

**COURSE OVERVIEW PE0230**  
**Process Plant Start-up, Commissioning & Troubleshooting**

**Course Title**

Process Plant Start-up, Commissioning & Troubleshooting

**Course Date/Venue**

March 03-07, 2024/Oryx 1 Meeting Room, Wyndham Grand Doha West Bay Beach, Doha, Qatar

**Course Reference**

PE0230

**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.***



Plant modifications are an ongoing process throughout the life of any process plant. Reasons for modification include efforts to improve reliability, production capacity, quality, or productivity. Seamless incorporation is the key concern associated with the installation of any new equipment in an operating plant due to the high cost of process downtime. Several steps shall be taken to minimise the risk associated with the installation of new equipment such as hazard and operability studies, project management, development of redundancy plans, and commissioning of the new equipment.



Start-up and commissioning are essential activities in all process plant-modification projects and have significant implications for project success. Yet paradoxically they tend to be approached in an ad hoc manner. Commissioning is often included in project plans, so it is not that people are ignorant. However, there is usually a lack of systematic approaches to commissioning, so it is frequently left to tradespeople and plant operators to manage in whatever way they see fit. This is an undesirable situation since it results in unpredictable outcomes. In some cases it can even cause serious problems. Lack of experience in dealing with these problems has frequently resulted in prolonged and costly start-ups, caused by inadequate preparation for the events of start-up.

This course is designed to provide participants with an up-to-date overview of the start-up and commissioning of Process plants including troubleshooting of the start-up process. It includes the methodology for start-up and commissioning of process plants, which can be used when commissioning a new plant, or for modified equipment in an existing facility, or in a turnaround, shutdown or overhaul scenario. It takes the approach that commissioning is a series of checks and counter-checks to confirm every unit in the process plant is fit for purpose and suitable for operation.

During the course, each participant will gain enough skills to anticipate and avoid problems associated with start-up processes. Participants will gain a satisfactory understanding of the commissioning strategy, organizational issues, estimation of required resources, CPM planning, mechanical integrity, troubleshooting, start-up operations, technical inspection, instrumentation/control systems, HSE and other necessary knowledge associated with the process plant start-up and commissioning. Actual case studies from around the world will be demonstrated to highlight the topics discussed.

### Course Objectives

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

- Apply systematic techniques in process plant start-up, commissioning and troubleshooting
- Carryout planning and preparation as well as cost estimation
- Discuss health, safety and environment, process plant start-up management and develop process plant commissioning strategy
- Conduct mechanical integrity testing and pre-commissioning, technical inspection and dynamic hydraulic testing
- Explain construction completion and the importance of machinery commissioning
- Apply start-up operations, start-up progress monitoring and control as well as determine instrumentation and control systems in commissioning process
- Demonstrate performance trials, troubleshooting and problem solving
- Implement change management including operational techniques and post commissioning audit in process plants

### 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 the process plant start-up and commissioning for those involved in the start-up operations of a process plant. This includes process engineers, team leaders, project managers, refinery managers, plant managers, section heads, plant supervisors, process engineers, maintenance staff, technical staff and contractor personnel involved in project execution and plant start-up in process industry. Mechanical, electrical, instrumentation and control engineers who are involved in process plant start-up and commissioning will also benefit from this course.

### 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 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 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 **35 years** of indepth industrial experience within the **Petrochemical, Oil & Gas** industries specializing in **Hydrocarbon Process Equipment, DOX Unit Operation & Troubleshooting, 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 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, 03<sup>rd</sup> of March 2024**

0730 – 0800	<i>Registration &amp; Coffee</i>
0800 – 0815	<i>Introduction &amp; Welcome</i>
0815 – 0830	<b>PRE-TEST</b>
0830 – 0930	<b>Introduction to Process Plant Commissioning</b> <i>Terminology • Requirements • Project Details • Contracting Strategy • Organizational Structure &amp; Responsibilities • Success Measures &amp; Problem Avoidance</i>
0930 – 0945	<i>Break</i>
0945 – 1230	<b>Planning &amp; Preparation</b> <i>Project Planning, Critical Path (CPM/PERT) • Gantt Chart • Logic Diagrams • Planning Methods • Preparation of Checklists &amp; Spare Parts Planning</i>
1230 – 1245	<i>Break</i>
1245 – 1330	<b>Cost Estimation</b> <i>Budget Components • Estimation Sheets • Resource Prediction • Extra Costs &amp; Change Orders</i>
1330 – 1420	<b>Cost Estimation (cont'd)</b> <i>Spare Parts • Inventory • Material Ordering • MIS &amp; Cost Control</i>
1420 – 1430	<b>Recap</b>
1430	<i>Lunch &amp; End of Day One</i>

#### **Day 2: Monday 04<sup>th</sup> of March 2024**

0730 – 0930	<b>Health, Safety &amp; Environment</b> <i>Hazard &amp; Operability Analysis (HAZOP) • Hazard Analysis (HAZAN) • Process Safety Management (PSM) • Root Cause Analysis &amp; Why Trees • Risk Assessment</i>
0930 – 0945	<i>Break</i>
0945 – 1230	<b>Health, Safety &amp; Environment (cont'd)</b> <i>Hazard Identification • Safety Training • HSE Problems &amp; contingency plans • Safety Procedures &amp; Implementation • Safety Manual</i>

1230 – 1245	<i>Break</i>
1245 – 1330	<b>Process Plant Start-Up Management</b> <i>Responsibilities &amp; Authorities • Organizational Structure • Manpower &amp; Staffing • Coordination Procedures • Leadership</i>
1330 – 1420	<b>Process Plant Commissioning Strategy</b> <i>The Commissioning Team • Training • Commissioning Strategy • Start-Up Procedures &amp; Logic</i>
1420 – 1430	<b>Recap</b>
1430	<i>Lunch &amp; End of Day Two</i>

**Day 3: Tuesday, 05<sup>th</sup> of March 2024**

0730 – 0900	<b>Mechanical Integrity Testing &amp; Pre-commissioning</b> <i>Hydraulic Testing • Flushing • Breaking-in Pumps • Drying Heaters</i>
0900 – 0915	<i>Break</i>
0915 – 1100	<b>Technical Inspection &amp; Dynamic Hydraulic Testing</b> <i>Vessel &amp; Column Internals • Dynamic Loop Testing • Tightness Testing</i>
1100 – 1230	<b>Construction Completion (The Beginning of Start-Up)</b> <i>Construction Schedules vs. Start-Up Needs • Start-Up by Systems • Systems Definition • Punch Listing • Handover</i>
1230 – 1245	<i>Break</i>
1245 – 1420	<b>Machinery Commissioning</b> <i>Types of Process Equipment Plant Machinery • Preparation of Machines • Compressor Commissioning • Compressor Surge</i>
1420 – 1430	<b>Recap</b>
1430	<i>Lunch &amp; End of Day Three</i>

**Day 4: Wednesday, 06<sup>th</sup> of March 2024**

0730 – 0930	<b>Start-Up Operations</b> <i>Isolation of Vessels &amp; Pipes • Types of Isolation • Initial Start-Up Activities • Steaming • Fuel Gas or Nitrogen Purge • Feed-in</i>
0930 – 0945	<i>Break</i>
0945 – 1100	<b>Start-Up Progress Monitoring &amp; Control</b> <i>Planning for Success • Sequence by Units • Sequence by Systems • Recovery from False Starts</i>
1100 – 1230	<b>Instrumentation &amp; Control Systems</b> <i>Instrument Commissioning • Start-up Problems &amp; Causes</i>
1230 – 1245	<i>Break</i>
1245 – 1420	<b>Performance Trials</b> <i>Performance &amp; Acceptance Testing, Preliminary Tests • Performance Test Runs</i>
1420 – 1430	<b>Recap</b>
1430	<i>Lunch &amp; End of Day Four</i>

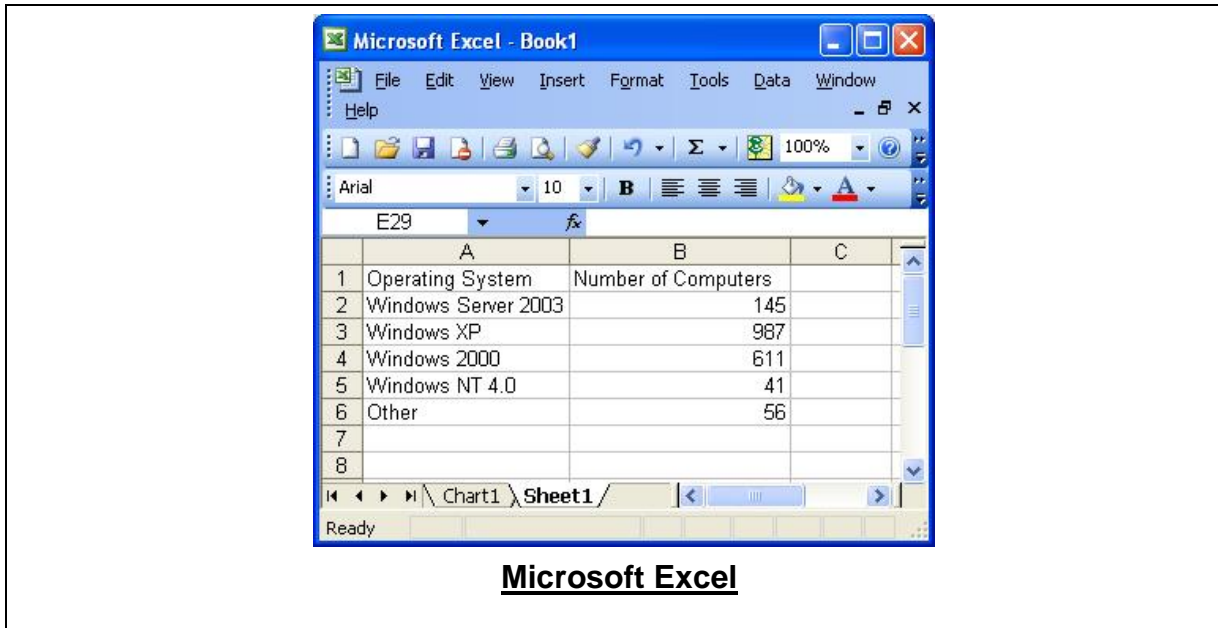
**Day 5: Thursday, 07<sup>th</sup> of March 2024**

0730 – 0930	<b>Troubleshooting &amp; Problem Solving</b> Identification of Problems & Priorities • Resource Allocation & Teamwork • Data Collection & Solution Selection
0930 – 0945	Break
0945 – 1100	<b>Troubleshooting &amp; Problem Solving (cont'd)</b> Troubleshooting Techniques • RCFA & RCM • Murphy's law
1100 – 1215	<b>Change Management</b> Implementation of Change • Success Measures • Operational Techniques • Post Commissioning Audit • Close-out Certificates
1215 – 1230	Break
1230 – 1345	<b>Case Studies</b>
1345 – 1400	<b>Course Conclusion</b>
1400 – 1415	<b>POST-TEST</b>
1415 – 1430	Presentation of Course Certificates
1430	Lunch & End of Course

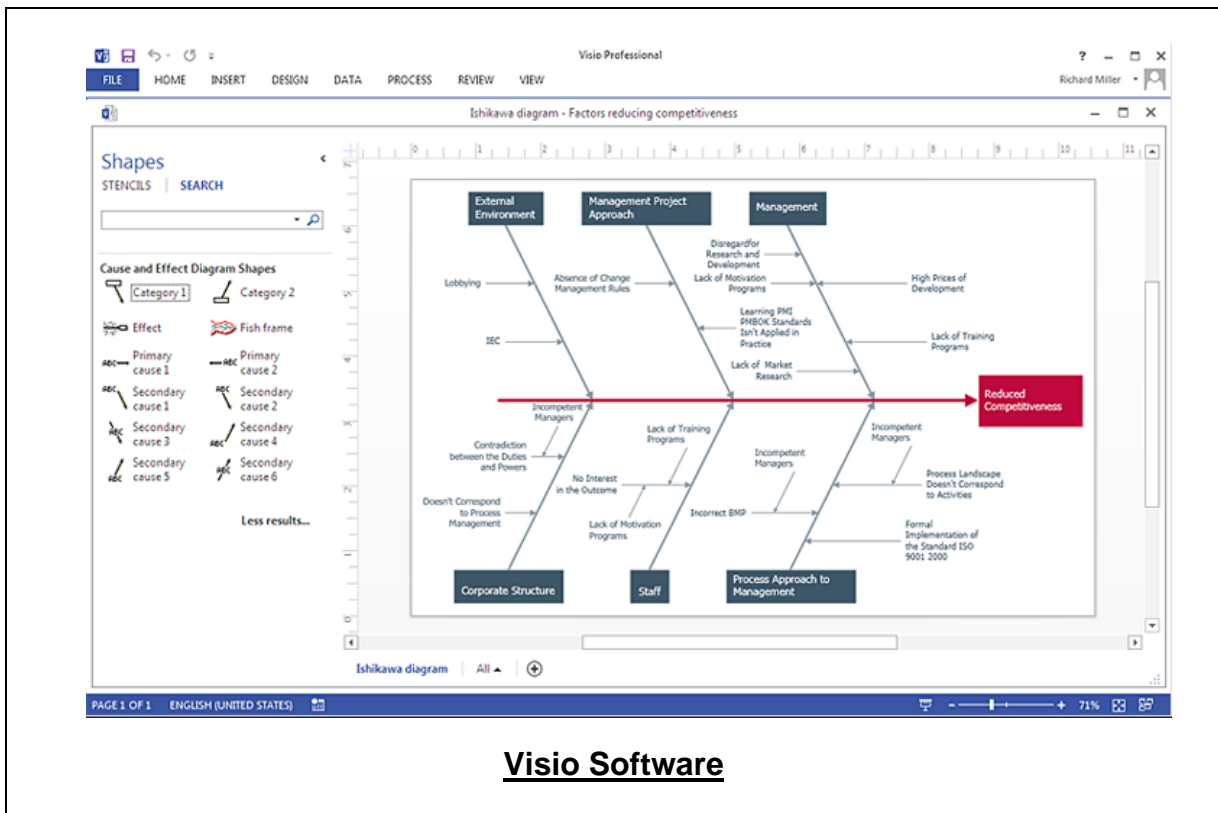
**Simulator (Hands-on Practical Sessions)**

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 “MS -Project”, “MS-Excel”, “Visio Software”, “Mindview Software”, “PHA/HAZOP Simulator”, “SIM 3300 Centrifugal Compressor Simulator”, “Centrifugal Pumps and Troubleshooting Guide 3.0” simulators and “ASPEN HYSYS” simulator.



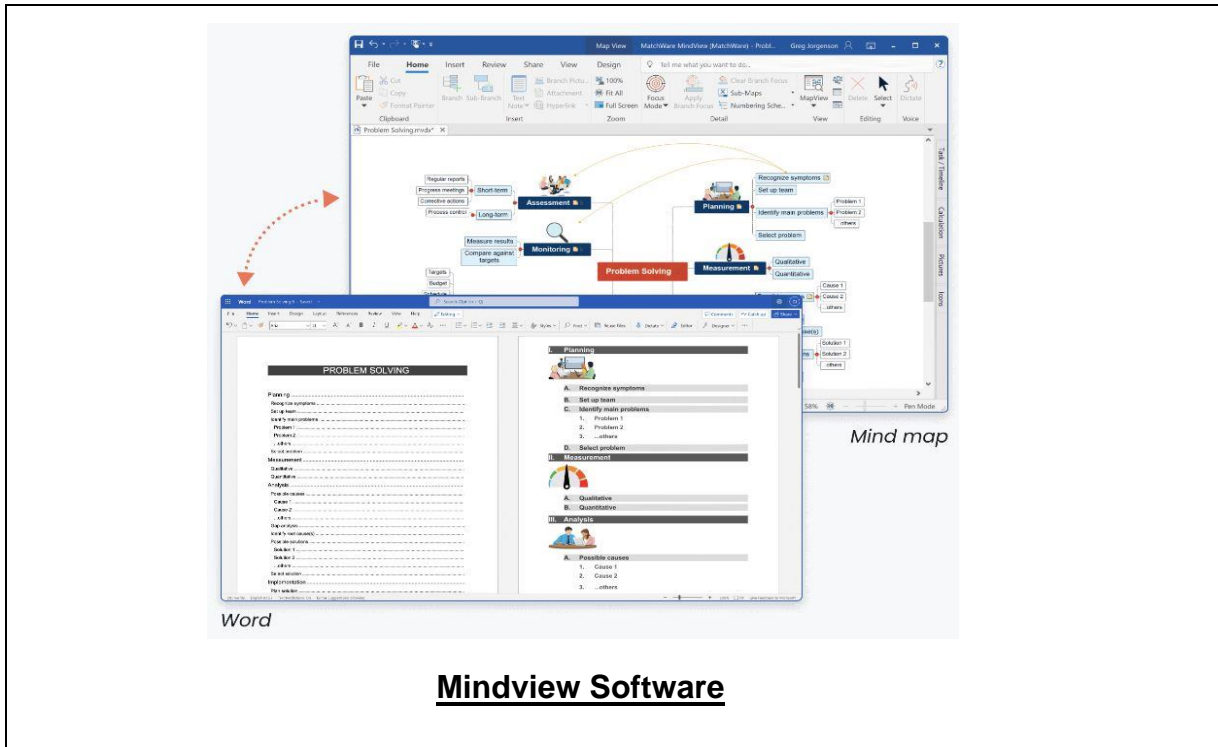


**Microsoft Excel**



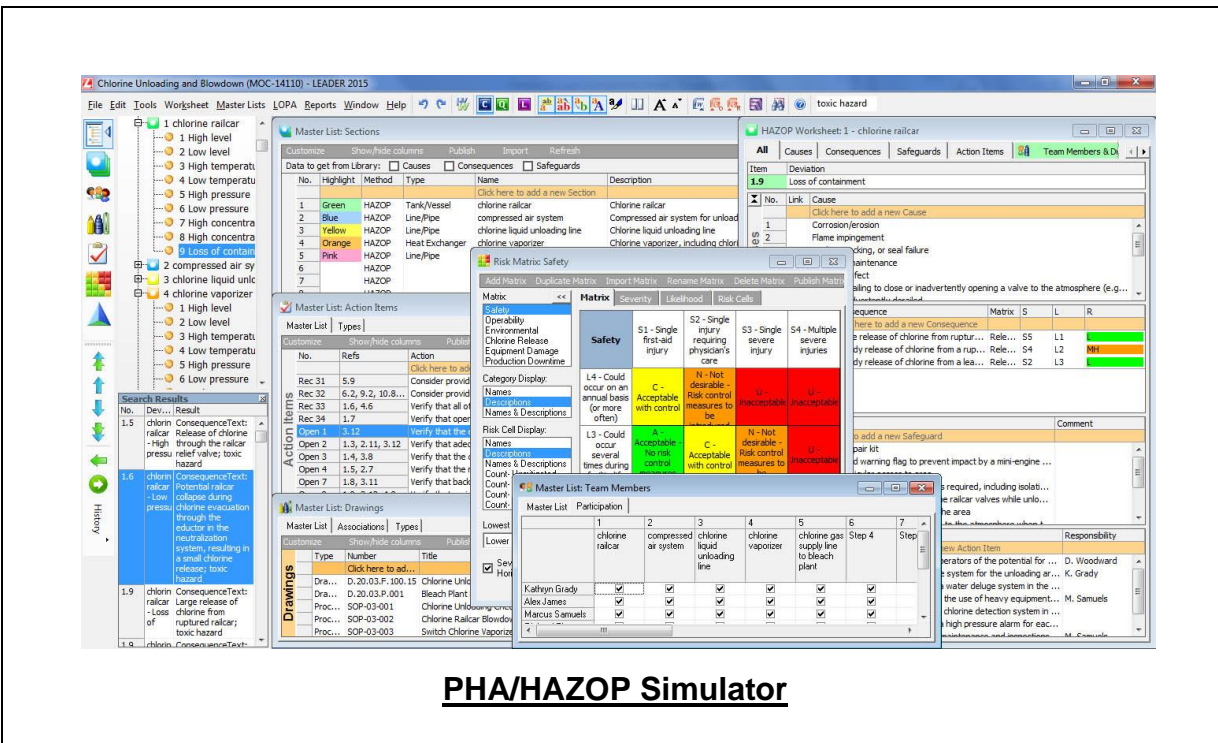
**Visio Software**





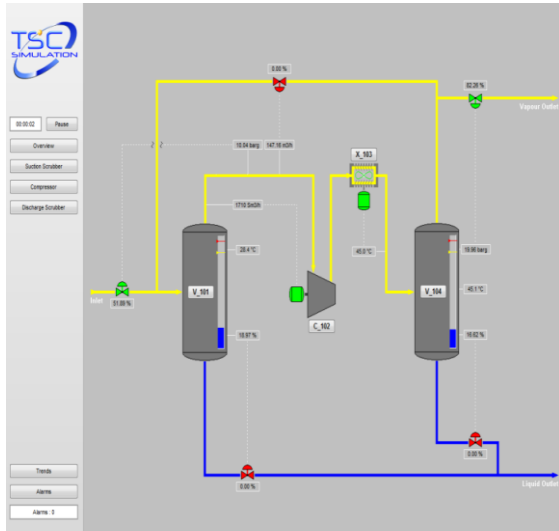
The screenshot displays the Mindview Software interface. At the top, a mind map is visible with nodes for 'Regular reports', 'Short-term', 'Assessment', 'Planning', 'Recognize symptoms', 'Set up team', 'Identify main problems', 'Problem 1', 'Problem 2', 'Others', 'Select problem', 'Measurement', 'Qualitative', and 'Quantitative'. Below the mind map, a window titled 'PROBLEM SOLVING' is open, showing a 'Word' document on the left and a 'Mind map' on the right. The 'Word' document contains text under the heading 'PROBLEM SOLVING', including sections for 'Planning', 'Measurement', and 'Analysis'. The 'Mind map' window shows a hierarchical structure with nodes for 'Recognize symptoms', 'Identify main problems', 'Select problem', 'Measurement', and 'Analysis'. The software interface includes a menu bar with options like 'File', 'Home', 'Insert', 'Review', 'Share', 'View', 'Design', and a toolbar with various icons.

**Mindview Software**

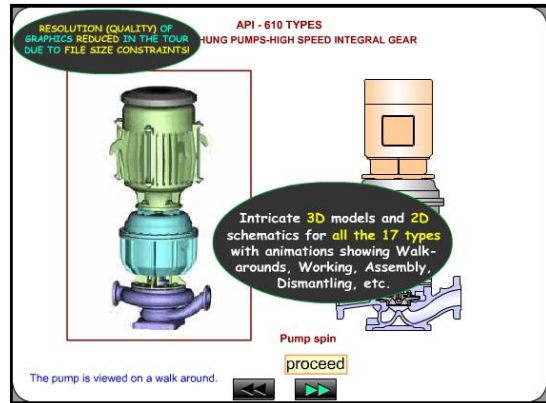


The screenshot displays the PHA/HAZOP Simulator software interface. The main window is titled 'Chlorine Unloading and Blowdown (MOC-14110) - LEADER 2015'. It features a sidebar with a tree view of hazard categories, including 'chlorine railcar', 'High level', 'Low level', 'High temperature', 'Low temperature', 'High pressure', 'Low pressure', 'High concentration', 'Low concentration', 'Less of contain', 'compressed air sy', 'chlorine liquid unli', 'chlorine vaporizer', and 'High level', 'Low level', 'High temperatu', 'Low pressure'. The main area is divided into several panes: 'Master List: Sections' with a table of sections, 'Master List: Action Items' with a table of actions, 'Master List: Drawings' with a table of drawings, 'Risk Matrix Safety' with a color-coded risk matrix, and 'Master List: Team Members' with a table of team members. The 'Risk Matrix Safety' table is a 4x4 grid with columns for 'Safety', 'Severity', 'Likelihood', and 'Risk Cells'. The 'Master List: Team Members' table has columns for 'Participation' and 'Responsibility'. The interface includes a menu bar with options like 'File', 'Edit', 'Tools', 'Worksheet', 'Master Lists', 'LOPA', 'Reports', 'Window', 'Help', and a toolbar with various icons.

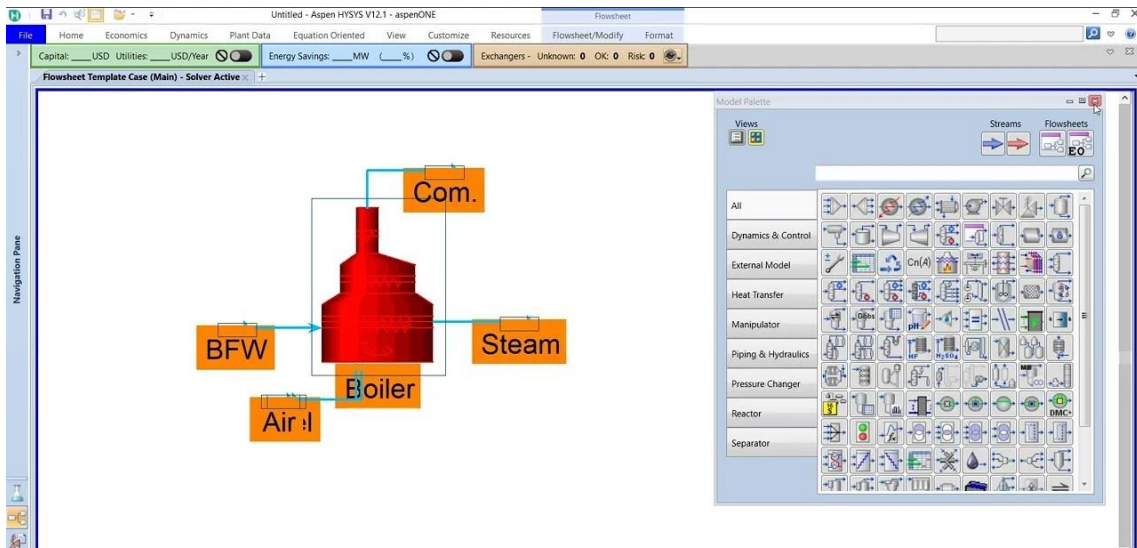
**PHA/HAZOP Simulator**



**SIM 3300 Centrifugal Compressor Simulator**



**Centrifugal Pumps and Troubleshooting Guide 3.0**



**ASPEN HYSYS V12.1 Simulator**

**Course Coordinator**

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