

ONLINE

Fleming

LIVE TRAINING COURSE

Microbiologically Influenced Corrosion

Early Identification and Control to Prevent Loss of Asset Integrity
in Oil Production, Pipelines and Storage Facilities

15 – 17 September 2021

8:45 – 13:00 CET

Course overview

Microbiologically influenced corrosion (MIC) is corrosion affected by the presence or activity of microorganisms in biofilms on the surface of the corroding material – a problem that threatens assets in many industries, including oil and gas. As a matter of fact, MIC has been reported to be the third most costly corrosion mechanism in the oil industry. Despite best efforts MIC returns on a regular ten year cycle resulting in major loss of integrity of pipelines and crude oil storage tanks. MIC presents a significant hazard to assets from the reservoirs to storage tanks therefore early identification and control is essential to prevent run-away irreversible loss of asset integrity. Join this course to learn about the best practices to identify and control the MIC in your assets and facilities.

Key Benefits

At the end of the training course, the delegates will be able to:



Identify

when MIC may be a major concern



Reduce

the hazard of MIC for new pipelines and tanks



Quantify

the MIC corrosion hazard



Evaluate

the progress of MIC



Select

optimal methods to control MIC

Your Expert Trainer



Dr. Roger King

Independent Consultant, UK

Roger has over 35 years experience of corrosion in the oil and gas, civil and nuclear industries. He has specialist

knowledge of sweet and sour corrosion and its prevention by chemical inhibition, monitoring of corrosion, microbiological corrosion and the design of efficient cathodic protection systems for flowlines, structures and seabed installations. He has been an independent consultant since September 1989 and prior to this was a founder member of the Corrosion and Protection Center Industrial Service (CAPCIS) at the University of Manchester, Institute of Science and Technology (UMIST).

Who should attend

- ✓ Corrosion Engineers, Materials Engineers and Designers who are concerned with corrosion related problems
- ✓ Technicians, Asset Integrity and Maintenance personnel who deal with repair and rehabilitation of pipings, pipelines, refineries, storage tanks, vessels and other equipment
- ✓ Facility and Plant Managers who are concerned with corrosion and methods of its mitigation
- ✓ Personnel involved in R&D Engineering, Corrosion Engineering, Pipeline Integrity, Pipeline Maintenance, Coatings, Materials and Maintenance, Design, Inspection and more...

Testimonials From Courses Led By Roger King

"Great course with experienced facilitators. Great learning and discussions"

Anders Simonsen, Pipeline Engineer, Shell

"Thanks again to Michael and Roger, I thoroughly enjoyed the course. My favourite aspect was the time taken to go everything in detail on the slides (e.g. talk through all the schematics and tables in details). This made the material easy to follow at a good pace."

Bruce Strachan, Process Engineer, Total Exploration & Production, UK

"Highly participatory and inclusive course! I have gained a lot of knowledge, excellent trainers, nice and inspiring group."

Kostas Golfinopoulos, CEO, Atom Group, Greece

"Qualified trainers, good course organization."

Edomer Siko, Head of Quality and Reliability, Azomures, Romania



Day 1

15 September

8:45 Online Meeting Room Opens

9:00 **Welcome Note from Fleming and Opening Remarks**

9:05 Introduction & Speed Networking

Join with your camera turned on to meet & greet the trainer and participants, as well as to share your experience and expectations from this course.

9:15 **SESSION 1: Basic Microbiology**

- Bacterial cells, their structure and growth mechanisms
- Taxonomy of microorganisms: fungi, algae, yeast and bacteria
- Cell terminology and the bacterial cell structure and morphology

10:00 Break

10:10 **SESSION 2: Basic Corrosion**

- Internal and external corrosion mechanisms
- The impact of potential-current relationships and anode-cathode ratios on corrosion kinetics
- Limitations on corrosion processes and use of E-pH diagrams
- Corrosion morphology and interrelationships between corrosion forms
- Corrosion prevention by materials selection, isolation from and modification of the environment, electrical modification and impact of design.

10:55 Break

11:05 **SESSION 3: Biofilms**

- Development of biofilms and interactions with the substrate material
- Protein synthesis in biofilm and the distribution of active bacteria
- Effect of flow, surface roughness and deposition processes in pipelines
- The development of SRB corrosion cells

11:50 Break

12:00 **SESSION 4: Sulphate-Reducing Bacteria - SRB**

- The sulphur cycle
- Sulphate reduction by the SRB
- Mesophilic and thermophilic SRB and their morphology
- Sulphate reduction, importance of the hydrogenase enzyme in SRB energetics and corrosion

13:00 **Q&A AND DISCUSSION**

13:15 End of Day 1



Day 2

16 September

8:45 Online Meeting Room Opens

9:00 **SESSION 5: Corrosion by SRB**

- Inorganic theories of microbial corrosion
- Impact of hydrogenase on hydrogen utilization
- Effect of ferrous iron on the corrosion rate and the formation of sulphides
- Nature of sulphides and their interaction with bacterial activity
- Internal and external corrosion mechanisms by SRB

10:00 Break



10:10 **SESSION 6: SRB Corrosion in Oil Production, Pipeline, and Storage Facilities**

- Hydrotesting
- Seawater injection systems
- Reservoir souring
- Sweet crude oil processing systems
- Sweet crude oil pipelines
- Gas pipelines
- Crude oil storage tanks
- Tanker oil and ballast tanks
- External corrosion of pipelines and tanks
- Offshore jackets under fouling

11:40 Break



11:50 **SESSION 7: External Corrosion by SRB**

- Soil corrosiveness
- Seabed sediments
- External protection

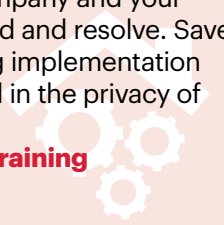
12:35 **Q&A AND DISCUSSION**

12:50 End of Day 2

Create your own In-House Training

Are you looking for something more specific? Create your own In-House Training customized to the specific issues your company and your employees need to understand and resolve. Save time and cost while increasing implementation with an In-House Training held in the privacy of your company.

Read more about In-House Training opportunities



Day 3

17 September

8:45 Online Meeting Room Opens

9:00 **SESSION 8: SRB Testing and Monitoring**

- SRB growth requirements and limitations in pipelines, water activity and potential
- Evaluation of SRB infestation by serial dilution using growth media
- Sampling, incubation and enumeration (most probable number)
- Alternative methods of enumeration including rapid enumeration kits
- SRB infection rating and risk assessment
- Use of iron counts and populations to rank risk to pipelines and networks
- Using bioprobes and conventional monitoring coupons

10:00 Break



10:10 **SESSION 9: Control with Chemical Treatments**

- Oxidizing and non-oxidizing biocides
- How biocides kill bacteria, development of resistance to treatment, bacterial recovery
- Treatment of water injection systems upstream of pipelines
- Alternative approaches to water injection pipeline treatment, e.g. chlorination, UV treatment.
- Selection of biocide formulation and regime by laboratory and field testing
- Hydrotesting of new pipelines
- Treatment of crude oil pipelines
- Environmental issues

10:55 **SESSION 10: Pigging**

- Cleaning and housekeeping pigs
- Requirement for mechanical removal of biofilm
- Deciding the frequency of pigging based on corrosion rates and SRB populations
- Precautions during pigging

11:25 Break



11:35 **SESSION 11: Cathodic Protection**

- How cathodic protection works and the interaction of coating and CP
- Sacrificial and impressed CP systems
- Measuring CP potential onshore and offshore
- Evaluating soil corrosiveness using resistivity, soil composition, water and chemical content, redox potential, bacterial evaluations in solids
- Modification of CP design to cope with SRB activity: effect on potential, current density, corrosion of sacrificial anodes

12:20 **Trends and Developments**

12:35 **FINAL Q&A, DISCUSSION AND THE COURSE SUMMARY**

12:50 End of the Training Course





- ✓ All sessions of this unique course online
- ✓ Live interaction options between the delegates and trainer
- ✓ Available via mobile, tablet or laptop

REGISTRATION

**Click
Here &
Register
Online**



FROM
1296 €

Join The Event

You will be transferred to secure payment gateway