COURSE OVERVIEW FE1012

ASME B31.3, API 579, API 580, API 581, API 570 & API 571

RBI, FFS, Vibration Analysis & Repair of Piping Systems & Pipelines

Course Title

ASME B31.3, API 579, API 580, API 581, API 570 & API 571: *RBI, FFS, Vibration Analysis & Repair of Piping Systems & Pipelines*

Course Date/Venue

October 05-09, 2025/Pierre Loti Meeting Room, Mövenpick Hotel Istanbul Golden Horn, Istanbul, Turkey

Course Reference

FE1012

Course Duration/Credits

Five days/3.0 CEUs/30 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.

This course is designed to provide participants with a detailed and up-to-date overview of ASME B31.3, API 579, API 580, API 581, API 570 & API 571: RBI, FFS, Vibration Analysis & Repair of Piping Systems & Pipelines. It covers the role of ASME and API in piping systems; the scope and application of ASME B31.3 and integration with API standards, regulatory compliance and jurisdiction; the process piping design philosophy, material selection and compatibility; the piping components and fabrication; the flexibility and stress analysis, hydrostatic and pneumatic testing and visual and non-destructive inspection; the risk-based inspection, RBI and plant integrity management and risk assessment methodology; and the API 581 quantitative RBI approach, data collection and assessment and RBI planning and implementation.

During this interactive course, participants will learn the role of FFS in mechanical integrity, FFS assessment levels (level 1, 2, 3), FFS versus RBI and applicability and limitations; the brittle fracture, local metal loss, general corrosion and crack-like flaws; the piping integrity assessment and monitoring, documentation and reporting of FFS; the piping inspection code, inspection planning and techniques and damage mechanisms in piping; the piping repair techniques and standards, in-service inspection and vibration monitoring and diagnosis; the vibration control and mitigation, root cause analysis and failure prevention; and the integration of RBI, FFS, inspection and vibration.

Course Objectives

Upon the successful completion of this course, each participant will be able to:-

- Apply and gain an in-depth knowledge on RBI, FFS, vibration analysis and repair of piping systems and pipelines in accordance with ASME B31.3, API 579, API 580, API 581, API 570 and API 571 standards
- Discuss the role of ASME and API in piping systems including the scope and application of ASME B31.3, integration with API standards and regulatory compliance and jurisdiction
- Explain process piping design philosophy, material selection and compatibility and piping components and fabrication
- Carryout flexibility and stress analysis, hydrostatic and pneumatic testing and visual and non-destructive inspection
- Apply risk-based inspection, RBI and plant integrity management and risk assessment methodology
- Employ API 581 quantitative RBI approach, data collection and assessment and RBI planning and implementation
- Discuss the role of FFS in mechanical integrity, FFS assessment levels (level 1, 2, 3), FFS versus RBI and applicability and limitations
- Recognize brittle fracture, local metal loss and general corrosion and crack-like flaws
- Carryout piping integrity assessment and monitoring as well as documentation and reporting of FFS
- Discuss piping inspection code, inspection planning and techniques and damage mechanisms in piping
- Apply piping repair techniques and standards, in-service inspection and vibration monitoring and diagnosis
- Employ vibration control and mitigation, root cause analysis and failure prevention and integration of RBI, FFS, inspection and vibration

Exclusive Smart Training Kit - H-STK®

*Participants of this course will receive the exclusive "Haward Smart Training Kit" (**H-STK®**). The **H-STK®** consists of a comprehensive set of technical content which includes **electronic version** of the course materials conveniently saved in a **Tablet PC**.*

Who Should Attend

This course provides an overview of all significant aspects and considerations of ASME B31.3, API 579, API 580, API 581, API 570 and API 571: RBI, FFS, vibration analysis and repair of piping systems and pipelines for mechanical engineers and piping engineers, inspection and integrity engineers, reliability and asset integrity professionals, pipeline and process engineers, risk-based inspection (RBI) specialists, fitness-for-service (FFS) analysts, vibration and rotating equipment engineers and those who involved in the design, inspection, maintenance, reliability, and integrity management of piping systems and pipelines.

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
Haward's certificates are accredited by the following international accreditation organizations: -

- British Accreditation Council (BAC)

  Haward Technology is accredited by the **British Accreditation Council** for **Independent Further and Higher Education** as an **International Centre**. Haward's certificates are internationally recognized and accredited by the British Accreditation Council (BAC). 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.

- 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 **3.0 CEUs** (Continuing Education Units) or **30 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.

Accommodation
Accommodation is not included in the course fees. However, any accommodation required can be arranged at the time of booking.

Course Fee
US$ 6,000 per Delegate + **VAT**. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

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. Karl Thanasis, PEng, MSc, MBA, BSc, is **Senior Engineer** with over **30 years** of extensive industrial experience. His wide expertise includes Oil & Gas **Pipeline Optimization**, **Pipeline** Design & Construction, **ASME B31.3**, Risk Base Inspection (**RBI**), Fitness For Service (**FFS**), **Pump Vibration Testing & Analysis**, **Piping Vibration**, **Troubleshooting Piping & Pipe Support Systems**, **Repair of Piping Systems & Pipelines, Piping & Pipeline**, **Gas Pipe Line** Operation & Maintenance, **Pigging** Operations – Fundamental, **Pipeline Pigging** & Intelligent-Pig Survey, **Pigging Foundations**, Facilities & **Pipeline** Integrity Assessment Maintenance, Repair, **Shutdown**, **Turnaround & Outages**, **Maintenance & Reliability** Management, **Mechanical Maintenance** Planning, Scheduling & Work Control, Advanced Techniques in **Maintenance** Management, **Predictive & Preventive** Maintenance, **Maintenance & Operation Cost Reduction** Techniques, Reliability Centered Maintenance (**RCM**), **Machinery Failure** Analysis, **Rotating Equipment Reliability** Optimization & Continuous Improvement, **Material Cataloguing**, **Mechanical & Rotating Equipment** Troubleshooting & Maintenance, **Root Cause Analysis & Reliability** Improvement, **Condition** Monitoring, **Root Cause Failure Analysis** (RCFA), **Steam Generation**, **Gas Turbines**, **Combined Cycle Plants**, **Boilers**, **Process Fired Heaters**, Air Preheaters, Induced Draft Fans, All Heaters Piping Work, Refractory Casting, Heater Fabrication, Thermal & Fired Heater Design, **Heat Exchangers**, Heat Transfer, Coolers, **Power Plant** Performance, Efficiency & Optimization, **Storage Tank** Design & Fabrication, **Thermal Power Plant** Management, **Boiler & Steam** System Management, **Pump** Operation & Maintenance, **Chiller & Chiller Plant** Design & Installation, **Pressure Vessel**, **Safety Relief Valve** Sizing & Selection, **Valve** Disassembling & Repair, Pressure Relief Devices (**PSV**), **Hydraulic & Pneumatic** Maintenance, Advanced **Valve** Technology, **Pressure Vessel** Design & Fabrication, **Pumps**, Turbo-Generator, Turbine **Shaft Alignment**, **Lubrication**, Mechanical **Seals**, Packing, **Blowers**, **Bearing** Installation, **Couplings**, **Clutches** and **Gears**. Further, he is also versed in Water Meter Reading System (**MMR**), Fundamentals of **Water Utility Regulation**, **Water Network** Systems & Pumping Stations, Hydraulic **Modelling** for Water Network Design, **Water Chemistry**, **Wastewater Treatment** Technology, **Networking** System, **Water Network Design**, Industrial **Water Treatment** in Refineries & Petrochemical Plants, **Piping** System, Water Movement, Water Filtering, Mud Pumping, **Sludge Treatment** and **Drying**, **Aerobic Process** of **Water Treatment** that includes **Aeration**, **Sedimentation** and **Chlorination Tanks**. His strong background also includes **Design** and **Sizing** of all **Waste Water Treatment Plant Associated Equipment** such as **Sludge Pumps**, **Filters**, **Metering Pumps**, **Aerators** and **Sludge Decanters**.

Mr. Thanasis has acquired his thorough and practical experience as the **Project Manager**, **Plant Manager**, **Area Manager - Equipment Construction**, **Construction Superintendent**, **Project Engineer** and **Design Engineer**. His duties covered **Plant Preliminary Design**, **Plant Operation**, **Write-up** of **Capital Proposal**, **Investment Approval**, **Bid Evaluation**, **Technical Contract Write-up**, **Construction** and **Sub-contractor Follow up**, **Lab Analysis**, **Sludge Drying** and **Management** of **Sludge Odor** and **Removal**. He has worked in various companies worldwide in the **USA**, **Germany**, **England** and **Greece**.

Mr. Thanasis is a **Registered Professional Engineer** in the **USA** and **Greece** and has a **Master's** and **Bachelor's** degree in **Mechanical Engineering** with **Honours** from the **Purdue University** and **SIU** in **USA** respectively as well as an **MBA** from the **University of Phoenix** in **USA**. Further, he is a **Certified Internal Verifier/Trainer/Assessor** by the **Institute of Leadership & Management** (**ILM**) a **Certified Instructor/Trainer** and has delivered numerous trainings, courses, seminars, workshops and conferences worldwide.

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: ***Sunday, 05th of October 2025***

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Overview of Codes & Standards*** *Role of ASME and API in Piping Systems • Scope and Application of ASME B31.3 • Integration with API Standards • Regulatory Compliance and Jurisdiction*
0930 – 0945	*Break*
0945 – 1030	***ASME B31.3 – Process Piping Design Philosophy*** *Design Pressure and Temperature Considerations • Pipe Wall Thickness Calculations • Allowable Stress and Material Strength • Safety Factors and Code-Defined Limits*
1030 – 1130	***Material Selection & Compatibility*** *Metallic versus Non-Metallic Materials • Corrosion Allowances • Impact Testing and Ductility Requirements • Material Traceability and Specifications*
1130 – 1215	***Piping Components & Fabrication*** *Valves, Flanges, Fittings and Gaskets • Fabrication Requirements and Tolerances • NDE Requirements for Fabrication • Welding Qualifications and Procedures*
1215 – 1230	*Break*
1230 – 1330	***Flexibility & Stress Analysis*** *Thermal Expansion and Flexibility Analysis • Sustained, Occasional and Displacement Stresses • Stress Intensification Factors • Expansion Loops and Anchors*
1330 – 1420	***Inspection, Testing & Records*** *Hydrostatic and Pneumatic Testing • Visual and Non-Destructive Inspection • Test Documentation and Certifications • Pressure Relief Device Considerations*
1420 – 1430	***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*
1430	*Lunch & End of Day One*

Day 2: Monday. 06th of October 2025

0730 – 0900	***Basic of RBI Concepts (API 580)*** *What is Risk-Based Inspection • Benefits and Limitations of RBI • Key RBI Terminology • RBI and Plant Integrity Management*
0900 – 0930	***Risk Assessment Methodology*** *Probability of Failure (PoF) • Consequence of Failure (CoF) • Risk Matrix and Tolerability Criteria • Categorization of Equipment*
0930 – 0945	*Break*
0945 – 1100	***API 581 Quantitative RBI Approach*** *Damage Mechanisms Supported by API 581 • Input Parameters and Data Requirements • Risk Calculation Models and Equations • Sensitivity Analysis*
1100 – 1230	***Data Collection & Assessment*** *Inspection History and Operating Data • Maintenance and Repair Records • Material and Corrosion Data • Accuracy and Reliability of Data*
1215 – 1230	*Break*
1230 – 1330	***RBI Planning & Implementation*** *Developing an RBI Program • Integration with CMMS or IDMS • Inspection Interval Optimization • RBI Reassessment and Review Cycles*
1330 – 1345	***RBI Software & Tools*** *Overview of RBI Software (e.g., PCMS, Meridium, T-OCA) • Software Inputs and Outputs • Generating RBI Reports • Practical Application Case Study*
1420 – 1430	***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*
1430	*Lunch & End of Day Two*

Day 3: Tuesday, 07th of October 2025

0730 – 0900	***FFS (API 579)*** *Role of FFS in Mechanical Integrity • FFS Assessment Levels (Level 1, 2, 3) • FFS versus RBI • Applicability and Limitations*
0900 – 0930	***FFS Part 3: Brittle Fracture*** *Fracture Mechanics Basics • Transition Temperature and MDMT • Evaluation Procedure and Acceptance Criteria • PWHT Considerations*
0930 – 0945	*Break*
0945 – 1100	***FFS Part 5 & 6: Local Metal Loss & General Corrosion*** *Definitions and Damage Characterization • Evaluation Procedures (Level 1 & 2) • Remaining Life Calculation • Acceptance Criteria*
1100 – 1230	***FFS Part 9: Crack-Like Flaws*** *Crack Types and Locations • Fracture Toughness and Stress Intensity • Analysis Procedures and Examples • NDE and Inspection Requirements*
1215 – 1230	*Break*
1230 – 1330	***Piping Integrity Assessment & Monitoring*** *Failure Modes and Degradation Mechanisms • Condition Monitoring and Assessment Tools • Leak-Before-Break Assessment • Online Monitoring Techniques*

1330 – 1345	***Documentation & Reporting of FFS*** *FFS Assessment Report Structure • Documentation Requirements per API 579 • Engineering Sign-Off and Review • Integration with Inspection and Maintenance Plans*
1420 – 1430	***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*
1430	*Lunch & End of Day Three*

Day 4: Wednesday, 08th of October 2025

0730 – 0900	***API 570 – Piping Inspection Code Overview*** *Scope and Application of API 570 • Inspector Responsibilities and Certification • Piping Classification and Service Conditions • Minimum Thickness and Corrosion Rate Calculations*
0900 – 0930	***Inspection Planning & Techniques*** *External Visual Inspection (EVI) • Thickness Measurements and UT • Radiography and Advanced NDE (Phased Array, TOFD) • Positive Material Identification (PMI)*
0930 – 0945	*Break*
0945 – 1100	***API 571 – Damage Mechanisms in Piping*** *Corrosion (General, Localized, Under-Deposit) • Mechanical Damage (Vibration, Erosion) • Metallurgical Failures (Embrittlement, Graphitization) • Environmental Cracking (SCC, HIC, SOHIC)*
1100 – 1230	***Piping Repair Techniques & Standards*** *Repair Methods per API 570 and ASME PCC-2 • Welded versus Non-Welded Repairs • Composite Repairs for Non-Metallic Piping • Temporary versus Permanent Repairs*
1215 – 1230	*Break*
1230 – 1330	***In-Service Inspection & Integrity Programs*** *API 570 Intervals and Inspection Frequency • Condition Monitoring Locations (CMLs) • Corrosion Monitoring Techniques • Fitness-for-Service Revalidation*
1330 – 1345	***Case Studies & Failure Investigations*** *Common Failures and Lessons Learned • Root Cause Analysis Techniques • Repair Decision-Making Process • Documentation and Follow-Up*
1420 – 1430	***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*
1430	*Lunch & End of Day Four*

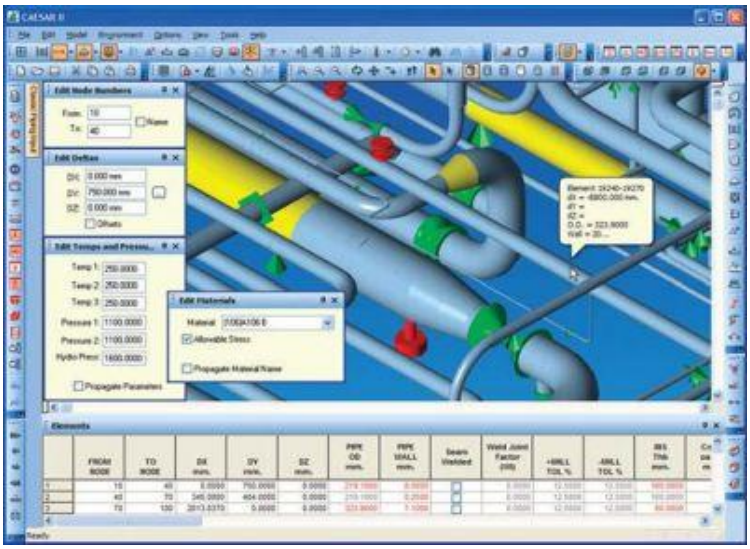
Day 5: Thursday, 09th of October 2025

0730 – 0830	***Basics of Piping Vibration*** *Sources of Vibration in Piping Systems • Types of Vibration (Acoustic, Mechanical) • Resonance and Critical Speeds • Consequences of Piping Vibration*
0830 – 0930	***Vibration Monitoring & Diagnosis*** *Field Measurement Tools (Accelerometers, Sensors) • Time Waveform and Frequency Spectrum Analysis • Operating Deflection Shapes (ODS) • Identifying Looseness, Misalignment and Imbalance*
0930 – 0945	*Break*

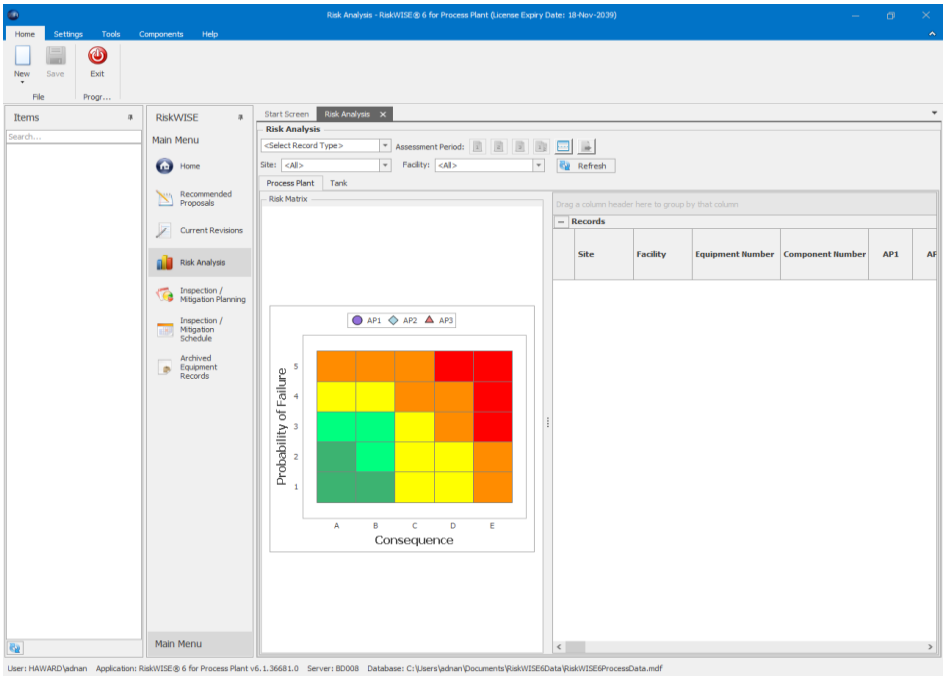
0945 - 1100	***Vibration Control & Mitigation*** *Support and Restraint Optimization • Use of Dampeners and Snubbers • Piping Layout Adjustments • Dynamic Supports and Vibration Absorbers*
1100 – 1230	***Root Cause Analysis & Failure Prevention*** *RCA Methodology for Vibration-Induced Failures • Examples of Typical Vibration Problems • Mitigation Through Design Modifications • Proactive Maintenance Planning*
1230 – 1245	*Break*
1245 – 1345	***Integration of RBI, FFS, Inspection & Vibration*** *Lifecycle Integrity Management • Cross-Linking RBI with FFS and Vibration Data • Digital Integrity Programs and Dashboards • Cost-Effective Inspection Planning*
1345 – 1400	***Course Conclusion*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Course Topics that were Covered During the Course*
1400 – 1415	***POST-TEST***
1415 – 1430	*Presentation of Course Certificates*
1430	*Lunch & End of Course*

Simulator (Hands-on Practical Sessions)

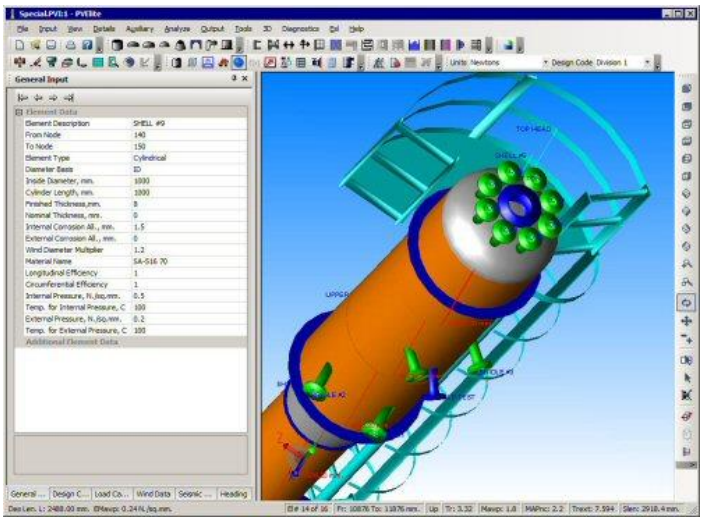
Practical sessions will be organized during the course for delegates to practice the theory learnt. Delegates will be provided with an opportunity to carryout various exercises using the state-of-the-art simulators "CAESAR II", "RiskWISE", "PV-Elite" and "IntegriWISE™".



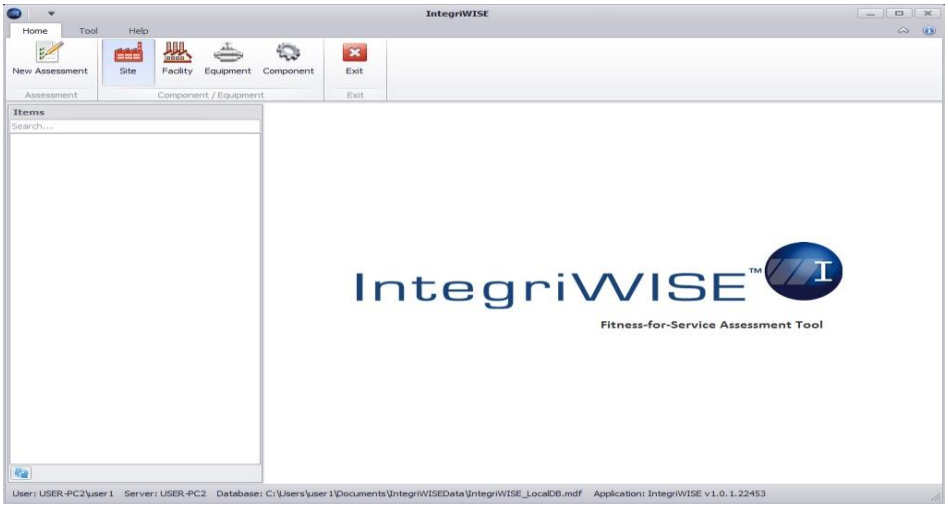
CAESAR II

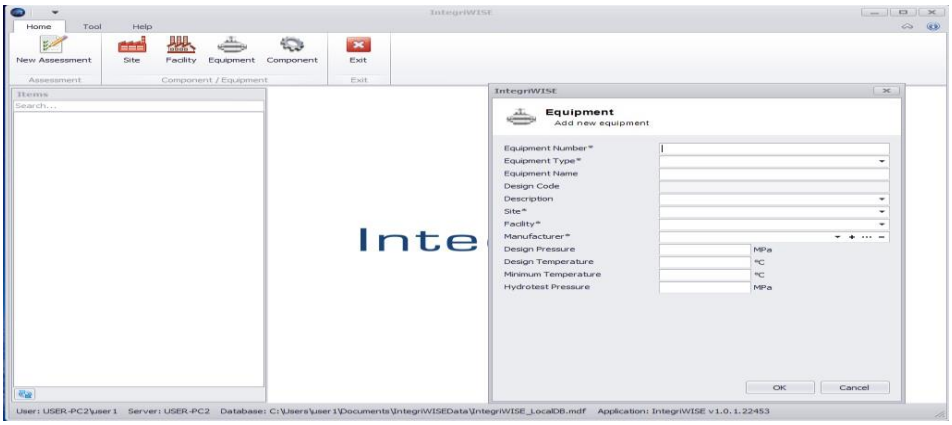


RiskWISE



PV-Elite Simulator





IntegriWISE™

Course Coordinator

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