COURSE OVERVIEW PE1074
Blending & Mixing of Liquid Products

Course Title
Blending & Mixing of Liquid Products

Course Date/Venue
August 10-14,2025/Meeting Plus 9, City Centre Rotana Doha Hotel, Doha, Qatar

Course Reference
PE1074

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 Blending & Mixing of Liquid Products. It covers the liquid mixing, liquid phase mixing mechanisms and mixing equipment; the blending process design parameters, mixing tank design and configurations and process control in mixing; the use of blenders in process industries, pumps used in blending operations and heating and cooling systems in mixing; the emulsification and phase control, mixing and homogenization technologies and agitation and flow pattern optimization; the inline versus batch blending systems covering operational differences, cost, space and energy implications, real-time composition control and flexibility and scalability; and the real-time quality monitoring in blending, blending automation and PLC systems and troubleshooting common blending issues.

Further, the course will also discuss the CIP process steps and validation, cleaning agents for various product residues, equipment design for cleanability and sterilization methods for hygiene-critical industries; the GMP compliance in blending operations, industry applications of blending systems and blending for product consistency and quality; and the design and optimization of multi-stage blending and hazard analysis in liquid blending.

During this interactive course, participants will learn the environmental considerations in blending covering waste stream identification and handling, VOC emissions from blending tanks, recycling and reuse of by-products and ISO 14001 practices; the process flow diagrams (PFDs), P&ID elements for tanks, pumps and sensors, safety interlocks and relief systems and flow path and valve logic; and the auditing blending system performance covering energy efficiency analysis, downtime reduction techniques, equipment maintenance KPIs and blending system health assessment.

Course Objectives

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

- Apply and gain an in-depth knowledge on blending and mixing of liquid products
- Discuss liquid mixing, liquid phase mixing mechanisms and mixing equipment
- Recognize blending process design parameters and apply mixing tank design and configurations and process control in mixing
- Identify the use of blenders in process industries, pumps used in blending operations and heating and cooling systems in mixing
- Illustrate emulsification and phase control, mixing and homogenization technologies and agitation and flow pattern optimization
- Recognize inline versus batch blending systems covering operational differences, cost, space and energy implications, real-time composition control and flexibility and scalability
- Carryout real-time quality monitoring in blending, blending automation and PLC systems and troubleshoot common blending issues
- Employ CIP process steps and validation, cleaning agents for various product residues, equipment design for cleanability and sterilization methods for hygiene-critical industries
- Carryout GMP compliance in blending operations, industry applications of blending systems and blending for product consistency and quality
- Design and optimize multi-stage blending and apply hazard analysis in liquid blending
- Discuss environmental considerations in blending covering waste stream identification and handling, VOC emissions from blending tanks, recycling and reuse of by-products and ISO 14001 practices
- Illustrate process flow diagrams (PFDs), P&ID elements for tanks, pumps and sensors, safety interlocks and relief systems and flow path and valve logic
- Audit blending system performance covering energy efficiency analysis, downtime reduction techniques, equipment maintenance KPIs and blending system health assessment

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 a complete and up-to-date overview of blending and mixing of liquid products for process engineers, production supervisors, quality control specialists, refinery operators, chemical technicians, plant managers and those who are involved in the formulation, blending, quality assurance and handling of liquid petroleum products.

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.

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. Henry Beer is a **Senior Process Engineer** with over **30 years** of indepth industrial experience within the **Petrochemical**, **Oil & Gas** industries specializing in **Hydrocarbon Process** Equipment, **DOX Unit** Operation & Troubleshooting, Mixing of **Liquids** & Complex Materials, Industrial **Liquid Mixing,** Refinery & Petroleum Products Quality Specifications, **Blending, Mixing**, Optimization, Operational Planning, Quality Control & Profitability, **Liquid Phase Mixing** Mechanisms, **Tank Design & Configurations, Heating & Cooling Systems in Mixing,** Quality Monitoring in **Blending, Emulsification & Phase Control, GMP** Compliance in Blending Operations, **ISO 14001** Practices, **Pump & Blender** Integration, **Polyethylene & Polypropylene** Processing, **Oil Movement** Storage & Troubleshooting, **Power Plant Chemistry**, **Fuel Quality** Monitoring System Fundamentals, **Liquid Bulk Cargo Handling**, **Oil Refinery Cost Management**, **Flare & Blowdown** Operation, **Pressure Relief Systems** Maintenance & Troubleshooting, Refinery **SRU**, **Tail Gas** Treating, **Sour Water & Amine Recovery** Units, **Propylene** Compressor and Turbine, **Clean Fuel** Technology & Standards, Principles of **Operations Planning**, **Heat Exchangers & Fired Heaters** Operation & Troubleshooting, **Plastic Extrusion Technology** Operation & Troubleshooting, **Chemical Engineering** for Non-Chemical Engineers, **Process Plant** Troubleshooting, **Process Plant Optimization** Technology, **Engineering Problem Solving**, **Process Plant** Performance & Efficiency, **Process Plant** Start-up & Shutdown, **Process Plant** Commissioning, **Process Plant** Turn-around & Shutdown, **Pumps & Compressors** Troubleshooting, **Fired Heaters & Air Coolers** Maintenance, **Pressure Vessels & Valves** Repair, **Polymers**, **Plastics**, **Polyolefin** & **Catalysts**, **Polymerization**, **Thermal Analysis Techniques**, **Rheology**, **Thermoplastics**, **Thermosets**, **Coating Systems** and **Fibre Reinforced Polymer Matrix Composites**. Further, he is also well-versed in **Water Hydraulic Modelling**, **Efficient** Shutdowns, Turnaround & Outages, **Pump** Selection and Installation, Operation and Maintenance of **Pumps**, **Demand & Supply** Management, **Catalyst Manufacturing Techniques**, **Fuel Systems Management**, **Aviation Fuel**, **Diesel**, **Jet Fuel**, **Petrol** and **IP Octane**, **Cetane Control** and related Logistics, Road, Rail and Pipeline Distribution, **Process Design** and **Optimisation**, **Boiler Feed Water Preparation**, **Flocculation Sedimentation**, **Hot Lime Water Softening Processes**, **Desalination Processes**, **Reverse Osmosis**, **Molecular Sieves**, activated **Sludge Aerobic/Anaerobic**, **Sludge Removal** and **Incineration Process Control**, **Domestic Sewage Plants Optimisation**, **Process Cooling Water System**, **High Pressure** and **Low Pressure Tank Farm Management**, **Hydrocarbon** and **Chemical products** and **GTL** (**Gas to Liquids**).

During his career life, Mr. Beer holds significant key positions such as the **Director**, **Global Commissioning Manager**, **Process Engineering Manager**, **Senior Business Analyst**, **Process Engineer**, **Chemical Engineer**, **Senior Technician**, **Technical Sales Engineer**, **Entrepreneur**, **Financial Consultant**, **Business Analyst**, **Business Financial Planner** and **Independent Financial Planner** to various international companies such as the **Sasol**, **SASOLChem**, **TAG Solvents**, **Virgin Solvent Products**, **SARS** & **SAPIA** (**South African Petroleum Industry Association**) and **RFS Financial Services** (**Pty**) **Ltd**.

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 Fee

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

Accommodation

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

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: ***Sunday, 10th of August 2025***

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Introduction to Liquid Mixing*** *Types of Liquid Products (Oil, Water, Chemical Bases) • Purpose & Importance of Mixing in Industrial Processes • Batch versus Continuous Mixing Systems • Key Physical and Chemical Considerations*
0930 – 0945	*Break*
0945 – 1030	***Liquid Phase Mixing Mechanisms*** *Molecular Diffusion & Convection • Laminar & Turbulent Flow in Mixing • Miscible versus Immiscible Liquids • Role of Viscosity & Density Differences*
1030 – 1130	***Mixing Equipment Overview*** *Mixers & Agitators Types (Propeller, Turbine, Paddle) • Inline versus Tank Mixing Systems • Dynamic & Static Mixers • Material Selection for Equipment*
1130 – 1215	***Blending Process Design Parameters*** *Mixing Time & Intensity • Mixing Energy & Power Requirements • Reynolds Number & Mixing Scale-Up • Mixing Zones (Bulk Flow, Vortex, Dead Zones)*
1215 – 1230	*Break*
1230 – 1330	***Mixing Tank Design & Configurations*** *Tank Geometry & Volume • Baffles & Their Function • Bottom versus Side Entry Mixers • Open versus Closed Tanks*

1330 – 1420	***Basics of Process Control in Mixing*** *Basic Control Loop Concepts • Sensors & Transmitters for Flow, Temperature, pH • Feedback & Feedforward Controls • Monitoring Mixing Performance*
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, 11th of August 2025

0730 – 0830	***Use of Blenders in Process Industries*** *Types: Ribbon, Paddle, Emulsifier, Static Mixers • Industrial Applications (Oil Blending, Detergents, Chemicals) • Factors Influencing Blender Selection • Power & Torque Requirements*
0830 – 0930	***Pumps Used in Blending Operations*** *Centrifugal versus Positive Displacement Pumps • Pump Selection for Viscous & Shear-Sensitive Liquids • Flow Rate & Head Calculation • Pump & Blender Integration*
0930 – 0945	*Break*
0945 – 1100	***Heating & Cooling Systems in Mixing*** *Temperature Control & Its Importance • Jacketed Vessels & Heat Exchangers • Thermocouples & Temperature Feedback • Cooling Media: Water, Glycol, Chilled Air*
1100 – 1215	***Emulsification & Phase Control*** *Types of Emulsions (Oil-in-Water, Water-in-Oil) • Role of Surfactants & Emulsifiers • Emulsion Stability & Breaking Techniques • Homogenization Techniques*
1215 – 1230	*Break*
1230 – 1330	***Mixing & Homogenization Technologies*** *Rotor-Stator Systems • Ultrasonic Mixing • High-Shear Mixers • Inline Homogenizers*
1330 – 1420	***Agitation & Flow Pattern Optimization*** *Axial versus Radial Flow Impellers • Vortex Formation & Control • Shear Rate Implications • Mixing Uniformity Evaluation*
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, 12th of August 2025

0730 – 0830	***Inline versus Batch Blending Systems*** *Operational Differences • Cost, Space & Energy Implications • Real-Time Composition Control • Flexibility & Scalability*
0830 – 0930	***Real-Time Quality Monitoring in Blending*** *Flowmeters, Viscosity Meters, & Densitometers • Inline Sampling Techniques • Spectroscopy & NIR Sensors • Digital Process Control Integration*
0930 – 0945	*Break*
0945 – 1100	***Blending Automation & PLC Systems*** *Automated Blending Logic • Recipe Control Systems • PLC-Based Programming for Blending Control • Alarm Management & Interlocks*

1100 – 1215	***Troubleshooting Common Blending Issues*** *Poor Mixing or Stratification • Phase Separation & Emulsification Failure • Contamination or Cross-Mixing • Pump Cavitation or Overheating*
1215 – 1230	*Break*
1230 – 1330	***Cleaning, Sterilization & CIP Practices*** *CIP Process Steps & Validation • Cleaning Agents for Various Product Residues • Equipment Design for Cleanability • Sterilization Methods for Hygiene-Critical Industries*
1330 – 1420	***GMP Compliance in Blending Operations*** *Documentation & Traceability Requirements • Equipment Calibration & Maintenance Logs • Risk Assessment & Deviation Handling • Personnel Hygiene & Cleanroom Behavior*
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*

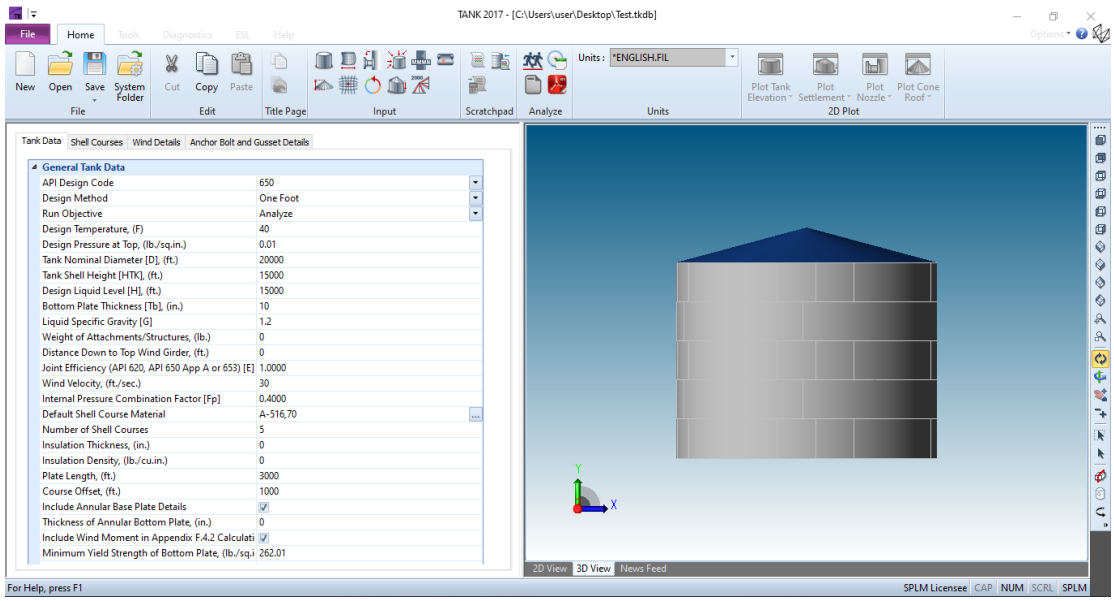
Day 4: ***Wednesday, 13th of August 2025***

0730 – 0830	***Industry Applications of Blending Systems*** *Oil & Gas: Fuel Blending & Additives • Water Treatment: Chemical Dosing & pH Control • Pharma & Cosmetics: Creams, Lotions, Syrups • Food & Beverage: Juices, Sauces, Dairy*
0830 – 0930	***Blending for Product Consistency & Quality*** *Product Uniformity Validation • Sampling Protocols & Lab Testing • Statistical Process Control (SPC) • Regulatory & Customer Compliance*
0930 – 0945	*Break*
0945 – 1100	***Design & Optimization of Multi-Stage Blending*** *Cascade Blending Tanks • Multi-Zone Heating/Mixing • Multi-Ingredient Blending • Optimization Using Simulation Software*
1100 – 1215	***Hazard Analysis in Liquid Blending*** *HAZOP & FMEA in Mixing Operations • Chemical Compatibility Charts • Explosion Risks with Solvents • Leak & Spill Containment Systems*
1215 – 1230	*Break*
1230 – 1330	***Environmental Considerations in Blending*** *Waste Stream Identification & Handling • VOC Emissions from Blending Tanks • Recycling & Reuse of By-Products • ISO 14001 Practices*
1330 – 1420	***Case Studies: Operational Blending Scenarios*** *Blending Failure Analysis • Optimization Success Stories • Operator Error & Consequences • Lessons Learned from Audits*
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*

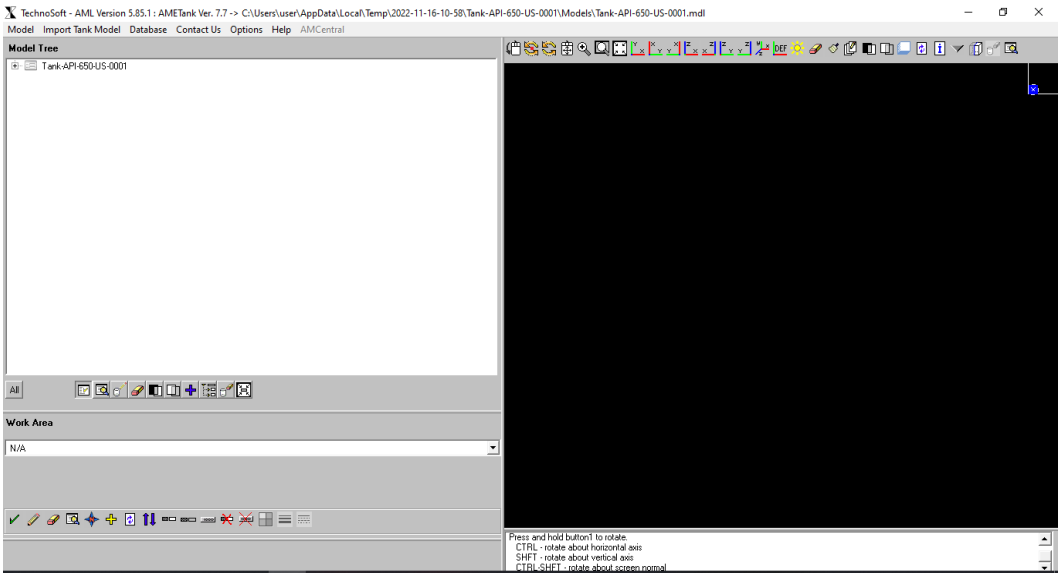
Day 5:	***Thursday, 14th of August 2025***
0730 – 0830	***Blending Plant Layout & P&ID Interpretation*** *Process Flow Diagrams (PFDs) • P&ID Elements for Tanks, Pumps, and Sensors • Safety Interlocks & Relief Systems • Flow Path & Valve Logic*
0830 – 0930	***Simulation of Blending Processes*** *Introduction to Software (e.g., CHEMCAD, Aspen Plus) • Setting Blending Ratios & Material Properties • Emulsification Modeling • Troubleshooting Virtual Scenarios*
0930 – 0945	*Break*
0945 – 1215	***Hands-On Troubleshooting Workshop*** *Identifying Common Faults • Simulated Startup & Shutdown • Root Cause Analysis Exercises • Emergency Handling During Phase Failure*
1215 – 1230	*Break*
1230 – 1345	***Auditing Blending System Performance*** *Energy Efficiency Analysis • Downtime Reduction Techniques • Equipment Maintenance KPIs • Blending System Health Assessment*
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)

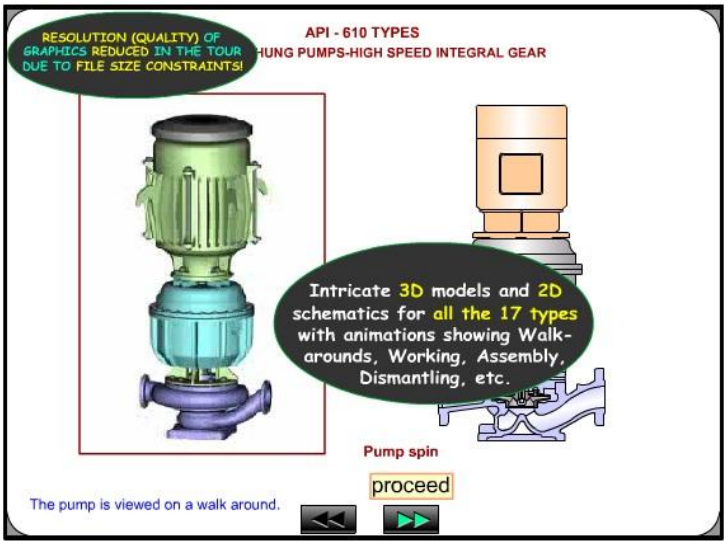
Practical sessions will be organized during the workshop for delegates to practice the theory learnt. Delegates will be provided with an opportunity to carryout various exercises using our state-of-the-art simulators "Hexagon PPM COADE TANK 2017 SP1 v9.00.01 (Integraph Tank)", "AME Tank v7.7", "Centrifugal Pumps and Troubleshooting Guide 3.0", "ASPEN HYSYS V12.1 Simulator" and "Heat Exchanger Tube Layout Simulator".



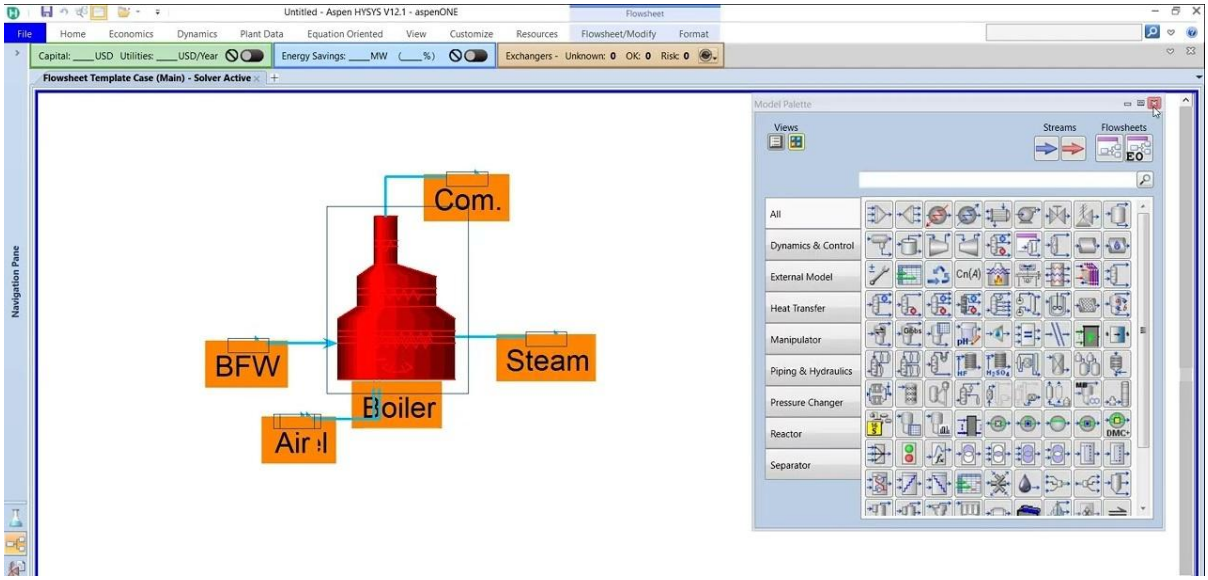
Hexagon PPM COADE TANK 2017 SP1 v9.00.01 (Integraph Tank)



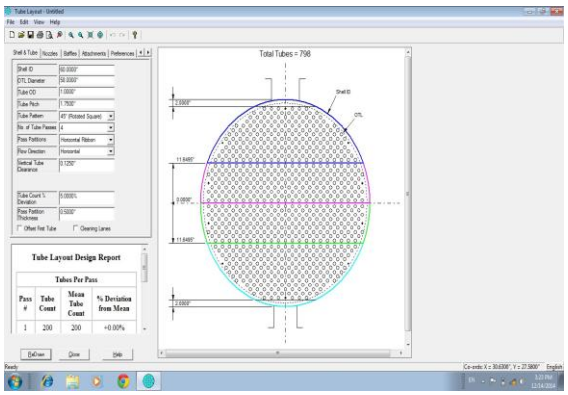
AME Tank v7.7



Centrifugal Pumps and Troubleshooting Guide 3.0



ASPEN HYSYS V12.1 Simulator



Heat Exchanger Tube Layout Simulator

Course Coordinator
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