



INSTITUTE OF  
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**FORUM**

**FOR ALL WET CORROSION ISSUES**

Welcome to MCF –  
Marine Corrosion Forum  
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Corrosion 2021 January  
Webinars.



**INSTITUTE OF  
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Institute of Corrosion and MCF  
partnering with:

- Dr. Patrick Lydon

19<sup>th</sup> January 2021



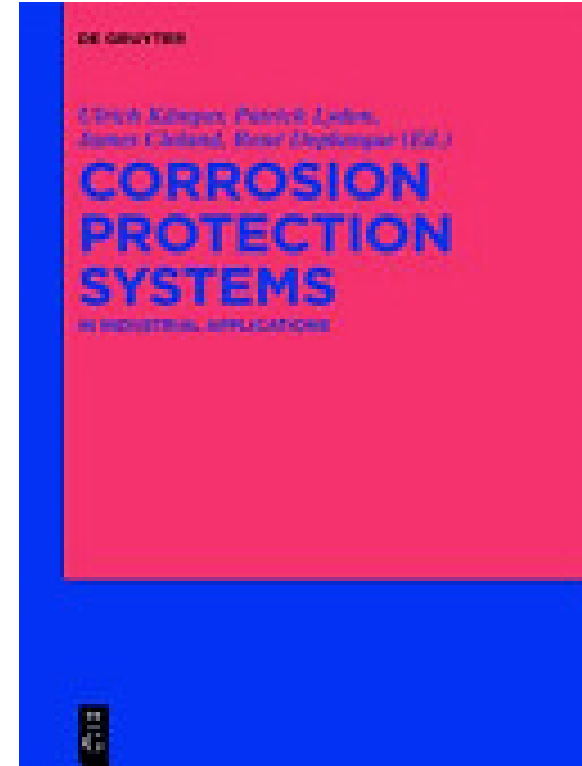
# “Safety and Design Considerations for CP of Marine Structures”

Dr. Patrick Lydon, Director  
IACS Corrosion Engineering Limited,  
19<sup>th</sup> January 2021

# About Me

## Dr. Patrick Lydon, Director, IACS Corrosion Engineering Limited,

- **Dr. Patrick Lydon** BSc (Hons), MSc, PhD, CEng, MIMMM, C Chem FRSC, C Sci, FICorr
- Qualified with an honours degree in Applied Chemistry and worked as a research scientist in the field of electronic materials with Plessey. Completed an MSc in Materials Protection and Corrosion at Loughborough University and then post graduate research studies at City of London Polytechnic in Metallurgy under Professor L L Shrier. Worked for Roxby Engineering Ltd a cathodic protection and electrical installation contracting company in South East England from 1982 to 1998 and undertook numerous projects in the UK, North Africa and Middle East. From 1989 acted as Corrosion Control Divisional Manager with both technical and commercial responsibilities. In 1998 joined Penspen Ltd as Senior Engineer in their London Head Office working on various projects worldwide.
- He is a Fellow of the Institute of Corrosion; Fellow of the Royal Society of Chemistry, Chartered Chemist, Member of the Institute of Mining Mineralogy and Materials, Chartered Engineer, Chartered Scientist, NACE accredited Corrosion Specialist, BS EN 15257 Level 3 Certified Senior Cathodic Protection Engineer and Director of IACS Corrosion Engineering Ltd.



**IACS**  
Corrosion Engineering Limited

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# About our Work

- **IACS Corrosion Engineering Ltd** provides specialist corrosion, materials selection and pipeline operation services with independent, professional advice and expertise to the oil, gas, petrochemical, water, power and construction industries.
- The Company incorporates long term experience gained from *Penspen Ltd*, *Spencer & Partners* and the cathodic protection division of *Roxby Engineering International Ltd*, all companies recognised throughout the world as authorities in the field of corrosion protection matters.
- **IACS Corrosion Engineering Ltd** was founded in 2004 after the closure of *Penspen Ltd's* cathodic protection department. Its engineers have undertaken projects throughout the United Kingdom and in all areas of the World, in particular Western Europe, the Middle East, Africa and South East Asia.
- **IACS Corrosion Engineering Ltd** works closely with **Inspection & Consultancy Services (IACS) Ltd**, which provides inspection and non-destructive testing services to the oil, gas and water industry.



Above ICCP TRU and SACP Bracelet Assembly (right).  
Below -1cm<sup>2</sup> AC coupons for monitoring AC interference on pipelines and Decoupling device (right) for discharge of AC current (40A) off pipelines



# Q&A

- Selection of Questions to **Dr. Patrick Lydon**, Director, IACS Corrosion Engineering Limited,  
Post-Presentation 19/01/2021

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

- Q1. Is there guidance (standard or practice) on how to measure and assure low resistance between piles ? What is a "good" resistance value ?
- A1. 0. 001 Ohms would be the resistance to be aimed at for connections onto piles. With CP of marine structures the currents are relatively high but the driving voltages are low so resistances between piles in the order of milli-ohms are always desired. .



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

- Q2. In offshore platforms protected with Al anodes do you recommend to connect platform with well conductor
- A2. Case by case basis, need to study structure configuration always rather than generalize ! Ideally all structures should be equipotential bonded provided CP is not compromised to mitigate touch potential risks and stray current risks.

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

- Q3. I find it counter intuitive to have isolation between ships and the pier/piles. I'd rather bond them together via a safety switch. Can you explain ?
- A3. No, there are specific regulations that **MUST** be followed most countries adopt the ISGOTT Guidelines, (Latest edition is 6<sup>th</sup> Edition). These require isolation between ship to shore. Some countries do permit bonding but any bonds must be via a flameproof or EExd isolator and ideally two should be used. Most operators insist on having all Isolations in place and the specific regulatory authority guidelines must always be followed.

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

- Q4. Can you elaborate on why internal CP of the piles might be required ? Is not the electrolyte inside the pile more or less stagnant and without oxygen replenishment ? I mean the risk of a non-controlled corrosion rate should be low ?
- A4. Internal CP of piles is not required . However, installation of a biocide or inhibitor should be considered. In most tubular piled structures oxygen present gets consumed and cathodic reaction ceases so at low oxygen levels in the ppb level the rate of corrosion would be low as there would be no oxygen replenishment inside the pile, MIC risks however always remain Biocides can be used and added to the internal volume and cap off the Piles, that is best. There is a well reported internal pile MIC failure in Tirptzhaven and lots of other Papers available on ALWC (Accelerated Low Water Corrosion).

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

- Q5. Many thanks Pat. You suggested that CP should be switched OFF despite the AODC guidance that, with the correct CP design, as you indicated, it IS safe for divers. It is possible to prove and monitor safety with spaced electrodes, this is inferred in the AODC document. How often have you seen CP systems switched OFF for diving and never switched ON again ? I have seen substantial corrosion damage due to this on a number of jetties.
- A5. Lots of different situations and lots of risk but at end of the day, the Operator must decide what is best for particular situation, safety wise. The AODC guidance was the guidance given before IMCA DO45. It is the responsibility of the facility operator to ensure that the appropriate safety risks are implemented .

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

- Q6. Pat, is there 1x Doc published, that summarise's all these Safety Codes / Refs that you have highlighted ?
- A6. No, certainly not one document. I am happy to assist with helping produce a document if MCF wish.

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

- Q7. With berthed ship isolated from uncoated jetty and high current impressed current CP system on jetty, there is clearly a risk of high rates of corrosion on the ship. This is seldom tested and codes are silent.?
- A7. Clear guidance to cover this would certainly be good to have. I have found that EI documents are generally good but not all docs available in the public domain cover all situations.

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

- Q8. CP Hydrogen Risks - Explosion experienced in Caission....due to H<sub>2</sub> from ICCP System generation.
- A8. Fully agree on this point. Above Water line in particular risk for gases to accumulate. H<sub>2</sub> creates a Very High Risk with its explosive range being quite large. H<sub>2</sub> Alarms should be provided. Anyone who has used impressed current in confined spaces in sea water will know that both Hydrogen and Chlorine will be generated and the water pH will could drop particularly in stagnant conditions. The pH change can be greater with ICCP anodes than with galvanic anodes. Use of ICCP in confined spaces is not certainly recommended and should be avoided . Additionally Al SACP anodes should not be used in a Zone 0 Area if they exceed the maximum potential energy limit of 275 Joules. Similarly Al ladders or equipment should not be used in hazardous areas because of the thermite ignition risk. EN 60079 gives some guidance on use of light metals in hazardous areas.

# THANK YOU FOR ATTENDING

This Webinar was brought to you by MCF working in partnership with ICorr and **Dr. Patrick Lydon**, Director, IACS Corrosion Engineering Limited.