

COURSE OVERVIEW PE0020
Process Equipment Design, Sizing,
Selection, Applications, Operation & Troubleshooting

Course Title

Process Equipment Design, Sizing, Selection, Applications, Operation & Troubleshooting

Course Reference

PE0020

Course Duration/Credits

Five days/3.0 CEUs/30 PDHs



Course Date/Venue

| Session(s) | Date | Venue |
|------------|-----------------------|--|
| 1 | September 15-19, 2024 | Horus Meeting Room, Holiday Inn & Suites Maadi, Cairo, Egypt |
| 2 | November 24-28, 2024 | |
| 3 | January 19-23, 2025 | |

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 state-of-the-art course is designed to provide a comprehensive understanding of process equipment design concepts and techniques. Process design methods and criteria are presented and discussed to familiarize engineers with practical techniques for selection, sizing and design of process equipment for refineries, petrochemical and related oil and gas processing plants.



During the course period, participants will be trained on short-cut methods, rules-of-thumb and example problems on the course topics, which include process design, categories & constraints; hydrocarbon properties, parameters and definitions; development of process design data & methods; engineering flow diagrams & specifications; sizing, selection & design of major process equipment; mechanical & safety aspects; cost estimating; and process design specification packages.

In addition to basic calculation procedures for design and rating of process equipment, design approaches in revamp of existing plant facilities are also discussed and guidelines provided. Each session will be conducted in a lecture/discussion format designed to provide intensive instruction and guidance.

Course Objectives

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

- Apply proper principles, procedures and techniques in the design, sizing, selection, application, operation and troubleshooting of process equipments
- Calculate, evaluate and compile basic process data essential for design of process equipment and plant
- Perform evaluations of existing equipment designs and revamp methods
- Prepare comprehensive process design specification document package
- Prepare scoping cost estimates and conduct evaluations of equipment and contractors' design proposals
- Maintain and troubleshoot process equipment and solve their related problems

Who Should Attend

This course is intended for process engineers engaged in the design of new process equipment and revamp of existing plants and who also in-charge of troubleshooting and maintaining of such equipment. The course is also recommended for mechanical, equipment and project engineers who wish to learn basic principles of process design and process equipment and who are willing to troubleshoot and maintain such equipment.

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 Participants Pack (Folder, Manual, Hand-outs, etc.), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

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:-


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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.

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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 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. Mohamed Abdallah is a Senior Process & Petroleum Engineer with over 25 years of Offshore & Onshore experience within the Oil, Gas, Refinery, Petrochemical and Utilities industries. His expertise covers Heat Exchangers, Heat Transfer, Fired Heaters Operation & Troubleshooting, Furnace & Combustion Process, Oil/Gas Surface and Sub-surface Production Facilities within upstream Offshore & Onshore Fields, Process Software (HYSIS), Process Engineering Calculations, Process Plant Operation & Problem Solving, Process Furnace (Pressure Relief System, Flare & Blowdown), Process Plant Performance & Efficiency, LNG, GTL, NGL, LPG & Petrochemical Plants Process Technology, Conditioning Monitoring, Gas Sweetening & Sulphur Recovery, Oil & Gas Processing, Gas Field Operations, Process Equipment including Fired Heaters, Pumps, Valves, Storage Tanks, Air Coolers, Heat Exchangers, Piping, Pigging, Well Tests, Pumps, Compressors, Flare System, Jack-Up Rig as well as Glycol Dehydration, Refrigerant, Inlet Separator, LTS, Chillers, Dep ropanizer, Debutanizer, Reflux System, LNG Compressor, LPG Storage & Facilities, Nitrogen Plant and DCS System. Further, his expertise includes Pipeline & Piping Design, Equipment Design, Chemical Analysis & Quality Control, HAZOP, HAZID, HAZMAT, HAZCOM, HAZWOPER, Environmental Management System (OHSAS 18001), Accident & Incident Investigation, Fire Fighting & Rescue Operation, Risk Assessment, Reverse Osmosis (RO), Oily Water Treatment for Plant Utilities, Water Injection and Waste Water Treatment. He is currently the Senior Process Engineer of Kuwait Oil Company (KOC) wherein he is responsible in different facets of Process Engineering from concept development to pre-commissioning, commissioning start-up, maintenance and troubleshooting.

With Mr. Mohamed’s in-depth practical experience was acquired from various multi-national companies including KOC, Geisum Oil Company and Al-Furat Petroleum Company as the **Senior Process Engineer, Onshore Process Assistant General Manager, Offshore Process & Production Department Head, Offshore Process & Production Engineer and HSE Process & Production Trainer**. Further, he specializes in various **Simulators** using **DCS** for LNG process and **HYSYS**.

Mr. Abdallah has a **Bachelor** degree in **Petroleum Engineering**. Further, he is a **Certified Instructor/Trainer** and an active member of the **Society of Petroleum Engineers (SPE)**.

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

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|-------------|---|
| 0730 – 0800 | Registration & Coffee |
| 0800 – 0815 | Welcome & Introduction |
| 0815 – 0830 | PRE-TEST |
| 0830 – 0930 | Introduction Nature of Design • Design Constraints • Design Categories |
| 0930 – 0945 | Break |
| 0945 – 1130 | Petroleum Properties & Definitions Composition of Petroleum • Petroleum Processing: An Overview • Hydrocarbon Properties: (Pure Hydrocarbons, Defined Mixtures, Undefined Mixtures) • Characterization Parameters & Definitions |
| 1130 – 1230 | Development of Process Data Process Design Tasks & Sequence • Process Calculations Methods: (Empirical Procedure, Rigorous Procedure) |
| 1230 – 1245 | Break |
| 1245 – 1420 | Development of Process Data (cont'd) Process Design Simulation Techniques: (Commercial Packages, Equipment Software, Process Data Packages) • Data Compilation and Presentation: (Process Flow Diagram, Equipment Data Sheets, Accuracy and Significance) |
| 1420 – 1430 | Recap |
| 1430 | Lunch & End of Day One |

Day 2

| | |
|-------------|---|
| 0730 – 0930 | Equipment Sizing, Selection & Design Process Equipment Categories • Required vs. Calculated Data |
| 0930 – 0945 | Break |
| 0945 – 1045 | Piping Fluid Flow Equations • Pressure Loss Categories • Pipe Properties • Sizing Criteria • Two-Phase Flow • Sizing Methods • Maintenance & Troubleshooting |
| 1045 – 1230 | Pumps Categories & Types • Performance Characteristics • Key Design Parameters • Calculation Method/Typical Format and Examples • Pump Selection Guidelines • Maintenance & Troubleshooting |
| 1230 – 1245 | Break |
| 1245 – 1420 | Compressors Categories and Types • Compression Process • Characteristics & Terminologies • Key Design Parameters • Compressor Control Methods • Calculation Method/Typical Format & Examples • Selection Guidelines • Maintenance & Troubleshooting |
| 1420 – 1430 | Recap |
| 1430 | Lunch & End of Day Two |

Day 3

| | |
|-------------|--|
| 0730 – 0930 | Heat Exchangers Types • Shell-and-Tube Construction – TEMA • Heat Transfer Relation • Key Design Considerations, Fouling Factors, Process Applications |
| 0930 – 0945 | Break |
| 0945 – 1045 | Heat Exchangers (cont'd) Reboilers • Calculation Methods – Short-cut with Example • Rating Existing Exchangers with Example • Selection Guidelines • Maintenance & Troubleshooting |
| 1045 – 1230 | Air Coolers Types – Forced and Induced Air • Key Design Considerations • Air vs Water Cooling • Calculation Procedure – Approximate Method • Maintenance & Troubleshooting |
| 1230 – 1245 | Break |
| 1245 – 1330 | Direct-Fired Heaters Types – Size and Configuration • Design Considerations – Process & Combustion • Control Systems • Maintenance & Troubleshooting |
| 1330 – 1420 | Process Vessels Types & Functions, Design Considerations • Calculation Method & Examples • Maintenance & Troubleshooting |
| 1420 – 1430 | Recap |
| 1430 | Lunch & End of Day Three |

Day 4

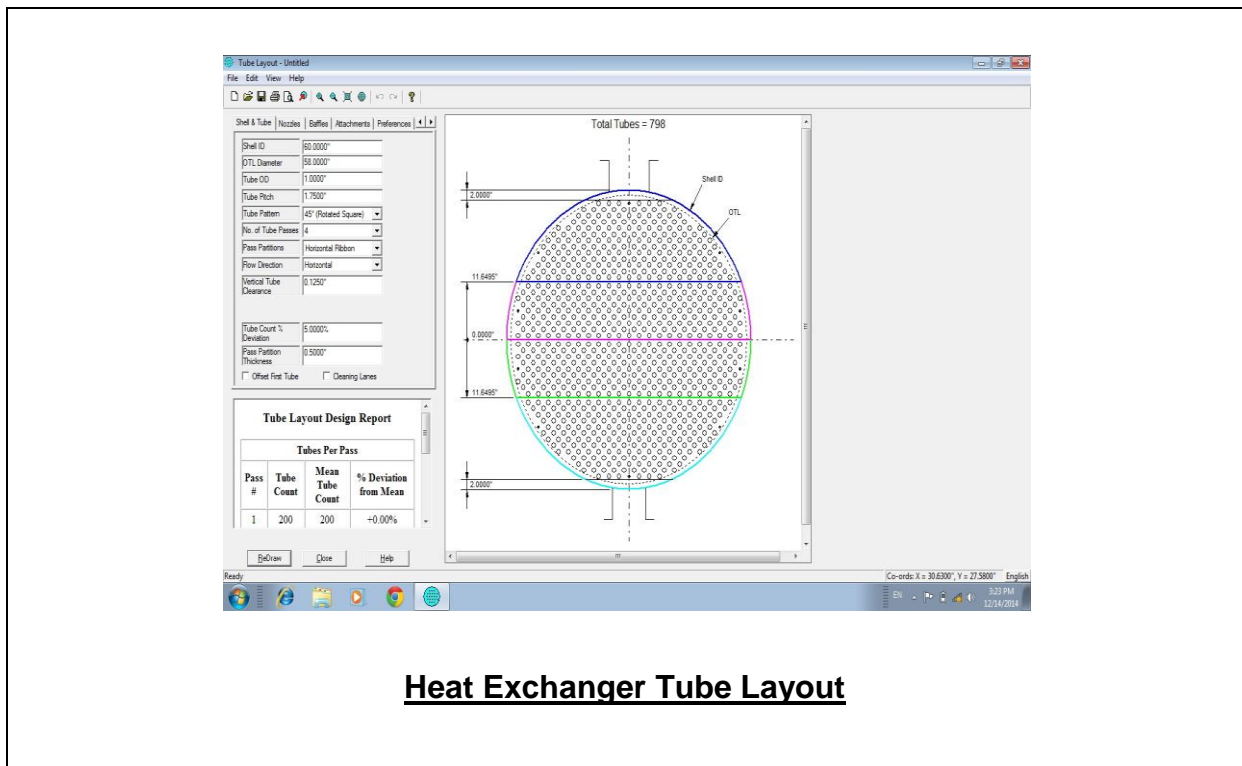
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| 0730 – 0930 | Fractionator Columns Fractionator Types: Simple * Complex Columns • Design Methods – Process/Hardware • Process Design Procedure/Examples: Simple Column-Stabilizer; Complex Column-Crude Column |
| 0930 – 0945 | Break |
| 0945 – 1045 | Fractionator Columns (cont'd) Internals: Trays, Packing/Grids, etc • Hydraulic Criteria • Performance Comparison • Process Specification Data Sheets • Maintenance & Troubleshooting |
| 1045 – 1130 | Reactors Fixed-Bed Reactors Types • Design Considerations • Sizing Methods – Press Drop Calc • Internals • Maintenance & Troubleshooting |
| 1130 – 1230 | Control Valves Types • Design Considerations • Valve Sizing • Valve Selection • Actuator Types • Actuator Selection • Calculation Methods & Examples |
| 1230 – 1245 | Break |
| 1245 – 1420 | Ancillary Equipment Steam Jet Ejectors • Pressure Relief Devices • Maintenance & Troubleshooting |
| 1420 – 1430 | Recap |
| 1430 | Lunch & End of Day Four |

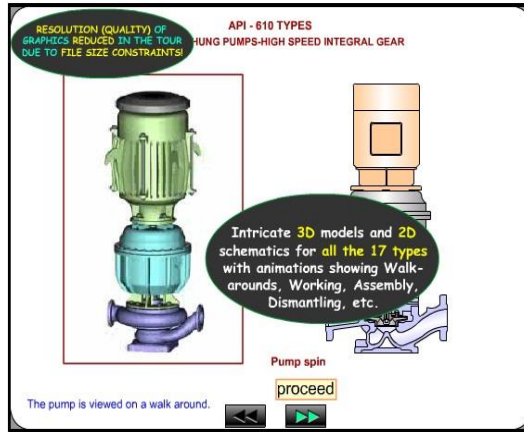
Day 5

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|-------------|---|
| 0730 – 0930 | Mechanical & Safety Aspects Codes, Standards and Specifications • Materials of Construction – Overview • Safety in Design – Equipment Spacing |
| 0930 – 0945 | Break |
| 0945 – 1045 | Cost Estimating Cost Estimating Methods • Estimate Types and Accuracy • Equipment Installation Factors • Contingency Allowances • Cost Escalation |
| 1045 – 1230 | Process Design Specifications Purpose of Specification Package • Types of Specification Packages • Specification Package Contents |
| 1230 – 1245 | Break |
| 1245 – 1330 | Process Design Specifications (cont'd) Process Design in Project Cycle • Cost of Process Design |
| 1330 – 1345 | Q & A Discussion |
| 1345 – 1400 | Course Conclusion |
| 1400 – 1415 | POST-TEST |
| 1415 – 1430 | Presentation of Course Certificates |
| 1430 | Lunch & End of Course |

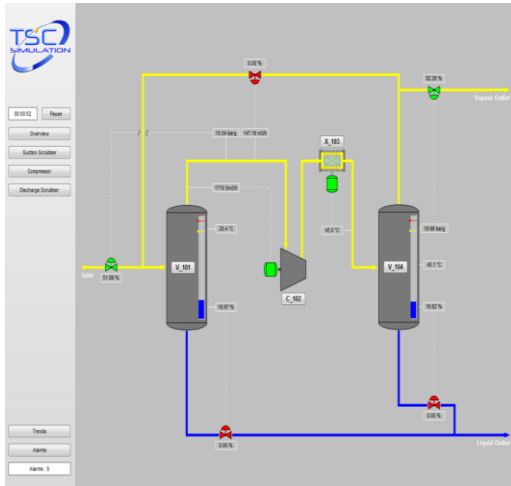
Simulator (Hands-on Practical Sessions)

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 our state-of-the-art simulators “Heat Exchanger Tube Layout”, “Centrifugal Pumps and Troubleshooting Guide 3.0”, “SIM 3300 Centrifugal Compressor”, “CBT on Compressors”, “Valve Sizing Simulator”, “Valve Simulator 3.0”, “Valvestar 7.2 Simulator”, “PRV²SIZE Simulator” and “ASPEN HYSYS” simulator.

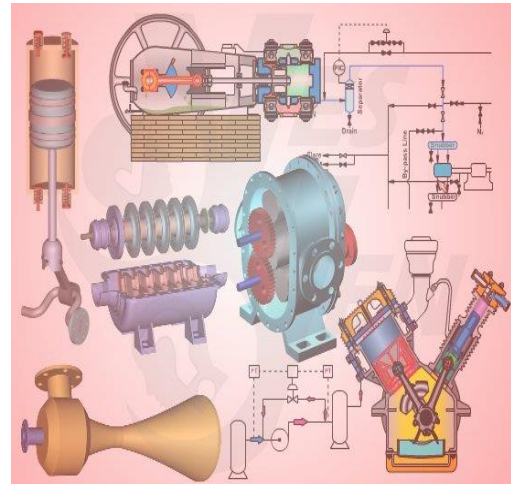




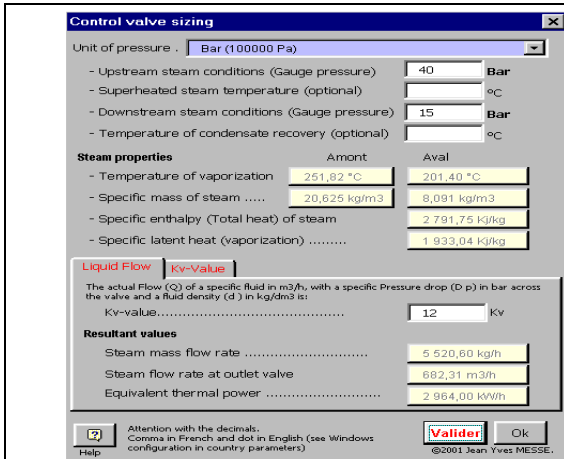
Centrifugal Pumps and Troubleshooting Guide 3.0



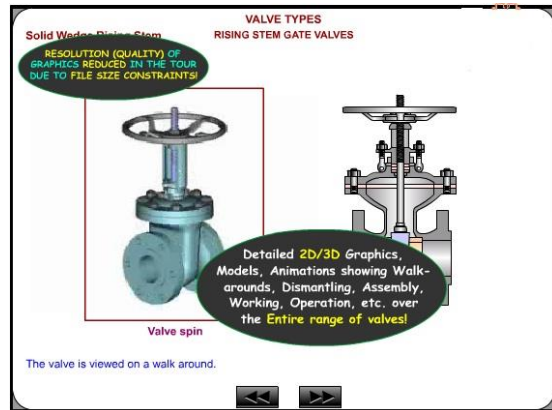
SIM 3300 Centrifugal Compressor Simulator



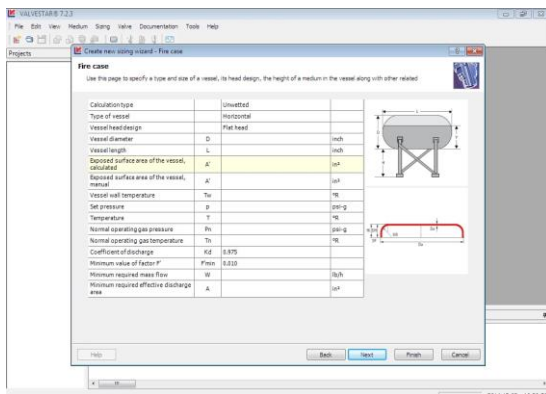
CBT on Compressors



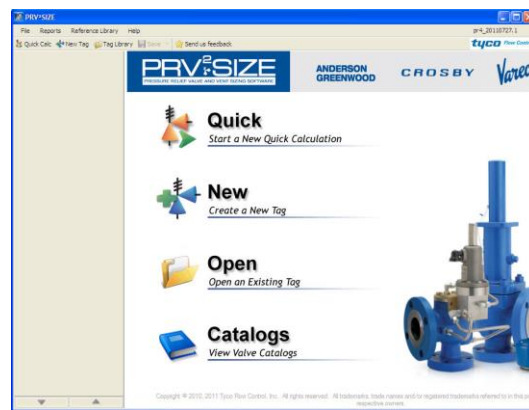
Valve Sizing Simulator



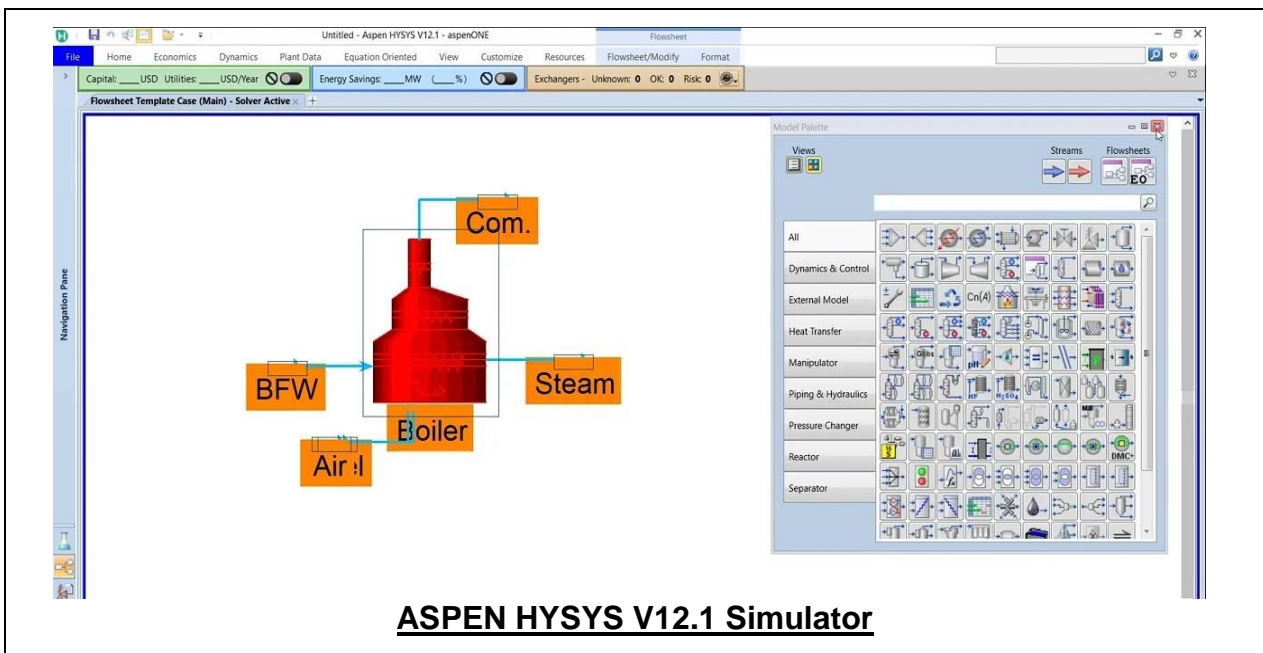
Valve Simulator 3.0



Valvestar 7.2 Simulator



PRV²SIZE Simulator



ASPEN HYSYS V12.1 Simulator

Course Coordinator

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