COURSE OVERVIEW FE0110-4D

Fitness-for-Service, Remaining Life Assessment & Repair of Pressure Equipment & Piping

(API-579/ASME FFS-1 & PCC-2 Standards)

Course Title

Fitness-for-Service, Remaining Life Assessment & Repair of Pressure Equipment & Piping *(API-579/ASME FFS-1 & PCC-2 Standards)*

Course Date/Venue

August 05-08, 2024/Online Virtual Training

Course Reference

FE0110-4D

Course Duration/Credits

Four days/1.6 CEUs/16 PDHs

Course Description

This practical and highly-interactive course includes various practical sessions and exercises. Theory learnt will be applied using our state-of-the-art simulators.

The latest ASME Post-Construction Code is an extension of the current API standards for Risk-Based-Inspection (API 580, API 581), Fitness-For-Service assessment (API 579), Damage Mechanisms (API 571) and repairs. They are a practical and important addition to the ASME design and construction codes, their objective is to prevent failures by timely detection and analysis of degraded conditions, and application of the right repair technique.

In this highly practical course, participants will learn how to (1) plan inspections, (2) evaluate inspection results and calculate the remaining life of corroded and degraded equipment, and (3) select and implement the right repair by applying the new ASME Post-Construction Codes (PCC).

The course will follow the same outline as the ASME PCC Codes, making the course notes a practical and handy reference to illustrate and explain the various requirements of the new ASME PCC codes.

Further, the course will review the recommended practices of API 579 and API 571 and how they can be applied on Fitness-for-Service and damage mechanisms affecting process plant equipment.

The course covers general engineering assessment, damage mechanisms, and specific assessment procedures that include the fitness-for-service of equipment and materials of construction used in refining, petrochemical, and chemical industries. It also covers brittle fracture applications for low temperature refinery and petrochemical services, assessment of corrosion damage, assessment of blisters/laminations, and assessment of crack-like flaws, assessment of fire damage, and the Run-Repair-Replace decision-making process.

The participants will not only be able to apply the rules to calculate the remaining life of corroded and degraded equipment, and make run-or-repair decisions, but will also understand the historical and technical basis of the rules.

The course is illustrated through a large number of case studies and does involve some calculations (with a hand-held calculator) to calculate failure margins and remaining life.

Course Objectives

The aim of this course is to provide the participants with a complete and up-to-date overview of the area of Inspection, Planning, Fitness-For-Service, Damage Mechanisms and Repair of Vessels, Tanks, Piping and Process Equipment in accordance with ASME PCC, API 579 and API 571. Furthermore, participants will learn how to identify damage mechanisms in accordance with API RP 571, evaluate the extent of damage and carry out FFS assessment at damage locations in plant equipment service in order to estimate the remaining life and extend the life of equipment and facilities or make decisions to repair or replace. Upon the successful completion of this course, each participant will be able to:-

- Apply and gain knowledge on fitness-for-service, remaining life assessment and repair of pressure equipment and piping in accordance with API-579/ASME FFS-1 and PCC-2 standards
- Plan the inspection of vessels, tanks, piping and process equipment
- Evaluate the inspection results
- Calculate the remaining life of corroded and degraded equipment
- Select and implement the right repair technique by applying the ASME PCC-2 codes
- Apply repair of pressure equipment and piping in accordance with ASME PCC-2 standard
- Discuss the applicability and limitations of repair methods covered by ASME PCC-2 and choose the correct repair technique for given defects
- Employ cost-effective repairs and detailed repair methods and inspection techniques
- Inspect pressure vessels, rating, repair and alteration and apply remaining life calculation of pressure vessels
- Identify butt-welded insert plates in pressure components, weld overlay to repair internal thinning, welded leak box repair and full encirclement steel reinforcing sleeves for piping
- Recognize fillet welded patches, alternatives to post-weld heat treatment, in-service welding onto carbon steel pressure components or pipelines and weld build-up, weld overlay and clad restoration

- Carryout flange repair, mechanical clamp repair, inspection and repair of shell and tube heat exchangers and examination and testing
- Apply pressure and tightness testing of piping and equipment, pneumatic testing and non-destructive examination in lieu of pressure testing for repairs and alterations
- Discuss the relevance of ASME PCC-2 standard with API 510 and API 570 codes as well as implement proper documentation and records of repairs

Who Should Attend

This course provides a wide understanding and deeper appreciation of fitness-for-service, remaining life assessment and repair of pressure equipment and piping for integrity assessment engineers, operations engineers, maintenance engineers, maintenance supervisors, facility integrity supervisors, corrosion engineers, corrosion specialists, site inspection engineers, inspectors, piping engineers, mechanical engineers, plant managers, plant engineers, project engineers and engineers who are responsible for maintaining the integrity of process plant equipment and piping.

Virtual Training (If Applicable)

If this course is delivered online as a Virtual Training, the following limitations will be applicable:-

Certificates	Only soft copy certificates will be issued to participants through Haward's Portal. This includes Wallet Card Certificates if applicable
Training Materials	Only soft copy Training Materials (PDF format) will be issued to participant through the Virtual Training Platform
Training Methodology	80% of the program will be theory and 20% will be practical sessions, exercises, case studies, simulators or videos
Training Program	The training will be for 4 hours per day starting at 0930 and ending at 1330
H-STK Smart Training Kit	Not Applicable
Hands-on Practical Workshops	Not Applicable
Site Visit	Not Applicable
Simulators	Only software simulators will be used in the virtual courses. Hardware simulators are not applicable and will not be used in Virtual Training

Course Certificate(s)
Internationally recognized certificates will be issued to all participants of the course who completed a minimum of 80% of the total tuition hours.

Certificate Accreditations
Certificates are accredited by the following international accreditation organizations:-

- The International Accreditors for Continuing Education and Training (IACET - USA)

  Haward Technology is an Authorized Training Provider by the International Accreditors for Continuing Education and Training (IACET), 2201 Cooperative Way, Suite 600, Herndon, VA 20171, USA. In obtaining this authority, Haward Technology has demonstrated that it complies with the **ANSI/IACET 2018-1 Standard** which is widely recognized as the standard of good practice internationally. As a result of our Authorized Provider membership status, Haward Technology is authorized to offer IACET CEUs for its programs that qualify under the **ANSI/IACET 2018-1 Standard**.

  Haward Technology's courses meet the professional certification and continuing education requirements for participants seeking **Continuing Education Units** (CEUs) in accordance with the rules & regulations of the International Accreditors for Continuing Education & Training (IACET). IACET is an international authority that evaluates programs according to strict, research-based criteria and guidelines. The CEU is an internationally accepted uniform unit of measurement in qualified courses of continuing education.

  Haward Technology Middle East will award **1.6 CEUs** (Continuing Education Units) or **16 PDHs** (Professional Development Hours) for participants who completed the total tuition hours of this program. One CEU is equivalent to ten Professional Development Hours (PDHs) or ten contact hours of the participation in and completion of Haward Technology programs. A permanent record of a participant's involvement and awarding of CEU will be maintained by Haward Technology. Haward Technology will provide a copy of the participant's CEU and PDH Transcript of Records upon request.

- British Accreditation Council (BAC)

  Haward Technology is accredited by the **British Accreditation Council** for **Independent Further and Higher Education** as an **International Centre**. BAC is the British accrediting body responsible for setting standards within independent further and higher education sector in the UK and overseas. As a BAC-accredited international centre, Haward Technology meets all of the international higher education criteria and standards set by BAC.

Course Fee
US$ 2,250 per Delegate + **VAT**.

Course Instructor(s)

This course will be conducted by the following instructor(s). However, we have the right to change the course instructor(s) prior to the course date and inform participants accordingly:

Mr. Geoff Kaschula is a **Senior Inspection Engineer** with over **30 years** of extensive experience within the **oil**, **gas**, **petrochemical**, **process** and **power industries**. His fields of specialization cover the areas of **design**, **fabrication**, **construction**, **installation**, **commissioning**, **inspection** & **maintenance** of **process equipment** such as **boilers**, **pressure vessels**, **piping systems**, **structures** & **storage tanks**; **condition assessment** of rotating & auxiliary equipment like **compressors**, **steam turbines**, **pumps**, **heat exchangers** & **valves**; Risk Based Inspection (**RBI**), Fitness-For-Service (**FFS**); **welding** & **fabrication engineering**, **failure analysis**, flaw evaluation, remnant life determination, capacity reviews for process and power equipment, asset management and project management. He has also worked extensively with international industry standards such as **ASME**, **API**, **TEMA**, **BS/EN**, **ANSI** & **AWS** to name a few. Mr. Kaschula is currently the **Director** of **RBI-Asset Management**.

Mr. Kaschula has handled wide-ranging responsibilities and assumed various important positions over the past 30 years in his career. Prior to founding his own company, he was the **Quality Manager** of **Parsons Brinckerhoff**, a power company, where he handled **design verification** of equipment such as boilers, pressure equipment, heat exchangers & pumps in addition to the overall development of management systems in compliance with **international safety**, **quality** and **technical standards**. He also worked as the **Inspection Manager** of **Weltech** where he was in charge of all major **inspection activities** and **plant condition evaluation** of **petrochemical plants** and **power stations**. He also worked extensively as a **Project Manager** for the design, fabrication and manufacturing of pressure vessels, heat exchangers and piping in accordance with **ASME** III & VIII standards. He also served as **Technical Assessor**, **Inspection Engineer**, **Welding Engineer** and **QA/QC Engineer** for companies like Arnot & Hendrina Power Station, Projects Expedited, Airtech Davidson & the Department of Transport. As the current **Director** of **RBI-Asset Management**, he oversees the overall operations of the company in providing technical and advisory services in the field of infrastructure asset management, design review, verification, inspection and condition assessment of major refinery equipment such as pressure vessels, storage tanks and piping systems.

Mr. Kaschula is a qualified **Welding Engineer**. He is also a **certified API 510 Pressure Vessel Inspector**, **certified API 570 Piping Inspector**, **certified API 580 Risk Based Inspector**, a **Registered Inspector** & **Competent Person** for Boilers, Pressure Vessels & Pressure Equipment as well as a **Registered International Professional Welding Technologist** by the International Institute of Welding (**IIW**) and a **Certified Instructor/Trainer**.

Training Methodology

All our Courses are including **Hands-on Practical Sessions** using equipment, State-of-the-Art Simulators, Drawings, Case Studies, Videos and Exercises. The courses include the following training methodologies as a percentage of the total tuition hours:-

30% Lectures
20% Practical Workshops & Work Presentations
30% Hands-on Practical Exercises & Case Studies
20% Simulators (Hardware & Software) & Videos

In an unlikely event, the course instructor may modify the above training methodology before or during the course for technical reasons.

Course Program

The following program is planned for this course. However, the course instructor(s) may modify this program before or during the course for technical reasons with no prior notice to participants. Nevertheless, the course objectives will always be met:

Day 1: ***Monday, 05th of August 2024***

0930 – 0935	*Registration, Coffee, Welcome & Introduction*
0935 – 0945	***PRE-TEST***
0945 – 1030	***Inspection Planning*** *Practical Overview & Classification of Degradation Mechanisms ● Corrosion Rates & Prediction of Future Damage • Inspection Techniques: Classic Methods & Sate-of-the-Art ● Risk-Based-Inspections (RBI)*
1030 - 1035	*Break*
1035 -1130	***Inspection Planning (cont'd)*** *Risk-Based-Inspections (RBI) • Inspection Planning ● Examples of RBI Programs*
1130 – 1230	***API-579: Fitness-for-Service & Remaining Life*** *Introduction to FFS Across Industries ● Failure Modes: Leaks & Breaks • Safety Margins for New & Operating Equipment ● The Remaining Strength Factor (RSF) of Equipment*
1230 – 1235	*Break*
1235 – 1325	***API-579: Fitness-for-Service & Remaining Life (cont'd)*** *Brittle Fracture & Cryogenic Service ● Assessment of General Wall Thinning ● Assessment of Local Thin Areas & B31G for Pipelines ● Assessment of Pitting Corrosion*
1325 - 1330	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1330	*End of Day One*

Day 2: ***Tuesday, 06th of August 2024***

0930 – 1030	***API-579: Fitness-for-Service & Remaining Life (cont'd)*** *Assessment of Blisters & Laminations ● Assessment of Mechanical Damage & Distortions*
1030 - 1035	*Break*

1035 – 1130	***API-579: Fitness-for-Service & Remaining Life (cont'd)*** *Assessment of Crack-Like Flaws ● Case Studies*
1130 – 1230	***API-579: Fitness-for-Service & Remaining Life (cont'd)*** *Creep Damage in Furnace & Boiler Tubes ● Assessment of Fire Damage*
1230 – 1235	*Break*
1235 – 1325	***API-579: Fitness-for-Service & Remaining Life (cont'd)*** *Assessment of Equipment in Sour Service ● Assessment of Overloads: Fatigue, Vibration, Hammer*
1325 - 1330	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1330	*End of Day Two*

Day 3: ***Wednesday, 07th of August 2024***

0930 – 1030	***ASME PCC-2: Repair of Pressure Equipment & Piping*** *Scope, Organization & Intent ● Applicability & Limitations of Repair Methods Covered by ASME PCC-2*
1030 - 1035	*Break*
1035 – 1130	***ASME PCC-2: Repair of Pressure Equipment & Piping (cont'd)*** *Choosing Correct Repair Technique for Given Defects ● Cost-effective Repairs ● Detailed Repair Methods & Inspection Techniques*
1130 – 1230	***ASME PCC-2: Repair of Pressure Equipment & Piping (cont'd)*** *Inspection of Pressure Vessels, Rating, Repair & Alteration ● Remaining Life Calculation of Pressure Vessels*
1230 – 1235	*Break*
1235 – 1325	***ASME PCC-2: Welded Repairs*** *Butt-Welded Insert Plates in Pressure Components ● Weld Overlay to Repair Internal Thinning ● Welded Leak Box Repair ● Full Encirclement Steel Reinforcing Sleeves for Piping*
1325 - 1330	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1330	*End of Day Three*

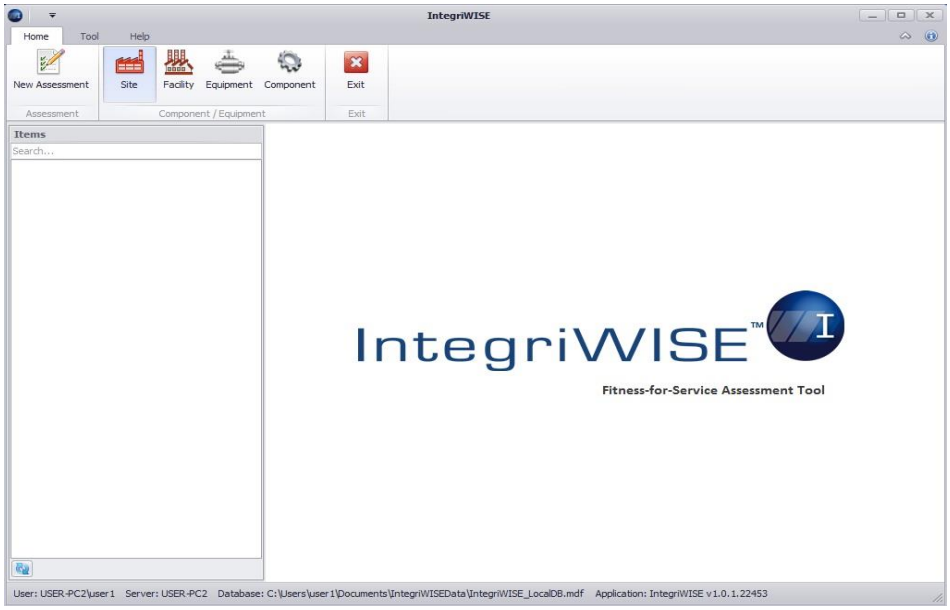
Day 4: ***Thursday, 08th of August 2024***

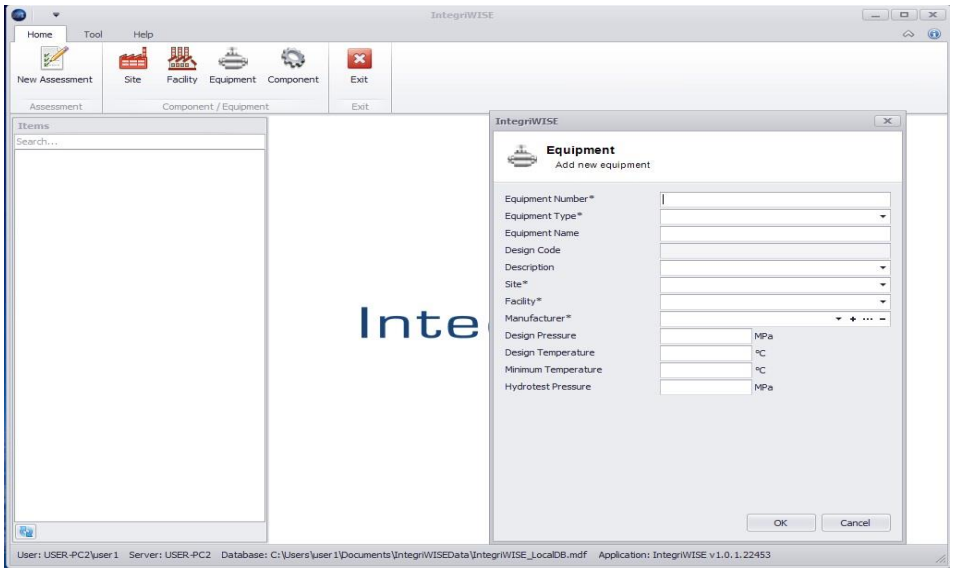
0930 – 1030	***ASME PCC-2: Welded Repairs (cont'd)*** *Fillet Welded Patches ● Alternatives to Post-Weld Heat Treatment ● In-Service Welding onto Carbon Steel Pressure Components or Pipelines ● Weld Build-up, Weld Overlay & Clad Restoration*
1030 - 1035	*Break*
1035 – 1115	***ASME PCC-2: Mechanical Repairs (Non-Welding Repairs)*** *Flange Repair ● Mechanical Clamp Repair ● Inspection & Repair of Shell & Tube Heat Exchangers ● Examination & Testing*
1115 - 1200	***ASME PCC-2: Mechanical Repairs (Non-Welding Repairs) (cont'd)*** *Pressure & Tightness Testing of Piping & Equipment ● Pneumatic Testing- Do's & Don'ts ● Non-destructive Examination in Lieu of Pressure Testing for Repairs & Alterations*
1200 – 1205	*Break*

1205 – 1225	***ASME PCC-2: Mechanical Repairs (Non-Welding Repairs) (cont'd)*** • *Relevance of ASME PCC-2 Standard with API 510 & API 570 Codes* • *Documentation & Records of Repairs*
1225 – 1230	***Course Conclusion*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Course Topics that were Covered During the Course*
1230 – 1330	*Presentation of Course Certificates*
1330	*End of Course*

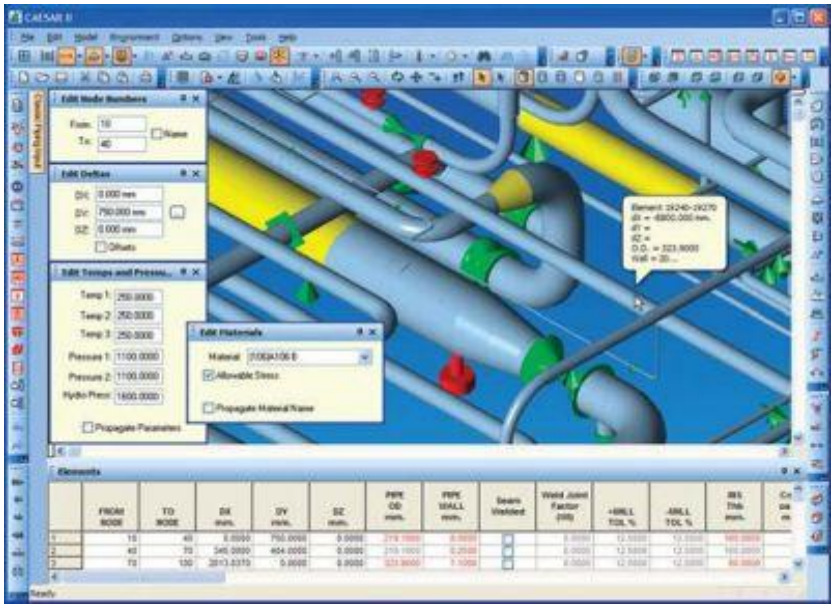
Simulator (Hands-on Practical Sessions)

Practical sessions will be organized during the course for delegates to practice the theory learnt. Delegates will be provided with an opportunity to carryout various exercises using the "IntegriWISE™" and "CAESAR II" simulators.





IntegriWISE™



CAESAR II

Course Coordinator

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