COURSE OVERVIEW PE1047
Process Design for Process Plant Equipment

Course Title
Process Design for Process Plant Equipment

Course Date/Venue
Please refer to page 3

Course Reference
PE1047

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 Process Design for Process Plant Equipment. It covers the process plant design, types of process equipment and fundamentals of process flow diagrams (PFD); the material and energy balances, process design parameters and process simulation tools; the types of heat exchangers, heat transfer mechanisms, sizing of heat exchangers and thermal expansion and stress considerations; and the selection of heat exchanger materials, energy efficiency in heat exchanger design and pressure vessel design.

During this interactive course, participants will learn the design codes for pressure vessels, material selection for pressure vessels, design of storage tanks and stress analysis and structural integrity; the non-destructive testing (NDT) methods, hydrostatic testing and leakage tests, inspection frequency and documentation and maintenance strategies and reliability; the types and applications of pumps including pumping systems design; the compressors, turbines, mechanical seals and bearings and safety considerations in rotating equipment; and the advanced process equipment sizing, integration of equipment in the overall process design and safety in process design.

Course Objectives

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

- Apply and gain an in-depth knowledge on process design for process plant equipment
- Discuss process plant design, types of process equipment and fundamentals of process flow diagrams (PFD)
- Recognize material and energy balances, process design parameters and process simulation tools
- Identify types of heat exchangers, heat transfer mechanisms, sizing of heat exchangers and thermal expansion and stress considerations
- Illustrate selection of heat exchanger materials, energy efficiency in heat exchanger design and pressure vessel design
- Discuss design codes for pressure vessels, material selection for pressure vessels, design of storage tanks and stress analysis and structural integrity
- Apply non-destructive testing (NDT) methods, hydrostatic testing and leakage tests, inspection frequency and documentation and maintenance strategies and reliability
- Identify the types and applications of pumps including pumping systems design
- Recognize compressors, turbines, mechanical seals and bearings and safety considerations in rotating equipment
- Employ advanced process equipment sizing, integration of equipment in the overall process design and safety in process design
- Discuss sustainability and environmental impact in design, process simulation and digital twin technology and design optimization and cost reduction strategies

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 process design for process plant equipment for process design engineers, mechanical engineers, project engineers and engineering consultants, plant engineers and operations engineers, maintenance and reliability engineers, technical managers and project managers, instrumentation and control engineers and those who involved in designing, evaluating, or operating process equipment in industries such as oil and gas, petrochemicals, refineries or power plants.

Course Date/Venue

Session(s)	Date	Venue
1	June 15-19, 2025	Tamra Meeting Room, Al Bandar Rotana Creek, Dubai, UAE
2	August 11-15, 2025	Glasshouse Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE
3	October 26-30, 2025	Tamra Meeting Room, Al Bandar Rotana Creek, Dubai, UAE
4	December 22-26, 2025	Glasshouse Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE

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: -

- 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.

- 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.

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 a **Senior Process & Mechanical Engineer** with **30 years** of extensive industrial experience within the **Oil & Gas**, **Refinery** and **Petrochemical** industries. His wide expertise includes **Control Valve** Maintenance & Testing, Advanced **Operational Skills**, **Process Equipment** Design & Troubleshooting, **Process Plant** Optimization & Continuous Improvement, **Production Process** Optimization, **Operations Planning** Optimization, **Process Equipment** Design, **Process Plant** Performance & Efficiency, **Process** Integration & Optimization, Root Cause Analysis (**RCA**) Methods, **Root Cause Analysis**, **Process Equipment & Piping** System, **Rotating Equipment Reliability** Optimization & Continuous Improvement, **Material Cataloguing**, **Mechanical & Rotating Equipment** Troubleshooting & Maintenance, **Rotating Equipment** for Process Industry, **Rotating Machinery** Best Practices, **Centrifugal Pumps** Operation, **Positive Displacement Pumps** Repair, **Pump** Maintenance & Troubleshooting, **Pressure Vessels**, **Heat Exchanger** Maintenance & Repair, **Heat Exchanger** Inspection & Troubleshooting, **Fin-fan Coolers**, Fundamentals of **Engineering Drawings**, **Codes & Standards**, **P&ID Reading Interpretation & Developing**, **Boiler Design**, **Boiler** Inspection & Maintenance, **Boiler** Operation & Control, **Boiler** Troubleshooting & Inspection, **Boiler Instrumentation & Control**, **Steam Boiler** Maintenance, **Boiler & Steam Generation System**, **Boiler** Failure Analysis & Prevention, **Boiler** Burner Management, **Boiler** Water Treatment Technology, **Machinery Failure Analysis**, **Preventive & Predictive Maintenance**, **Condition Monitoring**, Root Cause Analysis (**RCA**), Root Cause Failure Analysis (**RCFA**), Reliability Centred Maintenance (**RCM**), Risk Base Inspection (**RBI**), **Metallurgical Failure Analysis**, **Corrosion Failure Analysis**, **Steam Generation**, **Steam Turbines**, **Power Generator Plants**, **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 Transfer, Coolers, **Pumps**, Turbo-Generator, Turbine **Shaft Alignment**, **Lubrication**, **Mechanical Seals**, **Packing**, **Blowers**, **Bearings**, **Couplings**, **Clutches** and **Gears**. Further, he is also versed in **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**, **Maintenance Manager**, **Engineering Manager**, **Technical Consultant & Trainer**, **Head of Capital Projects**, **Refractory Specialist**, **Construction Superintendent**, **Maintenance Supervisor**, **Project Engineer**, **Maintenance Engineer** and **Thermal Design Engineer** of various companies worldwide in the **USA**, **Germany**, **England** and **Greece**.

Mr. Thanasis is a **Registered Professional Engineer** in the **USA** and **Greece** and has **Master's** and **Bachelor's** degree in **Mechanical Engineering** with **Honours** from the **Purdue University** and **Southern Illinois University** (**USA**) respectively as well as an **MBA** from the **University of Phoenix** (**USA**). Further, he is a **Certified Instructor/Trainer**, **Certified Internal Verifier/Trainer/Assessor** by the **Institute of Leadership & Management** (**ILM**), a member of the **American Society of Heating, Refrigeration and Air-Conditioning Engineers** and delivered various trainings, courses, seminars and workshops 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.

Accommodation

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

Course Fee

US$ 5,500 per Delegate + **VAT**. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Course Program

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

Day 1

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Overview of Process Plant Design*** *Key Stages in the Design Process • Role of Process Engineers in Design • Importance of Process Flow Diagrams (PFDs) • Integration of Equipment in Plant Design*
0930 – 0945	*Break*
0945 – 1030	***Types of Process Equipment*** *Static versus Rotating Equipment • Heat Exchangers and Pressure Vessels • Pumps, Compressors, and Turbines • Reactors, Tanks, and Columns*
1030 – 1130	***Fundamentals of Process Flow Diagrams (PFD)*** *Purpose and Structure of a PFD • Symbols and Standard Conventions • Fluid Flow and Energy Balances • PFD Creation Tools and Software*
1130 – 1215	***Material & Energy Balances*** *Material Balance Calculations • Energy Balance Considerations • Balancing Equations for Equipment Sizing • Heat and Mass Transfer Principles*
1215 – 1230	*Break*

1230 – 1330	***Process Design Parameters*** *Defining Design Parameters for Equipment • Impact of Temperature, Pressure, and Flow Rate • Material Properties and Compatibility • Safety and Regulatory Compliance Considerations*
1330 – 1420	***Basics of Process Simulation Tools*** *Overview of Simulation Software (Aspen, HYSYS) • Building a Simple Process Model • Validating Simulation Results • Integration with Design Documentation*
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

0730 – 0830	***Types of Heat Exchangers*** *Shell-and-Tube Heat Exchangers • Plate Heat Exchangers • Air-Cooled Heat Exchangers • Compact Heat Exchangers*
0830 – 0930	***Heat Transfer Mechanisms*** *Conduction, Convection and Radiation • Heat Transfer Coefficients and Fouling Factors • Effectiveness and Efficiency of Heat Exchangers • Methods for Improving Heat Transfer Rates*
0930 – 0945	*Break*
0945 – 1100	***Sizing of Heat Exchangers*** *Key Design Equations and Methods • Flow Arrangements and Selection • Pressure Drop Considerations • Thermal Design Specifications*
1100 – 1215	***Thermal Expansion & Stress Considerations*** *Material Expansion Due to Temperature Gradients • Thermal Stresses in Equipment • Design Considerations for Expansion Joints • Methods for Mitigating Thermal Stresses*
1215 – 1230	*Break*
1230 – 1330	***Selection of Heat Exchanger Materials*** *Criteria for Material Selection • Corrosion Resistance and Durability • Thermal Conductivity and Strength • Cost-Benefit Analysis in Material Selection*
1330 – 1420	***Energy Efficiency in Heat Exchanger Design*** *Heat Recovery Systems and Integration • Optimization of Heat Exchanger Networks • Advanced Thermal Design Techniques • Evaluating Energy Savings and Return on Investment*
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

0730 – 0830	***Pressure Vessel Design*** *Types of Pressure Vessels (Horizontal, Vertical, Spherical) • Applications and Function in Process Plants • Pressure Vessel Codes and Standards (ASME, PED) • Key Design Considerations for Pressure Vessels*
0830 – 0930	***Design Codes for Pressure Vessels*** *ASME Boiler and Pressure Vessel Code (BPVC) • European Pressure Equipment Directive (PED) • API 650 and API 620 for Storage Tanks • Design Calculations Based on Standards*
0930 – 0945	*Break*
0945 – 1100	***Material Selection for Pressure Vessels*** *Selection Based on Pressure, Temperature, and Corrosion • Material Strength and Toughness • Welding Considerations • Risk Assessment and Material Degradation*
1100 – 1215	***Design of Storage Tanks*** *Tank Types: Fixed Roof, Floating Roof, and Spherical Tanks • Tank Sizing and Volume Calculations • Atmospheric versus Pressurized Storage • Tank Foundation Design and Stability*
1215 – 1230	*Break*
1230 – 1330	***Stress Analysis & Structural Integrity*** *Calculation of Stresses in Pressure Vessels • Hoop Stress, Axial Stress, and Radial Stress • Failure Modes in Pressure Vessels • Structural Integrity Analysis Techniques*
1330 – 1420	***Inspection, Testing & Maintenance*** *Non-Destructive Testing (NDT) Methods • Hydrostatic Testing and Leakage Tests • Inspection Frequency and Documentation • Maintenance Strategies and Reliability*
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

0730 – 0830	***Pumps: Types & Application*** *Centrifugal versus Positive Displacement Pumps • Pump Curves and Performance Characteristics • Selecting the Right Pump for Process Requirements • Pump Operation and Maintenance*
0830 – 0930	***Pumping Systems Design*** *Sizing of Pumps for Flow and Pressure Requirements • Hydraulic Design and Efficiency • Energy Consumption and Optimization • Pump Selection Criteria Based on Application*
0930 – 0945	*Break*
0945 – 1100	***Compressors: Types & Selection*** *Reciprocating, Centrifugal, and Screw Compressors • Pressure Ratio and Flow Rate Considerations • Efficiency and Energy Consumption • Reliability and Maintenance of Compressors*
1100 – 1215	***Turbines & Their Role in Process Plants*** *Types of Turbines: Steam, Gas, and Hydraulic • Turbine Selection Based on Process Needs • Sizing Turbines for Power Generation • Maintenance and Troubleshooting of Turbines*
1215 – 1230	*Break*

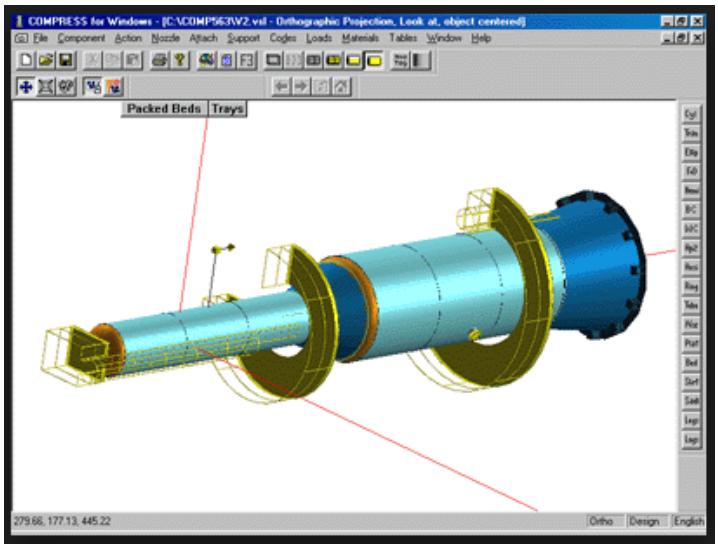
1230 – 1330	***Mechanical Seals & Bearings*** *Types of Mechanical Seals Used in Rotating Equipment • Selection Criteria for Bearings and Seals • Lubrication and Cooling Systems • Troubleshooting Common Issues in Pumps and Compressors*
1330 – 1420	***Safety Considerations in Rotating Equipment*** *Vibration Monitoring and Analysis • Over-Speed and Overload Protection • Fire and Explosion Prevention • Compliance with Safety Regulations and Standards*
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

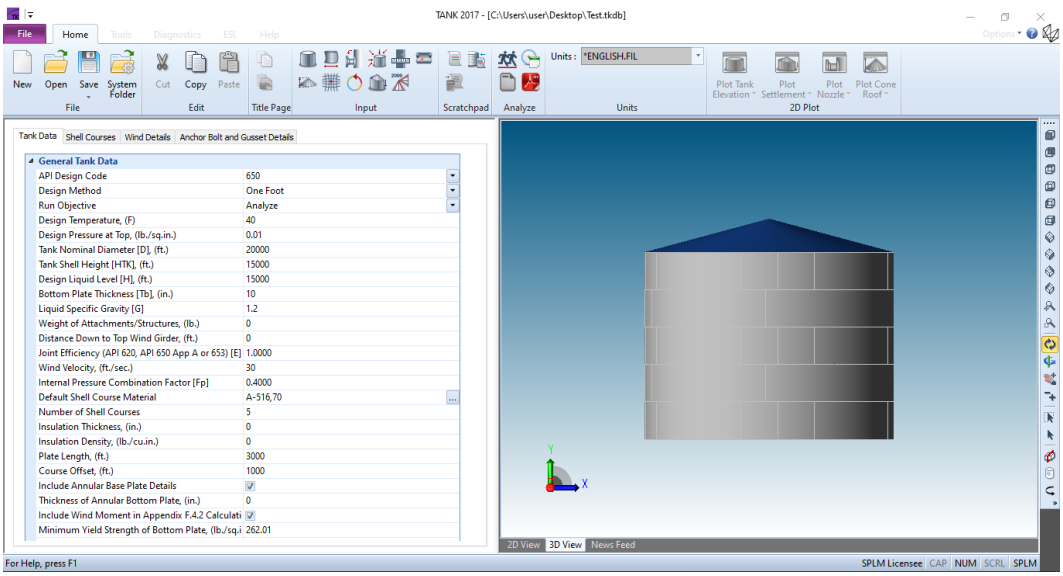
0730 – 0830	***Advanced Process Equipment Sizing*** *Methods for Accurate Sizing of Heat Exchangers, Vessels, and Pumps • Using Process Simulation for Equipment Sizing • Case Studies on Real-World Applications • Design Optimization Strategies*
0830 – 0930	***Integration of Equipment in the Overall Process Design*** *Equipment Layout and Spatial Considerations • Process Control Systems and Their Interaction with Equipment • Equipment Commissioning and Start-Up Procedures • Collaboration Between Process and Mechanical Engineers*
0930 – 0945	*Break*
0945 – 1100	***Safety in Process Design*** *Process Hazard Analysis (PHA) and Risk Assessments • Safety Instrumented Systems (SIS) and Emergency Shutdown Systems (ESD) • Compliance with Safety Standards (e.g., IEC 61508, OSHA) • Safety Considerations in Equipment Design*
1100 – 1215	***Sustainability & Environmental Impact in Design*** *Minimizing Emissions and Waste During Design • Energy-Efficient Equipment Design • Renewable Energy Integration in Process Plants • Lifecycle Assessment and Sustainability Considerations*
1215 – 1230	*Break*
1230 – 1300	***Process Simulation & Digital Twin Technology*** *Role of Process Simulation in Design • Introduction to Digital Twin Technology for Process Plants • Advantages of Simulation for Optimization and Troubleshooting • Case Studies on Successful Simulation Applications*
1300 - 1345	***Design Optimization & Cost Reduction Strategies*** *Techniques for Optimizing Design for Cost and Performance • Selection of Low-Cost Materials without Compromising Safety • Reducing Operational Costs through Efficient Design • Cost-Benefit Analysis in Equipment Selection*
1345 – 1400	***Course Conclusion*** *Using this Course Overview, the Instructor(s) will Brief Participants about t 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)

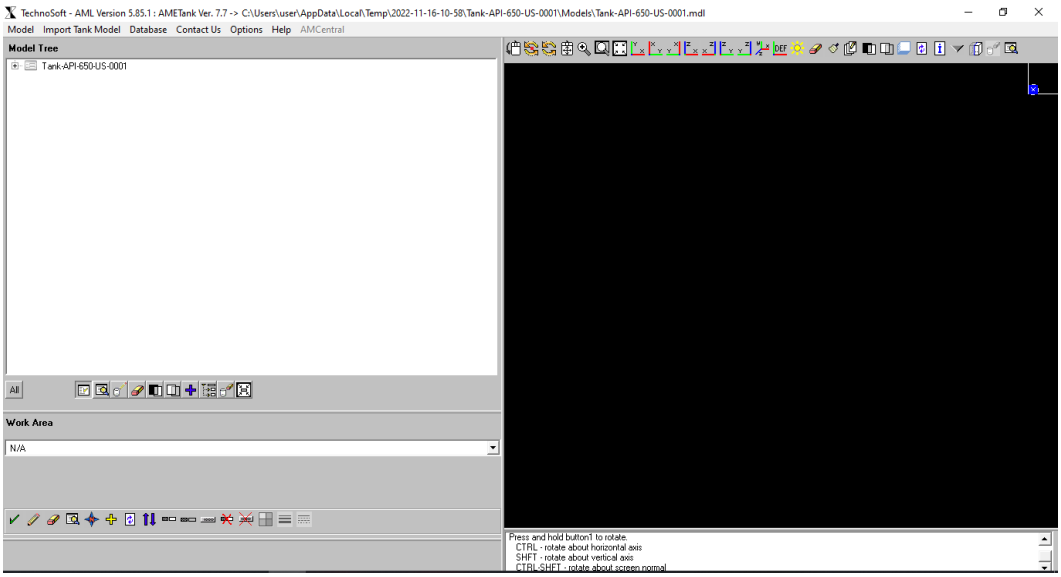
Practical sessions will be organized during the workshop for delegates to practice the theory learnt. Delegates will be provided with an opportunity to carryout various exercises using our state-of-the-art simulators ''COMPRESS Simulator'', ''Hexagon PPM COADE TANK 2017 SP1 v9.00.01 (Integraph Tank)", " AME Tank v7.7", "SafeRoof v2.1","Heat Exchanger Tube Layout", "Centrifugal Pumps and Troubleshooting Guide 3.0", "SIM 3300 Centrifugal Compressor", "CBT on Compressors", "Steam Turbine & Governing System CBT", '', "Single Shaft Gas Turbine Simulator" and "Two Shaft Gas Turbine Simulator".



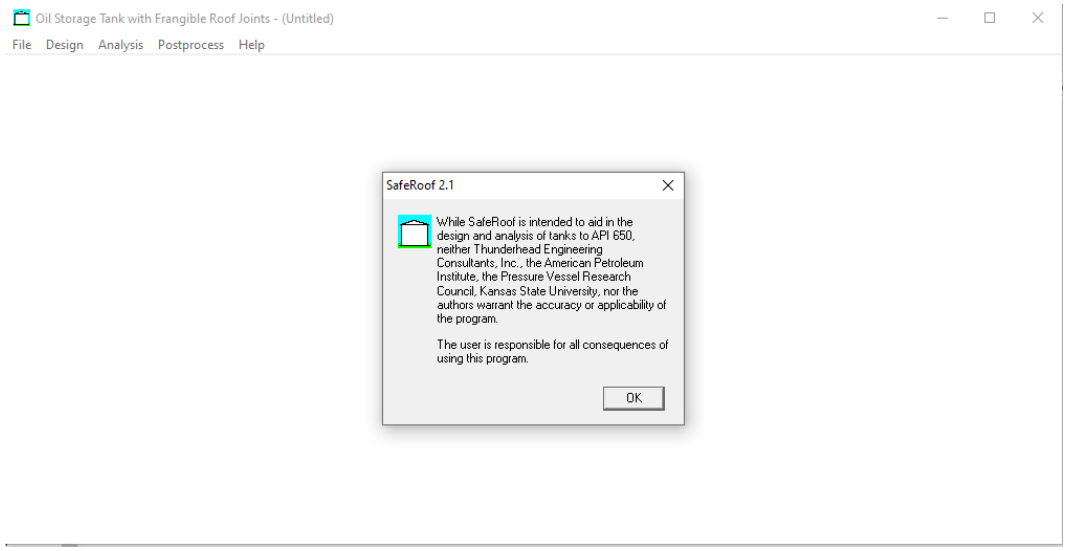
COMPRESS Simulator



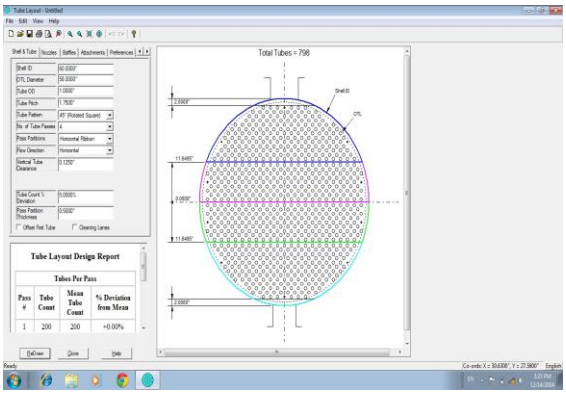
Hexagon PPM COADE TANK 2017 SP1 v9.00.01 (Integraph Tank)



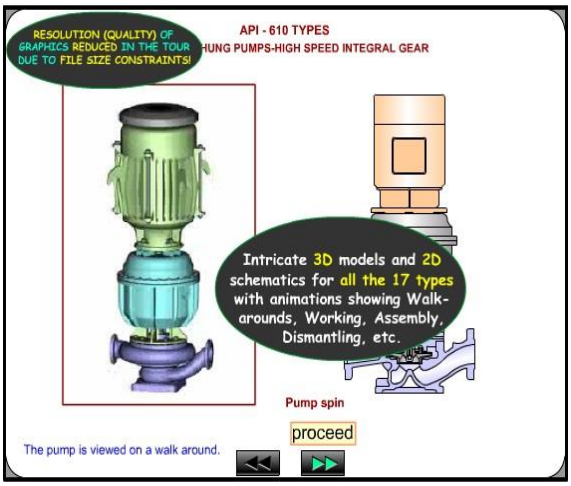
AME Tank v7.7



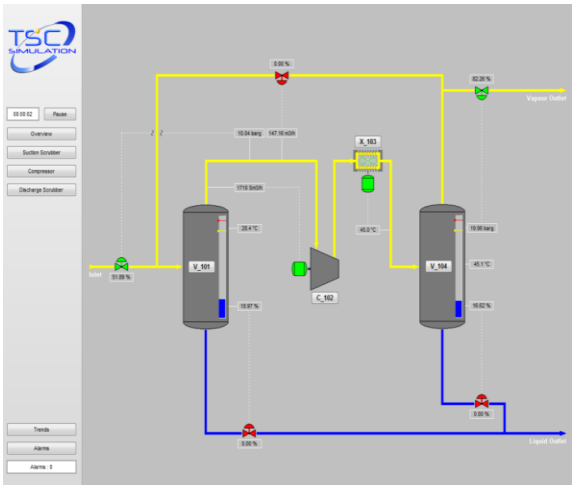
SafeRoof v2.1



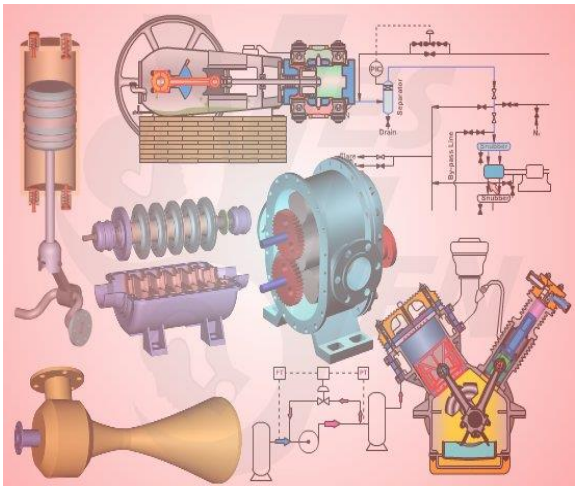
Heat Exchanger Tube Layout Simulator



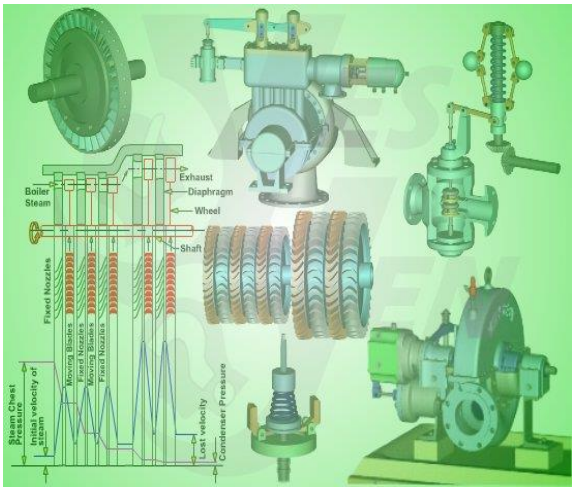
Centrifugal Pumps and Troubleshooting Guide 3.0



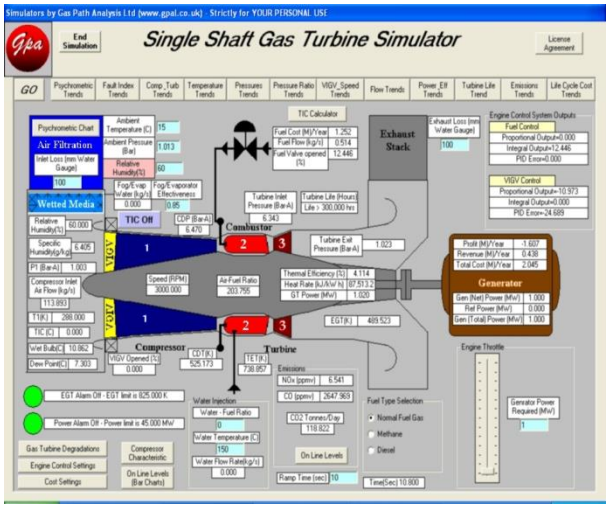
SIM 3300 Centrifugal Compressor Simulator



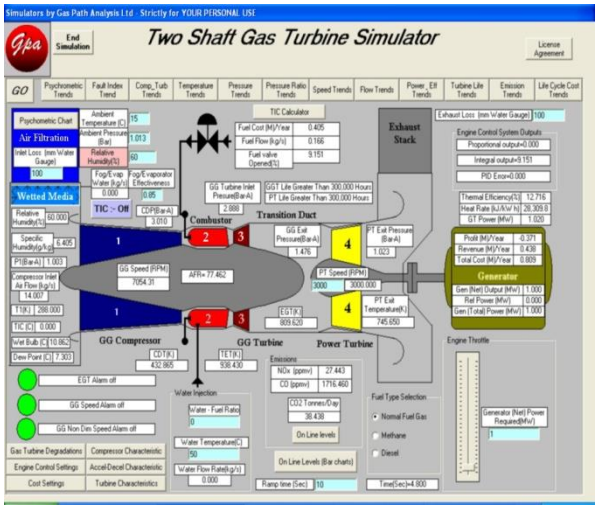
CBT on Compressors



Steam Turbine & Governing System CBT



Single Shaft Gas Turbine Simulator



Two Shaft Gas Turbine Simulator

Course Coordinator

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