Materials Selection and Failure Analysis

22nd / 23rd May 2017 at Hotel Towers Rotana, Dubai.

Meet Your Expert Coach:
Dr. Eng. Mohamed Fathi Elfeki

Introduction:
Failure analysis is the process of collecting and analyzing data to determine the cause of a failure, often with the goal of determining corrective action or liability. It is an important discipline in many branches of manufacturing industry, such as the electronics industry, where it is a vital tool used in the development of new products and for the improvement of existing products. The failure analysis process relies on collecting failed components for subsequent examination of cause or causes of failure using a wide array of methods, especially microscopy and spectroscopy. Nondestructive (NDT) methods are valuable because the failed products are unaffected by analysis, so inspection sometimes starts using these methods.

Course Overview:
- Profit from failure analysis techniques.
- Understand general failure analysis procedures.
- Learn fundamental sources of failures.

This course is designed to bridge the gap between theory and practice of failure analysis. It presents a very practical approach to failure analysis for the non-metallurgist as well as for those who are new to the field or those who want an update. It is also designed for technicians and those interested in understanding how knowledge of failure analysis can lead to better productivity.
Materials Selection and Failure Analysis

What Will You Miss:

- Learn what failure analysis can mean in terms of profitability - and liability.
- Understand general procedures, techniques and precautions in failure analysis.
- Learn how to identify design-related failures.
- Be able to analyze the factors that cause failure.
- Understand what environmental sources are responsible for failures and ways to prevent them.
- Learn how stress systems relate to fracture of ductile and brittle materials.

Who should attend?

- People who are new to failure analysis or for those who want an update.
- Technicians.
- Those interested in understanding how knowledge of failure analysis can lead to better productivity.
- Technical management.
- Planning.
- Operation and production.
- Mechanical engineers.
- Plant heads.

From the following industries:

- Generation-Transmission & Distribution.
- Cement.
- Fertilizers.
- Petrochemicals and Refineries.
- Electronics, Electricals and Semiconductors.
- Bottling and Packaging.
- Steel and Aluminum.
- Medical Equipments.
- Original Equipment Manufacturers (OEM).
- Precision Manufacturing.
- Pharmaceuticals.
- Heavy Manufacturing.
- Glass.
- Paper and Pulp.
- Oil & Gas.
- Chemical.
- Construction.
- Manufacturing.
- Sugar.
- Power Energy.

Course Outline:

- **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.

- **Types of Failure and Stress**: (Fracture, wear, corrosion, and distortion failures; tensile, compressive, torsion and shear stresses; residual stress.

- **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.

- **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.

- **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.

- **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.

- **Elevated-Temperature Failures**: Creep; stress rupture; thermal fatigue; effect of atmospheric environment; failures in industrial application; testing techniques.

- **Case studies**.
Meet Your Expert Coach:
Dr. Eng. Mohamed Fathi ElFeki

EDUCATION:
✓ PhD degree, Metallurgical field.
✓ Diploma in NDT Quality Management and ISO 9000 standards.
✓ Sr. Consultant of tests and Corrosion Protection.
✓ International Arbitration.
✓ Member of the International Arbitration Organization, (19605/Egypt).

PROFESSIONAL EXPERIENCE:
Dr. Elfeki is a Director of the Mechanical lab and X-ray industry, a laboratories assessor and Consultant of Tests and Corrosion Protection at Sakr Factory, Arab Organization for industrialization. Heat treatment of ferrous & non-ferrous, testing of metals (Destructive and Non-Destructive testing), Electroplating, Corrosion protection, Welding and welders’ evaluation, manage on-site control including non-destructive testing, thermal & thermo-mechanical treatment of all alloys and failure analysis.

Complete analysis of failed material, weld examination, technical assessor. He is also a ISO/IEC/ Guide25.Trainer, OJT and instructor of courses in Syria, ALFURAT PETROLEUM COMPANY (AFPT), consultant for Equa Egypt, Bonatti Company, (Italy), Libya branch and Lokma group (pipes division), Cairo, Egypt, Ministry of Electricity, Inter Cairo for all industry, Corrosion (causes & prevention) Emirates, Kuwait, Oman (ORPIC) and managing the courses of Materials Departments in Sudan University.

Consultant for Engico office for engineering consultancy and Pioneer Company for maintenance and technical services, INTEC and egyptrol. Member of the Egyptian engineering syndicates as a consultant engineer in the field of “TESTS AND CORROSION PROTECTION OF MATERIALS”.

CURRENT ACTIVITIES:
Dr.Elfeki is working as a professor in Ain Shams University and Helwan University and teaching the following courses: Testing of materials (Destructive and Non-Destructive), engineering drawing and heat treatment of ferrous and non-ferrous & corrosion protection, production engineering and welding technology. He has published over 20 papers in the field of materials.

Would You Like to Run This Course In-House?

Customised Training Solutions is the in-house training division of IBC

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Email: ronitkapur@ibcinfo.org / inhouse@ibcinfo.com
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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.

Types of Failure and Stress:
- Fracture, wear, corrosion and distortion failures.
- Tensile, compressive, Torsion and shear stresses.
- Residual stress.

BENEFITS:
Understanding the steps required to start failure analysis process and different types of stresses.

ACTIVITY:
Discussing the different mechanical stresses that lead to failure.

AFTERNOON

Ductile and Brittle Fractures:
- Definitions and comparisons.
- Dimple rupture.
- Tearing and shearing.
- Plastic deformation ductile-brittle transition. a Cleavage
- Inter-granular fracture.
- Thermally-induced and environmentally-assisted embrittlement.
- Effect of fabrication and heat treatment.
- Residual stress.

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.

BENEFITS:
Recognize the different shapes of fractures.

ACTIVITY:
Discussing the effect of each stress on fracture surfaces.

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Wear Failures:
- Abrasive wear.
- Adhesive wear.
- Role of friction.
- Lubricated wear.
- Lubricant failures.
- Non-lubricated wear.
- Examination of worn parts.
- Effect of micro-structure and hardness.
- Surface-fatigue pitting; wear rates.

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.

BENEFITS:
Understanding fracture due to wear and the fracture due to the different forms of corrosion.

ACTIVITY:
Discussing the effect of the lubricants and the environment on the failure of components and mechanical parts.

AFTERNOON

Elevated-Temperature Failures:
- Creep.
- Stress rupture.
- Thermal fatigue.
- Effect of atmospheric environment.
- Failures in industrial application.
- Testing techniques.

Case studies.

BENEFITS:
Showing the effect of high temperature on failure in industrial application due to creep.

ACTIVITY:
General discussion about the steps of failure analysis and how reporting any case of failure relating to case studies in the program.
Yes! Please register the following delegates for

Materials Selection and Failure Analysis

(For Additional delegates please photocopy this form)

**PERSONAL DETAILS**

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- For cancellations received in writing more than seven (7) days prior to the Workshop you will receive a 100% credit to be used at another IBC conference for up to one year from the date of issuance.
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- Please note that speakers and topics were confirmed at the time of publishing, however, circumstances beyond the control of the organizers may necessitate substitutions, alterations or cancellations of the speakers and/or topics. As such, IBC reserves the right to alter or modify the advertised speakers and/or topics if necessary.

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A confirmation letter and invoice will be sent on receipt of your registration. Payment is required within 5 working days of receipt of invoice. Please note that full payment must be received prior to the event. All payment should be in favour of “World Vision Management Consultancy” and couriered to Office No.707, 7th Floor Bank Street Bur Dubai UAE 043529341

**Payment Policy:**

Payment in full is required in advance or at the time of the registration. This Registration Fee includes luncheon, refreshment and conference/workshop materials.

**Registration Fee:**

Per Delegate
AED 3,500/-

**Four Easy Ways to Register**

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