

## Corrosion Testing & Monitoring

### Registration Form

Photocopies of this form may be used for registrations.  
You can also register online at [www.corrosionclinic.com](http://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](mailto:webcorr@corrosionclinic.com)  
<http://www.corrosionclinic.com>

## Course Details

**Date:** 29-30 July 2009  
**Time:** 9:00 am to 5:00 pm  
**Venue:** PUB WaterHub  
**Course Fee:** S\$1095  
**Closing Date:** 4 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.

## Corrosion Testing & Monitoring: Techniques and Applications

*Conducted by*

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

*Date*

**29-30 July 2009**

*Venue*

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

*Organized by:*



## Course Overview:

The enormous cost of corrosion to industry can be significantly reduced through effective corrosion testing and monitoring. This corrosion short course aims to present to the technologists and engineers a dozen of corrosion testing and monitoring techniques that can be used to solve many of their most tedious and persistent corrosion problems. This corrosion course will provide the participants with a thorough understanding of the basic principles and the practical applications of some simple yet powerful techniques in corrosion testing and monitoring. For each technique, a step by step guide for performing the corrosion measurements will be described. This 2-day course (3-days with lab) provides an excellent avenue for corrosion practitioners, researchers, designers, technical managers, inspection and maintenance engineers, quality control personnel and those involved in failure analysis to update their appreciation of modern techniques for corrosion testing and monitoring.

## Course Contents

This corrosion short course covers a wide range of testing and monitoring techniques from conventional weight loss coupons, ER and LPR to advanced electrochemical impedance spectroscopy (EIS) for routine applications such as rapid screening of corrosion inhibitors, materials selection, failure analysis, corrosion rate measurement, life prediction, evaluation of paints, coatings, electroplating, on-line monitoring of industrial processes, determination of resistance to pitting and crevice corrosion, and the degree of sensitization of stainless steels and alloys.

### 1. Basics of Corrosion Measurements

- 1.1 corrosion and society
- 1.2 the need for corrosion testing and monitoring
- 1.3 terminology and conventions
- 1.4 the nature of corrosion process
- 1.5 classification of corrosion test
- 1.6 electrochemistry and corrosion

### 2. Corrosion Testing and Monitoring Techniques

- 2.1 technique No.1: weight loss coupon
- 2.2 technique No.2: electrical resistance (ER)
- 2.3 technique No.3: linear polarization resistance (LPR)
- 2.4 technique No.4: Tafel polarisation
- 2.5 technique No.5: potentiodynamic anodic polarisation
- 2.6 technique No.6: potentiostatic polarisation
- 2.7 technique No.7: cyclic polarisation for pitting corrosion test
- 2.8 technique No.8: Electrochemical potentiokinetic reactivation (EPR) for sensitisation test
- 2.9 technique No.9: ZRA for galvanic corrosion of welded structures/components
- 2.10 technique No.10: electrochemical impedance spectroscopy (EIS)
- 2.11 technique No.11: electrochemical noise
- 2.12 technique No.12: hydrogen monitoring

### 3. On-Line Corrosion Monitoring

- 3.1 why use on-line corrosion monitoring
- 3.2 direct methods of on-line corrosion monitoring
- 3.3 on-line monitoring components & functions
- 3.4 principle on-line corrosion monitoring methods
- 3.5 where & when to use it & how much does it cost

### 4. Applications of Corrosion Testing and Monitoring Techniques

- 4.1 quality control, performance evaluation and process optimization of plating bath in electroplating and electroless plating
- 4.2 quality control, performance evaluation and process optimization in chromating and anodizing operations
- 4.3 impedance and admittance measurements on anodized aluminum/magnesium alloys
- 4.4 performance evaluation, equivalent circuit modeling and life-prediction of organic coatings
- 4.5 determining the effect of surface preparation, optimal thickness, edge effect, delamination

## Who Should Attend

This course has been structured in such a way that it is particularly suited for the technologists and engineers who are interested in applications of the state of the art technology in corrosion monitoring and testing to solving their most tedious and persistent corrosion problems. It is also suited for technical personnel whose work involves any of the following: materials evaluation, failure analysis, quality assurance, process control and maintenance.

## Course Lecturer

**Dr. Qiu Jianhai** *BEng PhD CEng MIM FICorr*

Dr Qiu has 25 years industrial, teaching, research and consulting experience in the field of corrosion. 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 condition assessment, process optimization, quality control, corrosion testing and monitoring, life predictions, trouble-shooting and corrosion failure analysis. Dr. Qiu is also experienced in providing expert witness and assistance in litigation and arbitration matters related to corrosion and materials. He has authored about 120 technical papers and reports. Dr. Qiu was an invited contributing author to the latest edition of 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) and a Fellow Member of the Institute of Corrosion (UK). He is a Chartered Engineer registered with the Engineering Council (UK), a professional member of the Institute of Materials, Minerals and Mining (UK), and a member of ASM International (USA). He is the Vice Chairman of the Corrosion Association of Singapore, and the Singapore representative in the International Corrosion Council (ICC).