

Marine Corrosion: Causes and Prevention

Registration Form

*Photocopies of this form may be used for registrations.
You can also register online at www.corrosionclinic.com*

Please register the following person(s) for the above course (please TYPE or PRINT clearly):

1. Dr/Mr/Ms _____
Designation _____

2. Dr/Mr/Ms _____
Designation _____

3. Dr/Mr/Ms _____
Designation _____

*delete where inappropriate

Enclosed is a cheque / bank draft No. _____
for S\$ _____ (payable to **WebCorr Corrosion Consulting Services**) being Registration Fee for the above person(s).

Organization _____
Contact Person _____
Contact Dept _____
Telephone _____ Fax _____
Email _____

Crossed cheques should be made payable to **WebCorr Corrosion Consulting Services** and mailed together with the registration form to:

WebCorr Corrosion Consulting Services

Toa Payoh Central, PO Box 225,
Singapore 913108

Tel: (65) 64916456 Mobile: (65) 97110759

Fax: (65) 64916456

Email: webcorr@corrosionclinic.com

<http://www.corrosionclinic.com>

Course Details

Date: TBA
Time: 9:00 am to 5:00 pm
Venue: PUB WaterHub
Course Fee: S\$1495 (GST not applicable)
Closing Date: 2 weeks before course date
Discount:
Group: (3 or more people): 10%
Early-bird: N% **if paid** "N" months before the course commencing date

Withdrawal/Refund Policy:

Withdrawal or replacement should be conveyed to the organizer in writing (email or fax). An administration charge of 50% of the course fee will be levied if the withdrawal notice is received less than 7 working days before the course commencing date. No refund will be made for withdrawal notice received 3 working days and less.

Certificates:

Certificate of attendance will be given to participants with at least 75% attendance of the course.

Cancellation:

WebCorr reserves the right to cancel the course and fully refund the participants should unforeseen circumstances necessitate it.

Marine Corrosion: Causes and Prevention

(14 PDUs)

Conducted by

Dr. Qiu Jianhai *BEng PhD CEng MIM FICorr
NACE Certified Corrosion Specialist*

Date
TBA

Venue
**PUB WaterHub
80 Toh Guan Road East
Singapore 608575**

Organized by:



Course Overview:

This corrosion course aims to provide the participants with a thorough understanding of the causes of corrosion in the marine environments and the technical know-how of corrosion prevention. Upon completion of the course the participants will be able to identify different forms of corrosion, analyze the root causes of common corrosion failures, select appropriate materials for applications in the marine environments, specify and apply proper protection methods against marine corrosion. This corrosion short course can be taken as in-house training course, online course and distance learning course worldwide. It can also be customized to meet the specific needs of your organization. This course is accredited by Professional Engineers Board (Singapore) and carries 14 PDUs.

Course Contents

1. Corrosion and the Marine Environment
 - 1.1 Classification of Corrosion and the Marine Environments
 - 1.2 Corrosion: its economic, social, environmental and political Impacts
2. Marine Corrosion: Terminology & Convention
 - 2.1 Effect of moisture and oxygen
 - 2.2 pH and potential-pH
 - 2.3 Effect of chloride
 - 2.4 Conductivity, anode, cathode, galvanic cell, corrosion cells, aeration, passivity, etc.
3. Why Do Metals Corrode
 - 3.1 Thermodynamic aspects of corrosion
 - 3.2 The effect of environment
 - 3.3 The driving force of corrosion
4. How corrosion occurs in the marine environments
 - 4.1 The reaction of a metal with electrolyte
 - 4.2 The electrochemical nature of corrosion
 - 4.2.1 the reaction of a metal with its environment
 - 4.2.2 the mixed potential theory
 - 4.2.3 polarization and corrosion rate
 - 4.2.4 passivation and its breakdown
 - 4.3 The characteristics of marine environments
 - 4.3.1 corrosivity of seawater

- 4.3.2 corrosivity of marine atmospheres
 - 4.4 Factors affecting marine corrosion
 - 4.4.1 salinity and chlorinity
 - 4.4.2 temperature, dissolved gases, velocity, pH, pollutants, biological organisms
 - 4.4.3 relative humidity, airborne contaminants etc.
 - 4.5 Common forms of marine corrosion
 - 4.5.1 uniform corrosion
 - 4.5.2 galvanic corrosion
 - 4.5.3 dealloying
 - 4.5.4 crevice corrosion
 - 4.5.5 pitting corrosion
 - 4.5.6 intergranular corrosion and weld decay
 - 4.5.7 exfoliation
 - 4.5.8 stress corrosion cracking
 - 4.5.9 hydrogen related damages
 - 4.5.10 erosion corrosion and cavitation damage
 - 4.5.11 Microbiologically Influenced Corrosion
 - 4.5.12 stray current corrosion
 - 4.5.13 biofouling
 - 4.6 Corrosion resistance of steels and alloys in the marine environments
5. How to control and prevent corrosion
 - 5.1 Materials selection for corrosion prevention
 - 5.2 Design against corrosion
 - 5.3 Theory and practice of cathodic protection
 - 5.4 Theory and practice of corrosion inhibitors
 - 5.5 Theory and practice of metallic coatings
 - 5.5.1 thermal spray, metallization
 - 5.5.2 hot-dip galvanizing
 - 5.5.3 conversion coatings (anodizing, chromating and phosphating)
 - 5.5.4 electroplating, electroless plating, immersion plating.
 - 5.6 Theory and practice of organic coatings
 - 5.6.1 composition and characteristics of paints
 - 5.6.2 types of paints
 - 5.6.3 protective coatings for marine applications
 - 5.6.4 common paint failures
 - 5.6.5 environment-friendly anti-fouling paints ("green" coatings)
 - 5.6.6 coatings and cathodic protection for marine structures

6. Corrosion Testing and Monitoring

Who Should Attend

This course has been structured in such a way that it is particularly suited for the technologists, engineers, technical service and maintenance personnel who are concerned with corrosion in the marine environments (seawater, marine atmospheres, and marine soil) and wish to gain an overall knowledge of corrosion and corrosion control. It is also suited for persons without previous training or experience, who wish to begin a career in this field.

Course Lecturer

Dr. Qiu Jianhai *BEng PhD CEng MIM FICorr*

Dr Qiu obtained his BEng and PhD degrees both in the field of corrosion. He has 27 years of industry, university teaching, research and consulting experience in areas of corrosion and its prevention. He has been working closely with both local and overseas companies and has been an active consultant to governmental agencies, multinational companies and private organizations on corrosion and materials related issues such as corrosion design review, materials selection and life prediction, corrosion inspection and condition assessment, plant process optimization, corrosion training, corrosion testing and monitoring, trouble-shooting and corrosion failure analysis. Dr Qiu has recently completed the design of a cathodic protection system for the upcoming Marina Coastal Expressway (MCE) Tunnels. Dr. Qiu is also experienced in providing expert witness and assistance in litigation and arbitration matters related to corrosion and materials. He has authored over 120 technical papers and reports. Dr. Qiu was an invited contributing author to the latest edition of the world renowned ASM Handbook Vol.13C Corrosion: Environments and Industries. His biographical profile was included in the 7th edition of Marquis Who's Who in Science and Engineering. Dr. Qiu is a NACE certified Corrosion Specialist (USA), a Chartered Engineer registered with the Engineering Council (UK), a Fellow of the Institute of Corrosion (UK) and a professional member of the Institute of Materials, Minerals and Mining (UK). Dr. Qiu is the Singapore representative in the International Corrosion Council (ICC).