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**CORROSION**



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Corrosion 2021 January  
Webinars.



**INSTITUTE OF  
CORROSION**



**FORUM**

**FOR ALL WET CORROSION ISSUES**

Institute of Corrosion and MCF  
partnering with:

- Dr. Maria Eleni Mitzithra
- 21<sup>st</sup> January 2021



# “Polymer Lined Carbon Steel Pipes”

Dr. Maria Eleni Mitzithra,  
21<sup>st</sup> January 2021

# About Me

- **Dr. Maria Eleni Mitzithra**, Senior Project Leader-Corrosion 7 yrs at TWI.

- [Prev. Research PHD Student EDF R&D & University of Toulouse III- Paul Sabatier Full-time, Oct 2010 – Nov 2013](#)

Detection of corrosion of reinforced concrete on cooling towers of power plants

Context of the project:

Development of an original methodology and strategy based on a double approach: a global technique (Ground Penetrating Radar-GPR) and a local electrochemical technique (Linear polarisation resistance-LPR)

Activities:

- GPR application and use of signal processing tools
- Critical analysis of the existing commercial devices for LPR
- Development of an original device and a measurement procedure for LPR
- Lap scale application of the new method (definition of its validity domain and uncertainties)

Results:

- Prototype and knowledge
- An operatory protocol for the on-site use of the proposed techniques

- [Delft University of Technology \(M.Sc.\) Sustainable Energy Technology \(2010\)](#)



# Q&A

- Selection of Questions to **Dr. Maria Eleni Mitzithra**, TWI,  
Post-Presentation 21/01/2021

# Questions and Answers – MCF / ICorr Joint Event Aberdeen – Jan.2021

- Q1. Is liner main objective to prevent sulfide SCC? if yes, then why the unlined carbon steel doesn't experience cracking?
- A1. Liner is a barrier, anything that prevents on of parameters beneficial.

# Questions and Answers – MCF / ICorr Joint Event Aberdeen – Jan.2021

- Q2. What are the reasons for the elongated pits/fissures ?
- A2. Local microstructure plays a role in this. Also local Oxides



# Questions and Answers – MCF / ICorr Joint Event Aberdeen – Jan.2021

- Q3. Will liner collapse in vacuum?
- A3. Unlikely, Needs to be calculated using Young's Modulus / Poisson's ratio.

# Questions and Answers – MCF / ICorr Joint Event Aberdeen – Jan.2021

- Q4. Was the base steel made to a sour service and HIC resistant steel?
- A4 Yes, material was sour rated.

# Questions and Answers – MCF / ICorr Joint Event Aberdeen – Jan.2021

- Q5. Do you conclude that the liners will prevent SSC, HIC and general corrosion in the base steel?
- A5. No cracks evident but this was not the main aim of work. Effects at interface most of interest.

# Questions and Answers – MCF / ICorr Joint Event Aberdeen – Jan.2021

- Q6. Permeability data on graph was on dry gas - is this correct? Also, was the X52 pipe tested to show sour resistant grade. I.e. hardness controlled, etc. HIC resistant?
- A6. Yes, dry gas was intentional. Really as an indicated as it might alter barrier props.

# Questions and Answers – MCF / ICorr Joint Event Aberdeen – Jan.2021

- Q7. How does the test data compare with service experience - Aramco experience?
- A7. For some areas, data not available in literature. Service experience for sour use still under study for several institutes. Next stage would consider effects at girth welds.

# Questions and Answers – MCF / ICorr Joint Event Aberdeen – Jan.2021

- Q8. With regard to your rapid decompression tests, did you measure the temperature drop (Joules- Thompson)? Would you expect a higher temperature drop in a real pipeline carrying a larger volume of gas? Might this affect the resistance of the liner to collapse, or even brittle cracking?
- A8. Limited volume in test, heaters left on continuously.

# Questions and Answers – MCF / ICorr Joint Event Aberdeen – Jan.2021

- Q9. Thank you good presentation. If this Polymeric liner is suitable for downhole tubing and casing service environment. What is the maximum service temperature and partial pressure can the liner withstand without failure.
- A9. Max. temp currently successfully used < 100 Deg.C. Failures within wellbores are not well recorded.

# Questions and Answers – MCF / ICorr Joint Event Aberdeen – Jan.2021

- Q10. With regards to the permeability coefficient's results, would the results have varied significantly in the presence of significant portions of water vapour (steam)?
- A10. In experiments can often get up to 20% changes in presence of Hydrocarbons.



# Questions and Answers – MCF / ICorr Joint Event Aberdeen – Jan.2021

- Q11. Did different concentrations of the H<sub>2</sub>S tested?
- A11. They will be in future scopes.

# Questions and Answers – MCF / ICorr Joint Event Aberdeen – Jan.2021

- Q12. Will you be looking at Thermal Cycling Effects to liners, as may happen when Flowlines are operated intermittently?
- A12. Yes this is fair point and worthy of further investigation.

# Questions and Answers – MCF / ICorr Joint Event Aberdeen – Jan.2021

- Q13. My experience with polymer lined pipes has been only HDPE for water injection lines. Is HDPE not suitable to be considered for hydrocarbon transport, hence not included in the test? - Were these 4 polymers identified previously as the best candidates for the test and potential use on the future?
- A13. Project undertaken was in cooperation with sponsors requirements. For lower HDPE, ok for lower temperatures but need to examine failure envelope in the presence of Hydrocarbons.

# Questions and Answers – MCF / ICorr Joint Event Aberdeen – Jan.2021

- Q14. Do you think water condensing conditions could make a difference to the threat? i.e. where gas starts of hot and then cools and water drops out?
- A14. Future work but evidence generally yes of permeation.

# THANK YOU FOR ATTENDING

This Webinar was brought to you by MCF working in partnership with ICorr and  
**TWI.**