** *The area of exposed graphite is extremely small, to non-existent compared to the surrounding area of steel. This is always regarded as the safe way to minimise galvanic corrosion by having a large ratio in area between the anode and cathode, so that any galvanic corrosion is spread over a relatively large area. Where traditional MORGRIP® connectors have been in service for a number of years and then recovered where a pipeline has been decommissioned no evidence of galvanic corrosion was observed. The CLiP Connector is a development technology which has been tested but not deployed in the field to date.*

Questions and Answers – MCF / ICorr Joint Event Aberdeen – July.2020

- **Q.** Is this suitable for high torsional moments?.
- **A.** *Yes the connector design is well suited to torsional moments. We request this type of load data to be provided during an application check so we can design the connector according to the project requirements.*

Questions and Answers – MCF / ICorr Joint Event Aberdeen – July.2020

- **Q.** Has there been any report of failure of connectors?.
- **A.** *The MORGRIP® CLiP connector is a development technology which has not entered service to date but has been through a rigorous process of design qualification including extensive testing. The design is based around the well known MORGRIP® Connector technology. In over 3000 MORGRIP® applications supplied to date there have been no in service failures.*

Questions and Answers – MCF / ICorr Joint Event Aberdeen – July.2020

- **Q.** Are the clamps classed as a permanent repair solution? If so would there have to be specific considerations or inspection to the clamp itself for something like a FFP or pipeline life extension?
- **A.** *The MORGRIP® CLiP Connector is classed as a permanent repair under the DNVGL Type Approval. Any inspection requirement would be applicable to accessories such as anodes which may be attached to the connector. Otherswise the connector is treated in the same way as the rest of the pipeline with respect to inspections. CSS do have a separate clamp product line with both permanent and temporary repair clamps available.*

Questions and Answers – MCF / ICorr Joint Event Aberdeen – July.2020

- **Q.** What are the maximum and minimum diameter for these solution?
- **A.** *For this product currently 10” to 26” pipelines are covered by the type approval however the technology is adaptable and scalable. For example the standard connector technology covers ½” to 44” pipe diameters. Refer also answer 1.*

Questions and Answers – MCF / ICorr Joint Event Aberdeen – July.2020

- **Q.** Could be applied these repair option on accessories types Tee, elbows?
- **A.** *Mechanical connectors can only be installed on a straight section of pipe, the length of straight pipe required is clarified during the bid/order process. Typically, even for a large connector, this length is below 2.5m. MORGRIP® Connectors have been used to enable the removal or installation of features such as tees and elbows in a pipeline system.*

Questions and Answers – MCF / ICorr Joint Event Aberdeen – July.2020

- **Q.** Was the new Clad & Lined pipe connector integrity tested in Fatigue?
- **A.** *Fatigue testing undertaken under an earlier DNVGL Type Approval was deemed to be suitable for this Connector variant was accepted by the JIP partners and DNVGL. Refer also answer 2.*

Questions and Answers – MCF / ICorr Joint Event Aberdeen – July.2020

- **Q.** What lifetime do you anticipate for the connector?
- **A.** *The MORGRIP® connector life is as per the pipeline, a 30-50 year design life is common.*

Questions and Answers – MCF / ICorr Joint Event Aberdeen – July.2020

- **Q.** At what depth , you're able to execute such repairs? Is it feasible in deep sea scenario , say 5000 metres & above?
- **A.** *To date repairs in approximately 1300m water depth have been completed using CSS MORGRIP® Connectors and installation tooling. The Connector technology can be designed to any theoretical depth by addressing the applicable application pressures as required. CSS have unique experience in repair of Deepwater pipelines and are available to discuss any applications.*

Questions and Answers – MCF / ICorr Joint Event Aberdeen – July.2020

- **Q.** Is this suitable for pressure fluctuations and slug loads in two phase flow?
- **A.** *Yes, the connector is suitable for multiphase flow and explosive decompression. Any forces due to slug loads should be provided for or assessment at application check phase in order to be considered in the design.*

Questions and Answers – MCF / ICorr Joint Event Aberdeen – July.2020

- **Q.** Who can we contact for any further information?
- **A.** *Any further queries or requests for information can be directed to* *andrew.woodward@connectorsubsea.com*