

Educational Upgrading Opportunity from ASM Edmonton Chapter

Failure Analysis

An introduction to failure analysis designed for those people who have training in materials engineering or equivalent, but want to learn how to use this knowledge to do failure analysis. Detailed course objectives and registration details are on the next page.

Begins Jan. 12, 2012- Limited to 25 students

Who Should Take the Course

- Materials engineers and technologists who are new to failure analysis or for those who want an update
- Those interested in understanding how knowledge of failure analysis can lead to better productivity
- People involved in failure analysis, who want to take it to the next level.

Course Instructors.

The course instructors are prominent failure analysts from the Edmonton materials community. The most senior instructor is Dr. Ted Hamre from Acuren and he is joined from Acuren by Dr. Kioumars Poorhaydari. Rory Belanger and Derrick Sarafinchan from Ludwig and Associates will co-teach the lecture ductile and brittle failures. Dr. Chinnia Subramanian from Black Cat Blades is covering wear failures and the lecture on corrosion failures is co-taught by Ray Goodfellow and Glenn Roemer from IrisNDT. The lecturers will illustrate the lessons with their own examples.

Venue and Dates.

The program will run for 14 weeks on Mondays from 6 to 9 PM beginning Jan. 16, 2012 and running to Apr. 16. The course material has 7 lessons, so there will be one lesson about every two weeks. The lessons have been developed by ASM International and their average length is about 80 pages so it will take two weeks for the participants to read the lesson in preparation for the next lecture.

We are able to take advantage of our public library system that offers free parking and well-equipped program rooms for a reasonable fee for not-for-profit groups like ASM. The venue will likely be the Idylwyld, Jasper Place and Woodcroft branches depending on availability.

Costs and Benefits.

The program fee for this course will be \$800 for ASM members and \$900 for non-members - including the course notes from ASM International and professional membership in ASM International if you are not already a member (a US\$113 value). If you took this course at ASM headquarters in their 5 day format it would cost over \$2,000 plus travel and lodging.

If you or your staff want to upgrade your knowledge through continuing education we encourage you to enroll now. It will be at least two years before we will be able to repeat this course. Successful completion of the course will include an internationally recognized completion certificate. The course includes bi-weekly testing, which will help you master the materials and to keep you on track in your learning.

Practical familiarity with metallurgical principles, basic mechanics of materials and metallography are prerequisites to the course.

What You'll Learn

- What failure analysis can mean in terms of profitability - and liability
- General procedures, techniques and precautions in failure analysis
- How to identify design-related failures
- Analysis of the factors that cause failure
- What environmental sources are responsible for failures and ways to prevent them
- How stress systems relate to fracture of ductile and brittle materials
- How to recognize typical fatigue characteristics
- How to grasp the many inter-related factors involved in examining a fracture
- The basic fracture modes and their characteristics and factors affecting ductile-brittle relationships
- Typical fatigue characteristics and learn how to identify them
- How to "read" fatigue fractures
- How to separate material (chemistry, microstructure) causes for failure from non-materials causes

Course Outline

1. General Procedures for Failure Analysis: collection of data and samples; preliminary examination; non-destructive inspection; mechanical testing; selection and preservation of fracture surfaces; macroscopic and microscopic examination; selection; preparation and examination of metallographic sections; fracture classification; report writing
2. Types of Failure and Stress: (fracture, wear, corrosion, and distortion failures; tensile, compressive, torsional and shear stresses; residual stress
3. Ductile and Brittle Fractures: definitions and comparisons; dimple rupture; tearing and shearing; plastic deformation ductile-brittle transition; cleavage; intergranular fracture; thermally-induced and environmentally-assisted embrittlement; effect of fabrication and heat treatment; residual stress
4. Fatigue Failures: factors affecting fatigue life; stages of fatigue fracture; fatigue cracking; effects of variables; mean stress; stress concentration; metal characteristics; manufacturing process; elevated temperatures; contact fatigue
5. Wear Failures: abrasive wear; adhesive wear; role of friction; lubricated wear; lubricant failures; nonlubricated wear; examination of worn parts; effect of microstructure and hardness; surface-fatigue pitting; wear rates
6. Corrosion Failures: electro-chemical reactions; types of corrosion; velocity-affected corrosion; bacterial and bio-fouling corrosion; underground corrosion; atmospheric corrosion; corrective and preventative measures; stress corrosion cracking; analysis of failure
7. Elevated-Temperature Failures: creep; stress rupture; thermal fatigue; effect of atmospheric environment; failures in industrial application; testing techniques

If you complete the tests for this course you will receive a certificate for 3.0 CEU's (Continuing Education Units), part of ASM's system of courses to allow members to upgrade their qualifications. These are recognized by APEGGA.

To register for the course or for more information contact the course coordinator Reg Eadie by phone at 780 492 2858 (days) or by e-mail at reg.eadie@ualberta.ca. Make cheques payable to ASM Edmonton and send to: Dr. R.L. Eadie, Dept. Chemical and Materials Engineering, ECERF 7-002 University of Alberta, Edmonton AB, T6G 2V4 A postdated cheque (Jan. 1) made out to ASM Edmonton for \$99 will reserve your place.