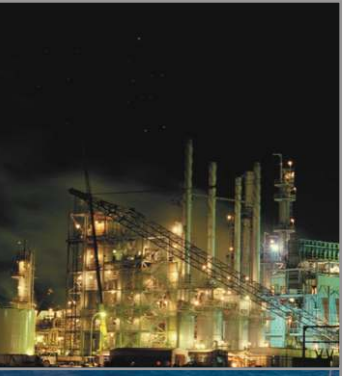
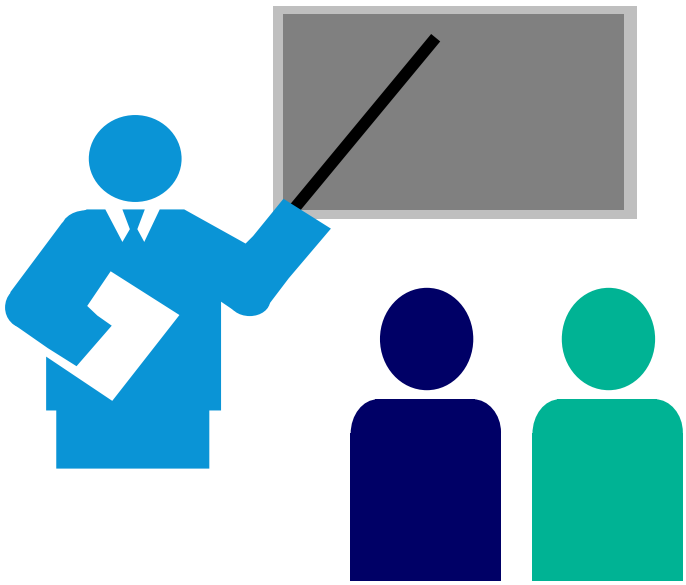





Aptech Engineering Services, Inc.

Directory of Seminars

APTECH offers customized seminars addressing a variety of topics to numerous clients. Examples of seminar outlines are presented in this directory. Using the outline as a basis for discussion, APTECH seminars are then customized to meet the specific needs of our clients.



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Seminar Outlines **Page**

For a more detailed description of any one of the APTECH seminars offered, or to schedule a seminar at your facility, please contact us at APTECH's Houston, Texas office.

Aptech Engineering Services, Inc.
16100 Cairnway Drive, Suite 310
Houston, TX 77084

Phone: 832.593.0550
Fax: 832.593.0551

E-mail: aptechtexas@aptecheng.com
Website: www.aptecheng.com

Corporate Headquarters:
601 W. California Ave.
Sunnyvale, CA 94086-4831
Phone: 408.745.7000
Fax: 408.734.0445

Corrosion

This course focuses on the fundamentals of corrosion as well as the potential problems caused by corrosion. This course provides a review of the causes of corrosion and the methods for identification, monitoring and control. An understanding of corrosion and its control is vital for any company hoping to avoid the high costs that can be directly or indirectly attributed to corrosion. This course also presents fundamental principles of corrosion and assists participants in recognizing corrosion problems, determining their causes, and understanding and selecting control methods. Emphasis is on the practical applications of corrosion technology to solve industrial corrosion problems. *Duration: 1 day.*

Introduction

Corrosion Basics

- Glossary
- Overview

Electrochemical Principles

- Fundamentals

Materials and Metallurgy

- Mechanical Properties
- Metals and Alloys
- General Characteristics of Metals
- Alloying
- Glossary

Forms of Corrosion

- General Corrosion
- Localized Corrosion
- Galvanic Corrosion
- Dealloying
- Intergranular Corrosion Cracking Phenomena
- Velocity Effects
- High Temperature Corrosion

Passivity and Passive Films on Stainless Steels

- Review of Fundamentals
- Passive Film

Corrosion by Water and Steam

- Role of Contaminants
- Types of Water
- Corrosion Materials
- Cooling Systems
- Water Treatment

Atmospheric Corrosion

- Types of Corrosion
- Change of Environment
- Design Considerations

Cathodic Protection and Protective Coatings

- How Cathodic Protection Works
- Galvanic Anodes
- Impressed Current Systems
- Introduction to Protective Coatings

Inhibitors

- Types of Inhibitors
- Aqueous Systems
- Other Considerations

Design and Failure Analysis

- Overview
- Inspection
- Failure Analysis

Metallurgy

This course presents a history of metals and the background on the origins of various metals. The course provides an explanation of physical characteristics of metals, including the reason metals behave differently than nonmetals. The course also explains how and why different metals are selected for specific environmental purposes, including resistance to wear, corrosion, heat, cold, repeated stress, and impact.

This is a lecture and problem-solving course that also deals with the metallurgical aspects of welding and will present many of the technical aspects of materials joining. Emphasis will be placed on arc welding, the fundamentals of welding technology, welding metallurgy, inspection and quality of welds, and welding codes and specifications. *Duration: 1 day.*

Metallurgy

- Review of Ferrous Metals
- Glossary

Introduction to Steel

- Classification of Steels
- Heat Treatment of Steels

Physical and Mechanical Metallurgy

- Crystal Structure
- Phase Diagrams
- Diffusion
- Phase Transformations

Review of Nonferrous Alloys and Stainless Steels

- Aluminum
- Copper
- Nickel-Based
- Stainless Steel
- Heat Treatment of Nonferrous Alloys and Stainless Steels

Welding Metallurgy

- Glossary
- Fundamentals
- Characteristics of Weld Solidification
- Weld Microstructure
- Temperature Changes in Welding
- Residual Stresses
- Welding Processes
- Heat Input
- Shrinkage and Distortion in Weldments
- Weld Defects

Nondestructive Examination

- Glossary
- Quality Control
- Standards for NDT
- Welding
- Inspection Techniques

Prevention of Failures

This course is concerned with the prevention of failures, the assessment of the state of damage in plant and equipment, and the use of failure analyses, inspection data, and operating history in predicting safe operating life or determining necessary remedial measures. Maintenance requirements, risk-based inspection procedures, and the fitness-for-service approach will be discussed along with the various mechanisms leading to damage and potential failure, mechanisms of accumulation, and predictive methods. *Duration: 1 day.*

Damage and Failure Mechanisms

- Ductile and Brittle Fracture
- Failure Mechanisms
  - ✓ How Components Fail

Failure Prevention

- Introduction
- Failures
- Inspection

Preventative and Predictive Maintenance

- Process Safety Management
- Occupational Health and Safety Administration (OSHA) OSHA 29CFR 1910.119(j)

Mechanical Integrity - What OSHA Expects

- Risk Based Inspection
- Failure Analysis
- Summary
- References

Codes and Standards

- In-Service – American Petroleum Institute (API)
  - ✓ API 510 (Pressure Vessels)
  - ✓ API 570 (Pressure Piping)
  - ✓ API 653 (Above Ground Storage Tanks)
  - ✓ API RP 579 (Fitness-for-Service)
  - ✓ API RP 580 (Risk Based Inspection)
- Construction and Repair
  - ✓ ASME Section VIII, Div. 1 (Pressure Piping)
  - ✓ ASME B31.3 (Chemical Piping)
  - ✓ ASME B31.1 (Power Piping)
  - ✓ ASME Section V (NDT)
  - ✓ ASME Section XI (In-Service Inspection - Nuclear)

Practical Applications of Fitness-for-Service

Fitness-for-service assessment is performed to make sure that process plant equipment, such as pressure vessels, piping, and tanks, operates safely and reliably. API Recommended Practice 579 provides a general procedure for assessing fitness for service. The assessment procedure evaluates the remaining strength of the equipment in its current condition, which may be degraded from its original conditions. Common degradation mechanisms include general corrosion, localized corrosion, pitting and crevice corrosion, hydrogen attack, high-temperature creep, and mechanical distortion. Methods for evaluating the strength and remaining service life of equipment containing these types of degradation are presented and reviewed. *Duration: 1 day.*

Introduction to APR RP 579, Fitness-for-Service (FFS)

- Definition of FFS
- Purpose of RP 579
- Relationship to API 510, 570, and 653
- Responsibilities
- Role of an Inspector
- The Engineer and Functional Roles

General Assessment Method

- Step 1 – Flaw and Damage Mechanism Identification
- Step 2 – Applicability and Limitations of FFS Assessment Procedure
- Step 3 – Data Requirements
- Step 4 – Assessment Techniques and Acceptance Criteria
- Step 5 – Remaining Life Evaluation
- Step 6 – Remediation
- Step 7 – In-Service Monitoring
- Step 8 – Documentation

Levels of Assessment

- Level 1
- Level 2
- Level 3

Flaw and Damage Matrix

- Brittle Fracture
- Corrosion, Erosion
  - ✓ Uniform or Local
- Pitting
  - ✓ Current Acceptance Criteria
  - ✓ Assessment as Local Metal Loss and the Conditions
- Crack-Like Flaws
- Mechanical Damage
- Fire Damage
- Creep Damage

Determination of Assessment Procedure for Corrosion

- Decision Tree for Assessment Damage Due to Corrosion
- Logic Diagram for General Metal Loss
- Logic Diagram for Local Metal Loss

Assessment of General Metal Loss

- Current Acceptance Criteria
- Level 1 – Sample Problem
- Level 2 – Sample Problem

Assessment of Local Metal Loss

- Current Acceptance Criteria
- Level 1 – Sample Problem
- Level 2 – Sample Problem

Practical Applications for Fitness-for-Service continued next page

Practical Applications of Fitness-for-Service - Continued

Assessment of Crack-Like Flaws

- Pre-Service
  - ✓ Damage Types
- In-Service
  - ✓ Damage Types
- Current Acceptance Criteria
- Limitations Imposed on Levels 1 and 2
  - ✓ Conditions
  - ✓ Loads
  - ✓ Material
- Logic Diagram for Level of Assessment
- Level 1 Problem

Assessment of Weld Misalignment

- Categories of Shell Distortion
  - ✓ General Distortion
  - ✓ Out-of-Roundness
  - ✓ Bulge
  - ✓ Dent

Risk Based Inspection

Risk Based Inspection (RBI) concerns applying risk analysis principles to manage inspection programs for plant equipment. RBI has been used in the nuclear power generation industry, refineries, and petrochemical plants. The objective of RBI is to develop a cost-effective inspection and maintenance program that provides assurance of acceptable mechanical integrity (MI) and reliability.

The American Society of Mechanical Engineers (ASME) and the American Petroleum Institute (API) are currently working on quantitative risk-based analysis procedures for use by the chemical industry. Methods for development of RBI objectives and goals, RBI Planning and Implementation (from pilot studies to full plant implementation), RBI Audits and Reviews, RBI Software and Integration with existing inspection planning tools will be presented and reviewed. *Duration: 1 to 2 days.*

Introduction and Overview

Regulations and Industry Guidelines

- Process Safety Management
- Mechanical Integrity
- Inspection Programs

Basic Risk Concepts

- Different Approaches and Methodologies

Organization Roles, Planning, and Training

- Roles and Responsibilities of the Project Team Members
- Elements that Make Up a Successful Program

Software, Documentation, Audits, and Quantity Assurance

- Understanding Equipment/Software Data Hierarchy
- Data Entry in Software

Likelihood of Failure (LOF)

- Overview of Damage Mechanisms
- Fundamentals of Corrosion
- Damage Modules

Consequences of Failure (COF)

- Explosions and Fires
- Toxic Release
- Environmental Impact
- Financial Impact

RBI Software Demonstration

- Levels
- Damage Modules
- LOF Analysis
- COF Analysis
- Risk Based Inspection Reports

Risk Management

Development of an Inspection Program

- Critical Equipment
- Scope and Frequency of Inspection
- Impact on Inspection Planning
- Turnaround Planning

Development Assessment and Deficiency Resolution

- How to Manage Inspection & Testing Records
- Managing the Records
- Correcting Equipment Deficiencies
- Requirements to Continue Operating when Deficiencies Exist

Maintaining the System (Evergreen Procedure)

- Background
- Project Control Philosophy

Compliance Issues and Perceived Benefits

- Compliance Audits
- Emergency Preparedness

Pilot Study Results

- Refining Process
- Chemical Process

Process Safety Management

Process safety management is a management system that helps personnel achieve a safe operation by defining safe operating limits and making sure that the process stays within those limits. This course addresses planning and managing a PSM program, reviewing the effectiveness of current PSM work, including the effectiveness of resource allocation, meeting regulatory requirements, particularly OSHA's 29 CFR 1910.119 and the Environmental Protection Agency's (EPA) Risk Management Program. The course also presents and reviews how to conduct an audit, the leading Process Hazards Analyses of all types (HAZOP, Checklists, FMEA, What-If, and Fault Tree Analysis). In addition, litigation support, writing operating procedures, and implementing a Management of Change program will be discussed. *Duration: 1 to 3 days.*

Principles of Process Safety Management

- Definition of Process Safety Management
- Process Safety Management Principles
- Organization of a PSM Program

Employee Participation

- OSHA Regulation

Process Safety Information

- OSHA Guidance
- Analysis of the Regulation
- Information Concerning Highly Hazardous Chemicals
- Information Concerning Technology
- Equipment and Engineering Information

Process Hazards Analysis

- Organization of a PHA
- Steps of PHA
- Hazard Identification Methods

Operating Procedures

- Elements of Operating Procedures
- Five Volume Structure
- Standard Operating Procedures

Training

- Implementing a Training Program

Contractors

- Definition of a Contractor
- Recordkeeping

Pre-Startup Safety Review

- Linkage of PSSR with Other Elements
- PSSR Checklist

Mechanical Integrity

- Managing Mechanical Integrity
- Mechanical Engineering
- Pressure Vessels
- Storage Tanks
- Piping and Valves
- Vent and Relief
- Safety Instrumentation

Hot Work

- Types of Energy Control Procedure
- Energy Control Procedures
- Levels of Isolation for Valves
- Confined Space Entry

Management of Change

- Types of Change
- Forms of Change
- Implementation
- Documentation

Incident Investigation

- Performing an Incident Investigation

Emergency Planning and Response

- Levels of Emergency

Process Safety Management continued next page

Compliance Audits

- The Basics of Auditing
- The Audit Staff
- Plan the Audit
- Conduct the Audit
- The Audit Report

Trade Secrets

Implementation

- Step 1 – Determine Regulatory and Industry Requirements
- Step 2 – Conduct a Regulatory Audit
- Step 3 – Develop the Goals
- Step 4 – Develop a Plan
- Step 5 – Implement the Plan
- Step 6 – Audit Progress
- Step 7 – Start the Next Cycle

Hazard Analysis

The purpose of hazard analysis is to gather data on the locations, quantities, chemical and physical properties, and the health hazards of the chemicals that are most likely to be released in a community. This course will provide an overview of hazard analysis, how a team is formed to perform a hazard analysis, and how to plan a hazard analysis study. *Duration: 4 hours.*

Introduction
- Glossary
- Overview

Role of Hazard Identification in the Management of Safety
- Hazard Materials Management
- Identification of Chemicals

Overview of Hazard Analysis
- Regulatory Concerns
- Risk

Study Initiator's Role in Hazard Analysis
- Individual or Group Roles
- Responsibilities

Team Selection and Roles of Team Members
- Team Selection
- Roles
- Duties and Responsibilities

Use of Guide Words
- Overview
- Glossary
- Data Analysis

Planning a Hazard Analysis Study
- Input from Resources
- Drawings
- Process Flow Diagrams
- Procedures

Recording, Signing-Off, and Follow-Up Work
- Responsibilities
- Recordkeeping

Hazard Identification Throughout Life of a System
- Evergreen
- Documentation

Dealing with Particular Difficulties
- Management of Change
- Organization

Developing Mechanical Integrity Programs

This course presents a method for developing a mechanical integrity (MI) program that addresses the OSHA process safety management (PSM) Regulation 29 CFR 1910.119 and the EPA's Risk Management Program (RMP) Rule 40 CFR 68. The course will review the latest MI strategies and technologies, and how to effectively address MI in a comprehensive and efficient manner. Using lectures, and review sessions, students will learn how to develop, implement, and maintain an efficient program for ensuring MI. *Duration: 1 day.*

About Mechanical Integrity

- Lesson Objectives and Introduction
- The Mechanical Integrity Concept
- OSHA Requirements for Mechanical Integrity
- Part 1910 - Occupational Safety and Health Administration Standards

Identifying and Listing Equipment

- Regulated Process Equipment
- Regulated Non-Proess Equipment
- Non-Regulated Non-Process Equipment
- Identifying and Tagging Equipment
- Integrity Information and Methods of Documenting

Written Procedures for Mechanical Integrity

- About Mechanical Integrity Program Procedures
- How to Obtain Procedure Information
- Implementing Mechanical Integrity Program Procedures

Training

- Required Training for Mechanical Integrity
- How to Conduct MI Training
- Training Records Required

Conducting an Inspection and Testing Program

- Inspection and Testing
- How to Implement Inspections and Tests
- Standard Record Form for Inspection and Testing
- How to Manage Inspection and Testing Records
- Procedures

Correcting Equipment Deficiencies

- Taking Action for Equipment Deficiencies
- Requirements to Continue Operation when Deficiencies Exist

Establishing Quality Assurance for New and Modified Equipment

- Quality Assurance for New or Modified Equipment
- Recording Inspection and Testing Information for Quality Assurance
- Implementing Inspection and Testing for Quality Assurance
- Managing Quality Assurance Records

Controlling Materials, Equipment, and Supplies for Maintenance

- Ensuring the Manufacturer Supplies Quality Replacement Parts and Materials
- Ensuring Quality During the Movement and Storage of Replacement Parts and Materials
- Role of the Craftsperson for Quality Assurance of Materials and Equipment

Pipeline Integrity and Direct Assessments

This course will introduce and cover methods for inspection, evaluation, repair and rehabilitation of onshore pipelines in accordance with industry-accepted regulations, standards and recommended practices. This course is designed for pipeline personnel from operations, maintenance, and project management, as well as contractors and integrity service providers. *Duration: 1 day.*

Pipeline Integrity

- Philosophy
- Rehabilitation
- Uprating
- Risk Assessment
- Maintenance
- Life Extension
- Evaluation

Inline Inspection

- Inspection Tools
- Geometry
- Corrosion
- Crack Detection
- Mapping
- Analysis and Reporting

Assessment

- Cleaning
- Repair/Replacement

Pipeline Inspection

- Standards to be Considered
- ANSI B31-G
- RSTRENG
- Data Collection
- Entering Data into Evaluation Model
- Interpreting Results

Cathodic Protection for Rehabilitation Projects

- Overview
- Applicable Engineering Calculations

Regulations

- Identifying Applicable Regulations
- Searching the Regulations

Aptech Engineering Services, Inc.
16100 Cairnway Drive, Suite 310
Houston, TX 77084

Phone: 832.593.0550
Fax: 832.593.0551

E-mail: aptechtexas@aptecheng.com
Website: www.aptecheng.com

Corporate Headquarters:
601 W. California Ave.
Sunnyvale, CA 94086-4831
Phone: 408.745.7000
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