API – 510 Pressure Vessel Inspector Preparatory Course, 2015

Duration: 5 days

INTRODUCTION:

- The course prepares the professional for the API 510 exam. The course is an intensive one-week course with a heavy emphasis on the use of the codes and mathematical calculations.
- API Authorized Pressure Vessel Inspectors must have a broad knowledge base relating to maintenance, inspection, repair, and alteration of pressure vessels. The API 510 Certification Preparation is designed to equip the professional with such information and understand the exam format.

COURSE OBJECTIVES:

The course provides participants with the knowledge necessary to:

- Successfully pass the API 510 pressure vessel inspector certification exam
- Effectively use major codes: ASME B&PV Sections V, VIII, & IX
- Perform all basic vessel calculations needed for the API exam (e.g. tmin, test pressure, MAWP, static head, MDMT, corrosion rates, remaining life, etc.)
- Use API's requirements during inspection, repairs, and alterations of pressure vessels
- Review welding procedures (WPS/PQR) and welder performance qualifications (WPQ)

WHO SHOULD ATTEND?

This course will specifically benefit Engineers, Supervisors, and Managers from the following disciplines:

- Mechanical Engineering
- Inspection
- Maintenance & Operations
- Technical & Engineering
- QAQC

and technical personnel with 2-3 years of experience in the management and planning of inspection and maintenance activities of pressure vessel system at upstream oil & gas facilities, refineries, process plants and petrochemical facilities.

DAYWISE COURSE SCHEDULE

DAY 1

Module - 1

Welcome and Introduction

Overview of API 510 Course

Module - 2

Joint Effeciencies

a) Weld Joint Categories from UW-3;

b) Type of radiography (full, spot, or none , RT-1, RT-2, etc.);
c) Joint efficiency by reading Table UW-12;
d) Joint efficiency for seamless heads and vessels Sections perUW-12 (d); and
e) Joint efficiency for welded pipe and tubing per UW-12 (e).

Module - 3
Thickness Calculations
a) The required thickness of a cylindrical shell (UG-27(c)(1));
b) The vessel part MAWP for a cylindrical shell
c) The required thickness of a head-Hemispherical, Ellipsoidal, Torispherical
d) The vessel part MAWP for a head

Module - 4
Static Head
a) Calculate static head pressure on any vessel part;
b) Calculate total pressure (MAWP + static head) on any vessel part;
c) Calculate maximum vessel MAWP given vessel parts MAWP and elevations

Module - 5
External Preasure
a) Calculate the maximum allowable external pressure;
b) Calculate whether a cylindrical shell meets Code design for external pressure.

Impact Testing
a) Determine the minimum metal temperature of a material which is exempt from impact testing (UG-20 (f), UCS-66,UCS-68(c).)

DAY 2

Module - 1
Pressure Testing
a) Calculate a test pressure compensating for temperature. (UG-99 & UG-100)
b) The precautions associated with hydrostatic and pneumatic testing,
c) Steps in a hydrotest Procedure (UG 99 and UG 100)
d) All steps in a pneumatic test procedure (UG 100 and UG 102)

Module - 2
Weld Size For Attachment Welds at Openings
a) Conversion of a fillet weld throat dimension to leg dimension , conversion factor(0.707)
b) Determine the required size of welds at openings (UW-16).

Module – 3
Nozzle Reinforcement
Key concepts of reinforcement, such as replacement of strength and limits of reinforcement
Credit for extra metal in shell and nozzle

Calculate the required areas for reinforcement

Module - 4

1 Scope of API 510

1.1 General Application

1.2 Specific Applications

1.3 Recognized Technical Concepts

2 references

Module - 5

3 definitions

4 owner/user inspection organization

4.1 General

4.2 Owner/user Organization Responsibilities

DAY 3

Module - 1

5 Inspection, Examination and Pressure Testing Practices

5.1 Inspection Plans

5.2 Risk-based Inspection

5.3 Preparation For Inspection

5.4 Inspection For Types Of Damage Modes Of Deterioration And Failure

Module – 2

5.5 General Types Of Inspection And Surveillance

5.6 Condition Monitoring Locations

5.7 Condition Monitoring Methods

Module - 3

5.8 Pressure Testing

5.9 Material Verification And Traceability

5.10 Inspection Of In-service Welds And Joints

5.11 Inspection Of Flanged Joints

Module - 4

6 interval/frequency and extent of inspection

6.1 General

6.2 Inspection During Installation And Service Changes

6.3 Risk-based Inspection

6.4 External Inspection

6.5 Internal And On-stream Inspection

6.6 Pressure-relieving Devices

Module - 5

7 inspection data evaluation, analysis, and recording

7.1 Corrosion Rate Determination

7.2 Remaining Life Calculations

7.3 Maximum Allowable Working Pressure Determination

Module - 6

7.4 Fitness For Service Analysis Of Corroded Regions

7.5 API RP 579 Fitness For Service Evaluations

7.6 Required Thickness Determination

7.7 Evaluation Of Existing Equipment With Minimal Documentation

7.8 Reports And Records

DAY 4

Module - 1

8 repairs, alterations, and rerating of pressure vessels .

8.1 Repairs And Alterations

Authorization

Approval

Materials Requirements

Welding Requirements

Module - 2

Heat Treating Requirements

Preheating

Post weld Heat Treating

Local Postweld Heat treatment

Repairs to Stainless Steel Weld Overlay and Cladding

Rerating

Module - 3

Introduction to ASME Sec. IX

Welding Procedure tests

Performance qualification tests

Acceptance criteria

Welding positions

P-No, F-No and A-No.

Review of:

a) Welding Procedure Specification (WPS); and

b) Procedure Qualification Record (PQR)

And determine:

a) Whether number and type of mechanical test listed on PQR are appropriate
b) Whether the results of the tests are acceptable
c) Whether all required essential and non-essential variables have been properly addressed.

DAY 5

Module - 1
API RP 576, Inspection of Pressure-Relieving Devices
1. Relief Devices
a) Description of Types -- (API RP-576, Section 2)
b) Causes of Improper Performance (API RP-576, Section 4)
c) Reasons for Inspection and Frequency Determination (API RP 576, Sections 3 & 5)
d) Inspection and Test Service Procedures (API RP-576, Sections 6 and 7)

Module - 2
A. Article 1, General Requirements:
B. Article 2, Radiographic Examination

Module - 3
C. Article 6, Liquid Penetrant Examination,
D. Article 7, Magnetic Particle Examination (Yoke and Prod techniques only):
E. Article 23, Ultrasonic Standards, Section SE–797

Module - 4
API RP 576, Inspection of Pressure-Relieving Devices
1. Relief Devices
a) Description of Types -- (API RP-576, Section 2)
b) Causes of Improper Performance (API RP-576, Section 4)
c) Reasons for Inspection and Frequency Determination (API RP 576, Sections 3 & 5)
d) Inspection and Test Service Procedures (API RP-576, Sections 6 and 7)

Module - 5

Discussion