COURSE OVERVIEW IE0680
Process Control, Instrumentation & Safeguarding

Course Title
Process Control, Instrumentation & Safeguarding



Course Date/Venue
Session 1: March 28-April 01, 2027/Meeting Plus 9, City Centre Rotana, Doha, Qatar
Session 2: December 12-16, 2027/Meeting Plus 9, City Centre Rotana, Doha, Qatar

Course Reference
IE0680

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.

Control systems for industrial applications have advanced dramatically during the last decade. They become more modular and more sophisticated offering a vast variety of control functions for all the systems that operate within a modern "intelligent" facility. Enhanced functionality of the automation systems also means more complexity, interactive strategies, new technologies and systems management with resulting better control and improved safety and reliability.

The ANSI SP 84 (formerly ISA 84.01) “Application of Safety Instrumented Systems for the Process Industries” standard requires that companies assign a target safety integrity level (SIL) for all safety instrumented systems (SIS) applications. The assignment of the target SIL is a decision requiring the extension of the process hazards analysis (PHA). The assignment is based on the amount of risk reduction that is necessary to mitigate the risk associated with the process to an acceptable level. All of the SIS design, operation, and maintenance choices must then be verified against the target SIL.

This course provides participants with the perfect bridge between theories and practical knowledge gained on the plant floor. It provides a thorough exposition of control components, pneumatics, actuators, and regulators and details their application to the industrial process. The course is designed for engineers and technicians in order to update them with the latest technologies in process automation, control and safeguarding. It covers the systematic methods for selecting safety integrity levels (SIL's) for safety instrumented systems (SIS).

Some of the material in this course is based on the application of the safety life cycle as it is described in the international standards ANSI SP 84 "Application of Safety Instrumented Systems for the Process Industries" and EN/IEC 61508/61511. This course expands upon the framework developed in these standards. In addition to describing the tasks that users should perform during the safety life cycle, this course also provides detailed procedures for accomplishing these tasks. These procedures are based on risk analysis and reliability engineering principles from a variety of disciplines. Each topic will be discussed in a logically organized manner and contains an abundance of realistic problems, examples, and illustrations to challenge the participants to think and encourage them to apply this knowledge to the solution of practical problems.

Course Objectives/Outcomes & Benefits for the Participants

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

- Apply and gain an in-depth knowledge and skills in process control, instrumentation and safeguarding
- Practice pressure measurement, level measurement, temperature measurement & flow measurement and recognize their importance in process control
- Identify the various types of Control Valves and learn how to choose the right valve using the selection guidelines and application comparison
- List the various types of actuators and be able to demonstrate valve selection & sizing
- Illustrate field communications including their classifications and safety considerations
- Apply the basic control concepts, including variables, elements, system responses and on-off control and implement modes of control
- Discuss the principles, types, features, configurations and functions of distributed control systems (DCS), programmable logic controllers (PLC) and SCADA systems and recognize their practical applications in process control
- Apply the safety engineering principles and standards and learn the concept of safety life cycle as well as its various models and phases
- Practice hazard analysis as applied in process control safeguarding and employ the safety instrumented functions (SIF), SIS and SIL techniques
- Employ the alarm management concepts, principles, architecture, displays, functions and operator considerations
- Recognize the future trends in measurement, control system & communication technology

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 control, instrumentation and safeguarding for process control engineers and supervisors, instrumentation and control system engineers, automation engineers, application engineers and technologists, process engineers, electrical engineers and supervisors and those involved in the design, implementation, upgrading and safeguarding of industrial control systems.

Training Methodology

Our courses employ an interactive, learner-centred methodology that integrates theoretical knowledge with practical application. The training is delivered through a suitable combination of some or all of the following methods, selected according to the course content and learning objectives:

- Instructor-led presentations and facilitated discussions
- Practical workshops and participant presentations
- Hands-on exercises and real-world case studies
- Equipment demonstrations and technical drawings
- Hardware- and software-based simulations
- Gamification & Role Play in soft-skills courses only
- Virtual Reality (VR) and Augmented Reality (AR)
- Instructional videos and other relevant training resources

This blended approach encourages active participation, strengthens practical skills and supports the effective application of acquired knowledge in the workplace.

Learning Design & Customization

This course can be customized to the exact requirements of clients. Haward Technology is so proud of our huge capabilities in tailoring our courses to the training needs of our valued clients.

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 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:



Dr. Mike Tay, PhD, MSc, BSc, is a **Senior Electromechanical & Control Engineer** with over **40 years** of extensive experience. His expertise widely covers **MarkVIe System**, **Data Logging & Event Tracking**, **Control System Interface**, **Process Control & Instrumentation**, **Process Control** Troubleshooting & Problem Solving, **Process Control System**, Advanced Process Control (**APC**) Technology, **Process Control & Loop Tuning**, **Process Control & Automation**, **Data Accuracy & System Function**, Distributed Control Systems (**DCS**), Programmable Logic Controller (**PLC**), **Liquid & Gas Flowmetering**, **Custody Measurement**, **Ultrasonic Flowmetering**, **Loss Control**, **Loss Control** & **Multiphase Flowmetering**, **Flow Measurement**, Interruptible Power Systems (**UPS**), Supervisory Control and Data Acquisition (**SCADA**), **Network** Comprehensive, Systems Analysis, **SCADA Security**, ESD System Function, Analysis & Control, Modern **Power Systems Protective Relaying**, **Custody Measurement & Loss Control**, **Protective Devices** Troubleshooting, **Protective Devices** Testing & Maintenance, **Uninterruptible Power Supply** (**UPS**) Design, Industrial **UPS Systems & Battery Power Supplies** Maintenance & Troubleshooting, **Fiber Optics** Access Network Planning, **Process Analyzer** & Analytical Instrumentation, **HV/MV Substation** Design & Maintenance, **Combined Cycle Power Generation**, Power System Faults, Current & Voltage **Transformers**, Power System Neutral Grounding, Feeder Overcurrent Protection, **Electrical Protection Systems**, Bus Protection, Motor Protection, **Transformer Protection**, **Generator Protection**, Numerical Relays, **ESD System Analysis** & **Control**, **Custody Measurement**, Safety Instrumented System (**SIS**), Safety Integrity Level (**SIL**), **Power System**, **Power Supply** Design Management, **Diesel Generator**, **Electric Motors** and Basic **Electricity** & **Electrical Codes**. Further, he is also well-versed in **Centrifugal Compressors, Gas Turbines**, **Gas Turbine**, **Gas Turbine Operation**, **Control Systems**, **Vibration Analysis & Control**, Maintenance & Troubleshooting, **Compressor Design & Specifications**, **Compressors**, **Motors**, **Turbines**, **Actuators**, **Communications**, **Telecommunications**, Mobile Protocols, 4G LTE, GSM/UMTS, CMDA2000, **WIMAX** Technology, HSPA+, **Alarm** Management System, **Computer Architecture**, Logic & Microprocessor Design, Embedded Systems Design plus **Computer Networking** with **CISCO**, **Network Communication**, **Industrial Digital Communication**, Designing **Telecommunications Distribution System**, Electrical Engineering, **WiMAX Broadband Wireless System**, TT Intranet & ADSL Network, TT Web & Voicemail, Off-site ATM Network, IT Maintenance, Say2000i, IP Phone, National Address & ID Automation, Electricity Distribution Network, Customs Network & Maintenance, **LAN** & **WAN Network**, UYAP Network, **Network Routing Protocols**, Multicast Protocols, Network Management Protocols, Mobile & Wireless Networks and Digital Signal Processing.

During his career life, Dr. Tay worked with various universities and institutions such as the KOC Sistem, Meteksan Sistem, Altek BT, Yasar University, Dokuz Eylul University and METU and occupied significant positions being the **Aegean Region Manager**, **Group Leader**, **Technical Services Manager**, **Field Engineer**, **Instrumentation & Control Engineer**, **Research Assistant**, **Instructor**, **Instrumentation & Control Instructor**, **Technical Advisor**, **Technical Consultant** and **Senior Instructor/Lecturer**.

Dr. Tay has **PhD**, **Master** and **Bachelor** degrees in **Electrical & Electronics Engineering** from the **Dokuz Eylul University** and the **Middle East Technical University** (**METU**) respectively. Further, he is a **Certified Instructor/Trainer**, a **Certified Internal Verifier/Assessor/Trainer** by the **Institute of Leadership & Management** (**ILM**), a **Certified CISCO** (**CCSP**, **CCDA**, **CCNP**, **CCNA**, **CCNP**) **Specialist**, a **Certified CISCO IP Telephony Design Specialist**, **CISCO Rich Media Communications Specialist**, **CISCO Security Solutions** & **Design Specialist** and **Information Systems Security** (**INFOSEC**) **Professional**. He has further hold certification in Fundamentals of Process Control and Understanding Process Control: An Overview and delivered and presented innumerable trainings, courses, workshops, seminars and conferences worldwide.

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

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0900	***Review of Course*** *Objectives of Course ● Timetables*
0900 – 0930	***Introduction to Process Control*** *Basic Concepts ● Performance Terms ● Process Control Fundamentals*
0930 – 0945	*Break*
0945 – 1030	***Pressure Measurement*** *Bourdon Spring ● Spring & Bellows Element ● Diaphragm Elements ● Pressure Transducers ● Installation Considerations*
1030 – 1100	***Level Measurement*** *Main Types ● Buoyancy Tape Systems ● Hydrostatic Pressure ● Ultrasonic Measurement ● Radar Measurement ● Electrical Measurement ● Installation Considerations*
1100 – 1145	***Video Presentation*** *Radar Level Measurement*
1145 – 1230	***Temperature Measurement*** *Thermocouples ● RTD's ● Installation Considerations*
1230 – 1245	*Break*
1245 – 1330	***Flow Measurement*** *Differential Pressure Flowmeters ● Oscillatory Flow Measurement ● Non-Intrusive Flowmeters ● Mass Flow Meters ● Positive Displacement Meters ● Installation Considerations ● Selection Guidelines*
1330 – 1420	***Video Presentations*** *Coriolis Mass Flow Measurement ● Ultrasonic Flowmeter*
1420 – 1430	***Recap***
1430	*Lunch & End of Day One*

Day 2

0730 – 0815	***Control Valve Types*** *Rotary ● Linear ● Valve Selection ● Price Comparison ● How to Choose the Right Valve ● Selection Guidelines ● Application Comparisons*
0815 – 0845	***Video Clips*** *Control Valve Assembly Break*
0845 – 0930	***Actuator Selection*** *Types of Actuators ● Linear Actuators ● Rotary Actuators ● Actuator Forces ● Positioners ● Fail Safe Systems*
0930 – 0945	*Break*
0945 – 1030	***Video Clips*** *Actuator Assembly*
1030 – 1100	***Process Considerations*** *End Connections ● Pressure Classes ● Face to Face Criteria ● Materials Selection ● Modes of Failure ● Leakage Rates*
1100 – 1130	***Video Clips*** *Valve Sealing*

1130 – 1200	***Practical Session*** *Valve Selection & Sizing*
1200 – 1230	***Video Clips*** *Control Valve Assembly*
1230 – 1245	*Break*
1245 – 1315	***Field Communications*** *Introduction ● Transmitter Classifications ● HART and 4-2-mA ● Driving the Circuit*
1315 – 1400	***Video Presentations*** *HART Communications*
1400 – 1420	***Safety Considerations*** *Intrinsic Safety ● Explosion-Proof Approval Standards ● Oxygen Service*
1420 – 1430	***Recap***
1430	*Lunch & End of Day Two*

Day 3

0730 – 0900	***Basic Control Concepts*** *Variables ● Basic Elements ● Manual Control ● Feedback Control ● System Responses ● ON-OFF Control ● Three Term Control*
0900 – 0930	***Video Presentation*** *Three Term Control*
0930 – 0945	*Break*
0945 – 1100	***Modes of Control*** *Stability ● Ultimate Gain ● Tuning Methods ● Ratio Control ● Cascade Control ● Application Examples*
1100 – 1230	***Distributed Control Systems*** *Introduction ● Traditional Process Controller ● System Architecture ● DCS Types*
1230 – 1245	*Break*
1245 – 1330	***Programmable Logic Controllers*** *Introduction ● History ● Today's Position ● Principles of Operation ● System Components ● I/O Interfaces ● Configuration*
1330 – 1420	***SCADA Systems*** *Basic Definitions ● Levels of Hierarchy ● SCADA Configuration*
1420 – 1430	***Recap***
1430	*Lunch & End of Day Three*

Day 4

0730 – 0900	***Safety Engineering*** *Introduction ● Standards ● Basic Fundamentals ● Safety Life Cycle ● Hazard Analysis ● Safety Requirements Specification*
0900 – 0930	***Video Presentation*** *HAZOP*
0930 – 0945	*Break*
0945 – 1100	***Safety Instrumented Functions*** *Definition ● Example of a Safety Function ● What a SIF is ● What a SIF is not ● How SIF fits with SIS and SIL ● Summary ● Bibliography*

1100 – 1230	***Safety Integrity Level*** *Introduction ● Definition ● Selection Procedure ● Practical Examples*
1230 – 1245	*Break*
1245 – 1420	***Safety Instrumented Systems*** *Introduction ● Probability of Failure ● System Architecture ● Safety PLC ● Major Systems ● Typical Questions & Answers*
1420 – 1430	***Recap***
1430	*Lunch & End of Day Four*

Day 5

0730 – 0830	***Alarm Management*** *Introduction ● Architecture ● Update Times ● Speed of Response ● Operator Considerations ● Alarm Displays ● Alarm Priorities ● Alarm Functions ● Seven Steps to Alarm Management*
0830 – 0930	***Video Presentation*** *Explosion at BP Texas City Refinery*
0930 – 0945	*Break*
0945 – 1130	***Future Trends*** *Measurement Technology ● Control System Technology ● Communication Technology*
1130 – 1230	***Video Presentation*** *3 Beam Ultrasonic Flowmeter*
1230 – 1245	*Break*
1245 – 1345	***Case Studies*** *Piper Alpha Disaster ● Bhopal Gas Tragedy ● Chernobyl Disaster*
1345 – 1400	***Addendums*** ***Review, Wrap-up Session & 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 one of our state-of-the-art simulators "Allen Bradley SLC 500", "AB Micrologix 1000 (Digital or Analog)", "AB SLC5/03", "AB WS5610 PLC", "Siemens S7-1200", Siemens S7-400" "Siemens SIMATIC S7-300", "Siemens S7-200" "GE Fanuc Series 90-30 PLC", "Siemens SIMATIC Step 7 Professional Software", "HMI SCADA" , "RSLogix 5000" , "Logix5555" , "Schneider Electric Magelis HMISTU" , "Automation Simulator" , "Gas Ultrasonic Meter Sizing Tool", "Liquid Turbine Meter and Control Valve Sizing Tool", "Liquid Ultrasonic Meter Sizing Tool" and "Orifice Flow Calculator".



Allen Bradley SLC 500 Simulator



Allen Bradley Micrologix 1000 Simulator (Digital)



Allen Bradley Micrologix 1000 Simulator (Analog)



Allen Bradley SLC 5/03



Allen Bradley WS5610 PLC Simulator PLC5



Siemens S7-1200 Simulator



Siemens S7-400 Simulator



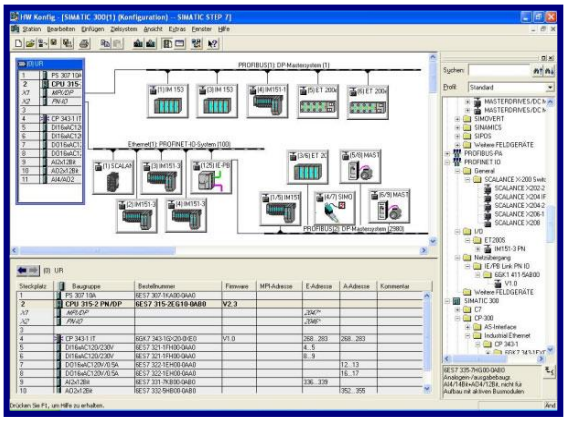
Siemens SIMATIC S7-300



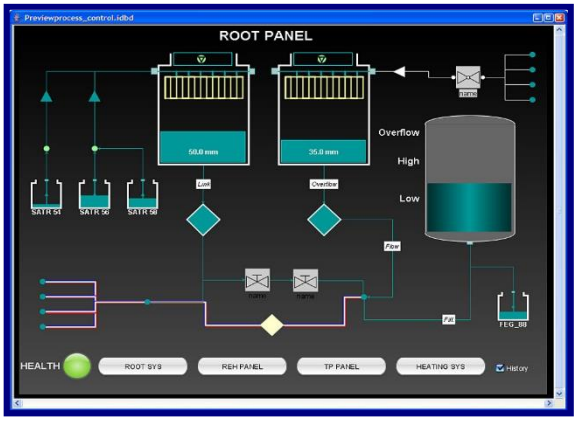
Siemens S7-200 Simulator



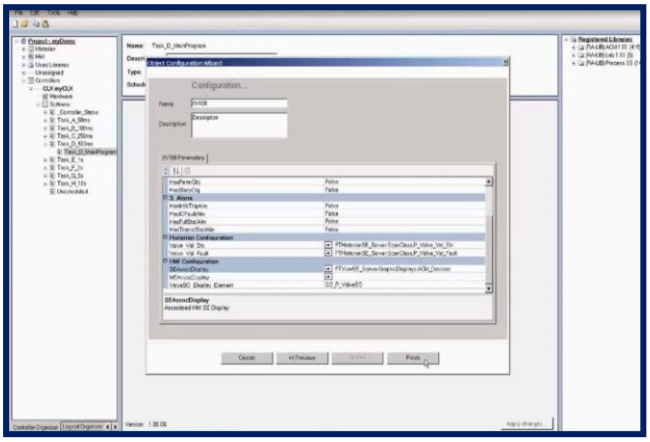
GE Fanuc Series 90-30 PLC Simulator



Siemens SIMATIC Step 7 Professional Software



HMI SCADA



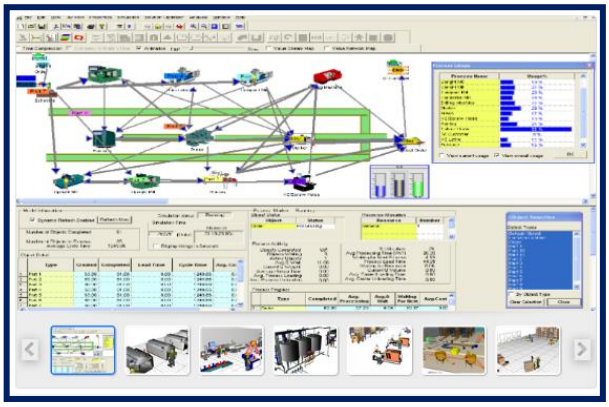
RSLogix 5000



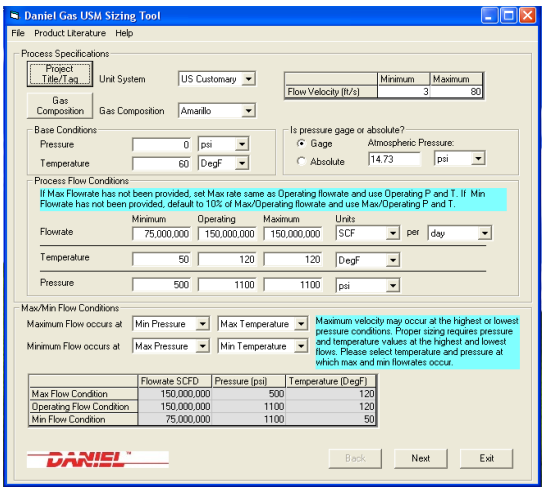
Logix5555



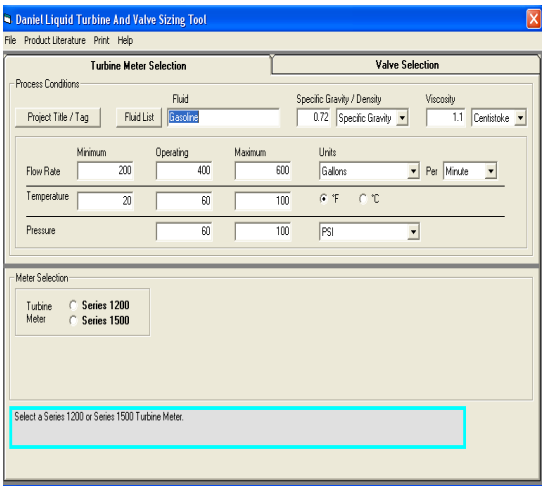
Schneider Electric Magelis HMISTU



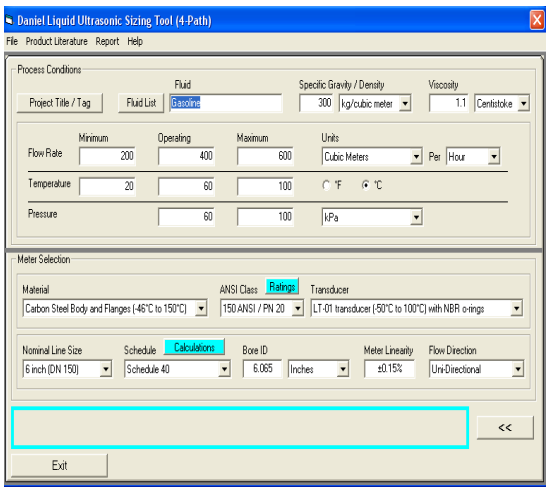
Automation Simulator



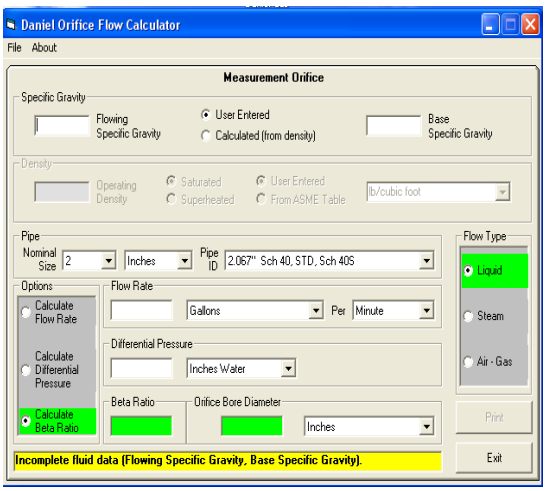
Gas Ultrasonic Meter (USM) Sizing Tool Simulator



Liquid Turbine Meter and Control Valve Sizing Tool Simulator



Liquid Ultrasonic Meter Sizing Tool Simulator



Orifice Flow Calculator Simulator

Course Coordinator

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