COURSE OVERVIEW IE0535
Hydrocarbon Liquid Measurement using Flow Computers

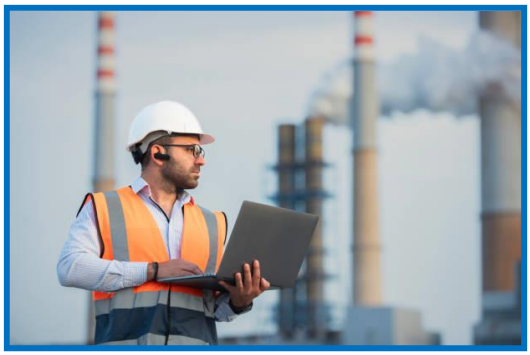
Course Title
Hydrocarbon Liquid Measurement using Flow Computers

Course Date/Venue
October 05-09, 2025/Tamra Meeting Room, Al Bandar Rotana Creek, Dubai, UAE

Course Reference
IE0535

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 one of our state-of-the-art simulators.

This course is designed to provide participants with a detailed and up-to-date overview of Hydrocarbon Liquid Measurement using Flow Computers. It covers the hydrocarbon liquid measurement, flow measurement technologies and measurement standards and compliance; the basic metering system components and purpose and functionality of flow computers in metering; the inputs and outputs, hardware architecture and real-time data acquisition and integration; the detailed flow computer architecture and signal inputs and instrumentation; configuring flow computers, meter proving and factor calculation; and the redundancy, alarms and fail-safe logic.

Further, the course will also discuss the gross, net and standard volume, base conditions and standard reference; the impact of temperature and pressure on volume and correction factor formulas; the temperature compensation using flow computers, pressure compensation in liquid systems and density and viscosity corrections; when to use mass flow measurement; and the comparison of coriolis versus volumetric systems, mass-to-volume conversion logic and standard versus actual mass flow.

During this interactive course, participants will learn the flow computer communication protocols, data logging and audit trail; calibrating temperature and the pressure inputs and pulse verification; the signal simulation, meter factor verification and calibration frequency and documentation; the preventive maintenance of flow systems and troubleshooting measurement errors; the custody transfer and fiscal metering, batch measurement and ticketing and auditing and regulatory compliance; the real-time data upload to control rooms, flow data into ERP systems, cybersecurity and data protection and cloud-based measurement systems; and the advanced applications and trends covering multiphase flow measurement, smart meters and IIoT in metering, remote diagnostics and edge computing and environmental and emission monitoring.

Course Objectives

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

- Apply and gain an in-depth knowledge on hydrocarbon liquid measurement using flow computers
- Discuss hydrocarbon liquid measurement, flow measurement technologies and measurement standards and compliance
- Identify basic metering system components and explain the purpose and functionality of flow computers in metering, inputs and outputs, hardware architecture and real-time data acquisition and integration
- Describe detailed flow computer architecture and signal inputs and instrumentation
- Configure flow computers, apply meter proving and factor calculation and identify redundancy, alarms, and fail-safe logic
- Discuss gross, net, and standard volume, base conditions and standard reference, impact of temperature and pressure on volume and correction factor formulas
- Apply temperature compensation using flow computers, pressure compensation in liquid systems and density and viscosity corrections
- Recognize when to use mass flow measurement, comparison of coriolis versus volumetric systems, mass-to-volume conversion logic and standard versus actual mass flow
- Discuss flow computer communication protocols, data logging and audit trail
- Calibrate temperature and pressure inputs and apply pulse verification and signal simulation, meter factor verification and calibration frequency and documentation
- Employ preventive maintenance of flow systems and troubleshooting measurement errors
- Apply custody transfer and fiscal metering, batch measurement and ticketing and auditing and regulatory compliance
- Carryout real-time data upload to control rooms, flow data into ERP systems, cybersecurity and data protection and cloud-based measurement systems
- Discuss advanced applications and trends covering multiphase flow measurement, smart meters and IIoT in metering, remote diagnostics and edge computing and environmental and emission monitoring

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 hydrocarbon liquid measurement using flow computers for process engineers, automation engineers, SCADA engineers, regulatory and compliance personnel, measurement and instrumentation personnel and other technical staff.

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$ 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.

Accommodation

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

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. Sydney Thoresson, PE, BSc, is a **Senior Electrical & Instrumentation Engineer** with over **30 years** of extensive experience within the **Petrochemical**, **Utilities**, **Oil**, **Gas** and **Power** industries. His specialization highly evolves in **Process Control Instrumentation**, **Process Instrumentation & Control**, **Process Control**, **Instrumentation**, **Troubleshooting** & Problem Solving, Process **Instrumentation** and Control Techniques, **Instrumentation** for Process Optimization and Control, Process Automation and **Instrumentation** Systems Integration, Troubleshooting in Process Control Systems**,** Process Control & Safeguarding, **Troubleshooting Instrumentation** and Control Systems, GC Processes **Troubleshooting** and Control Systems, Practical **Troubleshooting** and Repair of Electronic Circuits**,** Process Control, **Troubleshooting** & **Problem Solving.** Process Control (**PCI**) & Safeguarding, **Control Loop & Valve Tuning**, **Controller Maintenance** Procedures, High Integrity Protection Systems (**HIPS**), **Instrument Calibration & Maintenance**, **Instrumented Safety Systems**, **Compressor Control & Protection**, **Control Systems**, Programmable Logic Controllers (**PLC**), **SCADA System**, **PLC & SCADA** - Automation & Process Control, **PLC & SCADA** Systems Application, Technical **DCS/SCADA**, **PLC-SIMATIC S7 300/400**: Configuration, Programming and Troubleshooting, **PLC, Telemetry and SCADA** Technologies, Cyber Security of Industrial Control System (**PLC, DCS, SCADA & IED**), Basics of **Instrumentation Control System, DCS**, **Distributed Control System** - Operations & Techniques, Distributed Control System (**DCS**) Principles, Applications, Selection & Troubleshooting, Distributed Control Systems (**DCS**) especially in **Honeywell DCS**, **H&B DCS**, **Modicon, Siemens**, **Telemecanique**, **Wonderware** and **Adrioit,** Safety Instrumented Systems (**SIS**), Safety Integrity Level (**SIL**), Emergency Shutdown (**ESD**), **Emergency Shutdown** System, Variable Frequency Drive (**VFD**), **Process Control & Safeguarding**, **Field Instrumentation**, **Instrumented Protective Devices** Maintenance & Testing, Instrumented Protective Function (**IPF**), **Refining & Rotating Equipment**, **Equipment Operations**, **Short Circuit Calculation**, **Voltage Drop Calculation**, **Lighting Calculation**, **Hazardous Area Classification**, **Intrinsic Safety**, **Liquid & Gas Flowmetering**, **Custody Measurement**, **Ultrasonic Flowmetering**, **Loss Control**, **Gas Measurement**, **Flowmetering & Custody Measurement**, **Multiphase Flowmetering**, **Measurement and Control**, **Mass Measuring System Batching** (**Philips**), Arc Furnace Automation-Ferro Alloys, Walking Beam Furnace, Blast Furnace, Billet Casting Station, Cement Kiln Automation, Factory Automation and Quality Assurance Accreditation (**ISO 9000** and **Standard BS 5750**). Further, he is also well-versed in **Electrical Safety**, **Electrical Hazards Assessment**, **Electrical Equipment**, **Personal Protective Equipment**, Log-Out & Tag-Out (**LOTO**), **ALARP & LOPA** Methods, Confined Workspaces, Power **Quality**, Power **Network**, Power **Distribution**, **Distribution Systems**, **Power Systems Control**, **Power Systems Security**, Power **Electronics**, Electrical **Substations**, **UPS** & **Battery System**, **Earthing & Grounding**, Power **Generation**, **Protective Systems**, **Electrical Generators**, **Power** & **Distribution Transformers**, **Electrical Motors**, **Switchgears**, **Transformers**, **AC** & **DC Drives**, **Variable Speed Drives** & **Generators** and **Generator Protection**. He is currently the **Projects Manager** wherein he manages projects in the field of electrical and automation engineering and in-charge of various process hazard analysis, fault task analysis, FMEA and HAZOP study.

During Mr. Thoresson's career life, he has gained his thorough and practical experience through various challenging positions and dedication as the **Contracts & Projects Manager**, **Managing Director**, **Technical Director**, **Divisional Manager**, **Plant Automation Engineer**, **Senior Consulting Engineer**, **Senior Systems Engineer**, **Electrical & Instrumentation Engineer**, **Consulting Engineer**, **Service Engineer** and **Section Leader** from several international companies such as **Philips**, **FEDMIS**, **AEG**, **DAVY International**, **BOSCH**, **Billiton** and **Endress/Hauser**.

Mr. Thoresson is a **Registered Professional Engineering Technologist** and has a **Bachelor**'**s** degree in **Electrical & Electronics Engineering** and a **National Diploma** in **Radio Engineering**. Further, he is a **Certified Instructor/Trainer**, a **Certified Internal Verifier/Assessor/Trainer** by the **Institute of Leadership & Management** (**ILM**) and an active member of the International Society of Automation (**ISA**) and the Society for Automation, Instrumentation, Measurement and Control (**SAIMC**). He has further delivered numerous trainings, courses, seminars, conferences and workshops worldwide.

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, 05th of October 2025***

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Introduction & Hydrocarbon Liquid Measurement*** *Importance of Accurate Measurement in the Oil & Gas Industry • Custody Transfer versus Allocation Metering • Overview of Measurement Systems: Mechanical versus Electronic • Key Parameters: Volume, Mass, Density, Temperature, & Pressure*
0930 – 0945	*Break*
0945 – 1030	***Flow Measurement Technologies Overview*** *Positive Displacement (PD) Meters • Turbine Meters • Ultrasonic & Coriolis Meters • Comparison: Accuracy, Range, Maintenance*
1030 – 1130	***Measurement Standards & Compliance*** *API MPMS (Manual of Petroleum Measurement Standards) • AGA (American Gas Association) & ISO Standards • OIML & Local Regulatory Codes • Traceability & Auditability in Measurement*
1130 – 1215	***Basic Metering System Components*** *Primary Devices (Meter, Strainer, Prover Connections) • Secondary Devices (RTDs, Pressure Transducers, Transmitters) • Flow Control Valves & Isolation • Typical Skid Layout for Liquid Measurement*
1215 – 1230	*Break*
1230 – 1330	***Introduction & Flow Computers*** *Purpose & Functionality in Metering • Inputs & Outputs (I/O) • Hardware Architecture (CPU, Power Supply, Cards) • Real-Time Data Acquisition & Integration*
1330 – 1420	***Workshop: Liquid Metering System Familiarization*** *Identify Parts of a Measurement System on Diagrams • Understand Signal Flow from Sensor & Flow Computer • Discuss System Architecture (Simplex versus Duplex) • Q&A & Real-World Examples*
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 – 0830	***Detailed Flow Computer Architecture*** *Common Brands: Emerson ROC, OMNI, ABB, Daniels • I/O Modules: Analog, Discrete, Frequency • Communication Interfaces (RS-485, Ethernet, Modbus) • Power Supply & Grounding Best Practices*
0830 – 0930	***Signal Inputs & Instrumentation*** *Flow Signals: Pulse & Analog • Temperature: RTDs & Thermowells • Pressure: Pressure Transducers • Density & Viscosity Meters (Optional Inputs)*
0930 – 0945	*Break*

0945 – 1100	***Configuring Flow Computers (Basic Programming)*** *System Clock, Units, & Measurement Parameters • Meter Factors & K-Factor Setup • Span, Offset, & Scaling of Analog Inputs • Tagging & Identification of Devices*
1100 – 1215	***Meter Proving & Factor Calculation*** *Purpose of Proving & Custody Transfer • Prover Types: Bidirectional, Compact, Tank Prover • Flow Computer Interaction & Prover System • Automatic Meter Factor Calculation & Update*
1215 – 1230	*Break*
1230 – 1330	***Redundancy, Alarms, & Fail-Safe Logic*** *Alarm Thresholds & Shutdown Logic • Input Loss & Fallback Conditions • Dual Sensors & Signal Validation • Event Logging & Historical Data*
1330 – 1420	***Workshop: Simulated Flow Computer Configuration*** *Configure a Flow Computer & Input Devices • Enter Meter Factor & Base Conditions • Set Up Alarms & Flow, Temp, & Pressure • Practice I/O Testing Using a Simulation Tool*
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 – 0830	***Gross versus Net Volume Calculation*** *Definitions of Gross, Net, & Standard Volume • Base Conditions & Standard Reference • Impact of Temperature & Pressure & Volume • Correction Factor Formulas (CTL, CPL)*
0830 – 0930	***Temperature Compensation Using Flow Computers*** *API Chapter 11.1 Temperature Correction • Thermowell Location & Response Time • RTD Calibration & Drift Monitoring • Typical Errors & How to Detect Them*
0930 – 0945	*Break*
0945 – 1100	***Pressure Compensation & Liquid Systems*** *API Chapter 11.2 Pressure Correction • Transducer Accuracy & Pressure Range • Dynamic versus Static Pressure Impact • Using CPL & Flow Computer Logic*
1100 – 1215	***Density & Viscosity Corrections*** *Real-Time versus Fixed Density Use • Manual versus Automatic Input & Density • Effects & Viscosity & Meter Performance • Compensation Settings & Flow Computers*
1215 – 1230	*Break*
1230 – 1330	***Mass versus Volume Flow Considerations*** *When & Use Mass Flow Measurement • Comparison & Coriolis versus Volumetric Systems • Mass-&-Volume Conversion Logic • Standard versus Actual Mass Flow*
1330 – 1420	***Workshop: Flow Calculation Simulation*** *Input Sample Values & Flow, Temp, & Pressure • Use Software & Calculate Gross & Net Volume • Adjust Compensation Settings • Observe System Behavior & Parameter Change*
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*

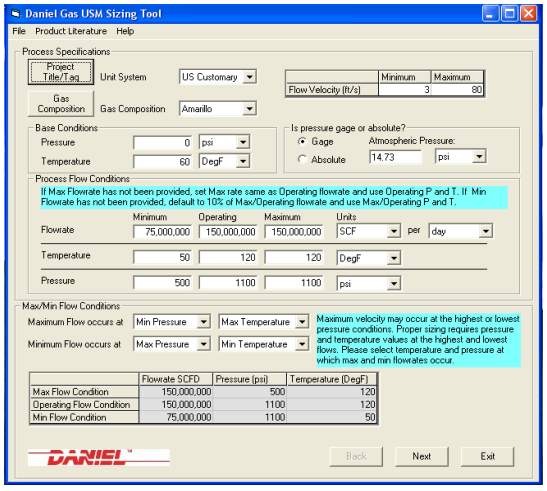
Day 4:	Wednesday, 08th of October 2025
0730 – 0830	***Flow Computer Communication Protocols*** *Modbus RTU/TCP, OPC, Hart, Foundation Fieldbus • SCADA/DCS Integration • Network Topology & Data Polling • Data Buffering & Polling Intervals*
0830 – 0930	***Data Logging & Audit Trail*** *Event & Alarm Logs • Daily/Hourly Batch Reports • Secure Data Storage & Retrieval • Regulatory & Contractual Requirements*
0930 – 0945	*Break*
0945 – 1100	***Calibration & Verification Procedures*** *Calibrating Temperature & Pressure Inputs • Pulse Verification & Signal Simulation • Meter Factor Verification • Calibration Frequency & Documentation*
1100 – 1215	***Preventive Maintenance & Flow Systems*** *Maintenance Checklists • Inspection & Wiring, Terminals, & Sensors • Firmware Updates & Backups • Cleaning & Recalibrating RTDs & Transmitters*
1215 – 1230	*Break*
1230 – 1330	***Troubleshooting Measurement Errors*** *Diagnosing Flow Mismatches • Signal Dropout & Spike Analysis • Troubleshooting Alarms & Failure Logs • Interface Signal Testing Techniques*
1330 – 1420	***Workshop: Maintenance & Troubleshooting Exercise*** *Simulated Calibration & Input Signals • Review & Event Logs & Fault Conditions • Perform Diagnostic Test & Laptop Interface • Develop a Corrective Action Report*
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	***Custody Transfer & Fiscal Metering*** *Definitions & Contractual Significance • Calibration Traceability & Seal Requirements • Measurement Uncertainty Management • API Custody Transfer Compliance*
0830 – 0930	***Batch Measurement & Ticketing*** *Batch Ticket Creation & Approvals • Proving versus Delivery Ticket Differences • Start-Stop Triggers & Valve Interlocks • Batch Event Reporting & Flow Computers*
0930 – 0945	*Break*
0945 – 1040	***Auditing & Regulatory Compliance*** *Preparing & Third-Party Audits • API/ISO Audit Documentation • Flow Computer Configuration Validation • Record-Keeping Best Practices*
1040 – 1135	***Integration & SCADA/ERP Systems*** *Real-Time Data Upload & Control Rooms • Flow Data & ERP (SAP, Maximo) Systems • Cybersecurity & Data Protection • Cloud-Based Measurement Systems*

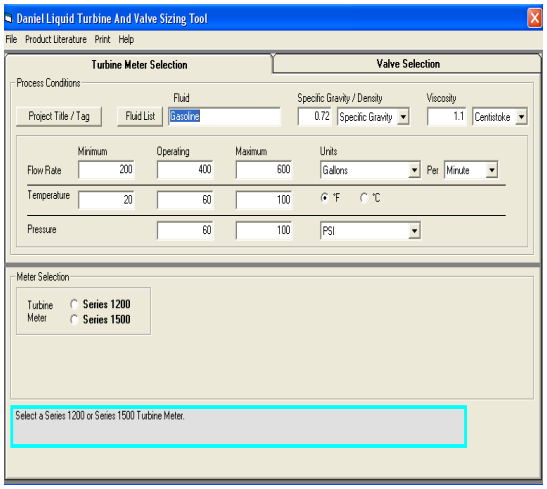
1135 - 1230	***Advanced Applications & Trends*** *Multiphase Flow Measurement (Liquid/Gas/Water) • Smart Meters & IIoT & Metering • Remote Diagnostics & Edge Computing • Environmental & Emission Monitoring*
1230 – 1245	*Break*
1245 – 1345	***Capstone Workshop: Design & Audit a Metering System*** *Design a Sample Hydrocarbon Liquid Metering System • Configure Flow Computer I/O & Compensation Logic • Generate & Interpret Test Data*
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*

Simulators (Hands-on Practical Sessions)

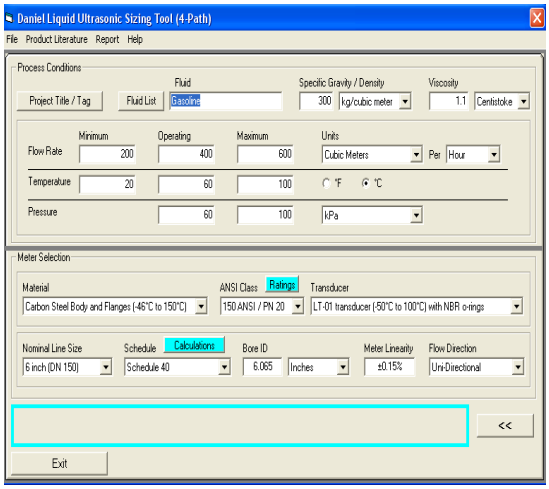
Practical sessions will be organized during the course for delegates to practice the theory learnt. Delegates will be provided with an opportunity to carryout various exercises using our state-of-the-art "Gas Ultrasonic Meter Sizing Tool", "Liquid Turbine Meter and Control Valve Sizing Tool", "Liquid Ultrasonic Meter Sizing Tool" and "Orifice Flow Calculator" simulators.



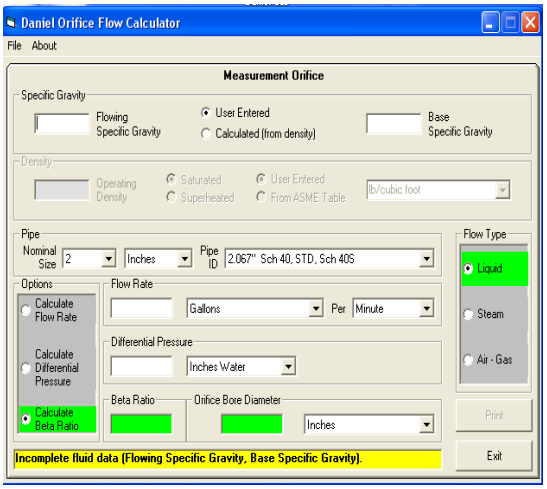
Gas Ultrasonic Meter (USM) Sizing Tool Simulator



Liquid Turbine Meter and Control Valve Sizing Tool Simulator



Liquid Ultrasonic Meter Sizing Tool Simulator



Orifice Flow Calculator Simulator

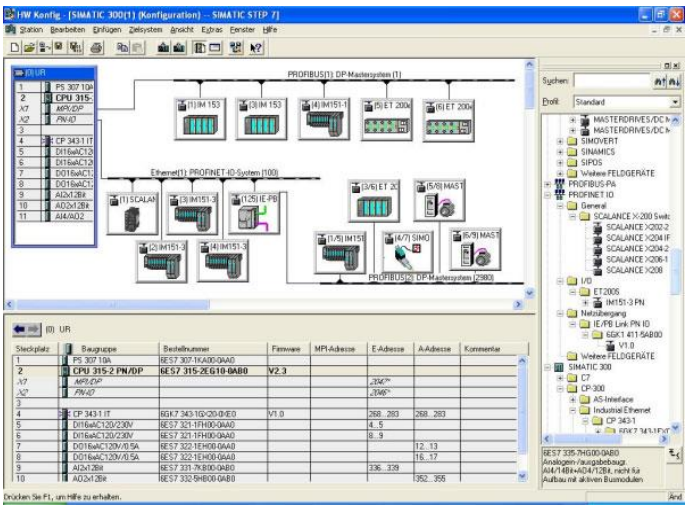
Siemens S7-400 Simulator

Siemens SIMATIC S7-300

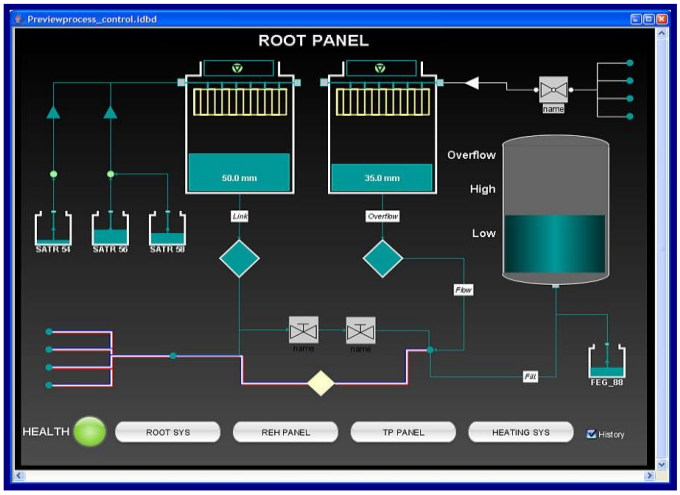
Siemens S7-200 Simulator

GE Fanuc Series 90-30 PLC Simulator

Schneider Electric Magelis HMISTU



Siemens SIMATIC Step 7 Professional Software



HMI SCADA

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