COURSE OVERVIEW IE0501
Plant Equipment & Control System Protection

Course Title
Plant Equipment & Control System Protection

Course Date/Venue
Session 1: September 08-12, 2024/The H Dubai Hotel, Sheikh Zayed Road, Dubai, UAE
Session 2: September 15-19, 2024/The H Dubai Hotel, Sheikh Zayed Road /Dubai, UAE

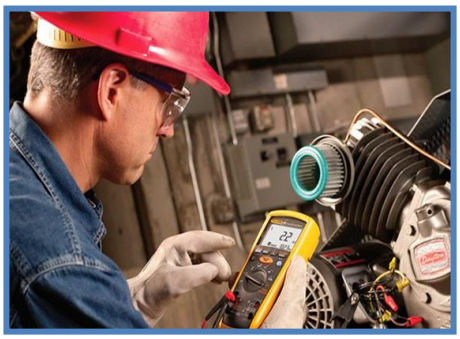
Course Reference
IE0501

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 complete and up-to-date overview of Plant Equipment and Control System Protection. It covers the basic operations and flow of processes in oil and gas production; the types of equipment used in oil and gas plants covering pumps, compressors and turbines; the basic components and functions of control systems used in oil and gas operations; the principles of equipment protection and other international safety standards applicable in oil and gas operations; and the basic techniques for assessing and managing risks associated with equipment and control systems.



Further, the course will also discuss the different types of control systems (DCS, SCADA, PLC); the types, functions and importance of various sensors and transmitters in system control; the control system communication protocols like MODBUS, Profibus and ethernet in plant communications; the cybersecurity threats and protection mechanisms; troubleshooting control systems and the techniques for protecting pumps, compressors and valves against mechanical failures; the electrical protection for plant equipment covering fuses, circuit breakers and relays in protecting electrical equipment; and the environmental factors and the impact of environmental conditions on equipment and mitigation strategies.

During the interactive course, participants will learn the routine monitoring techniques and preventative maintenance planning; the use of protective gear and equipment in the field; the PID control, feedforward control and other advanced control strategies; utilizing condition monitoring and predictive diagnostics for early problem detection; the instrument calibration and validation and control system with enterprise resource planning; the tools and techniques for decision-making based on real-time data; the importance, components and operation of emergency shutdown systems (ESDs) in oil and gas production; and the hazardous area classification and protection, fire and gas detection systems and emergency response procedures.

Course Objectives

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

- Apply and gain an in-depth knowledge on plant equipment and control system protection
- Discuss the basic operations and flow of processes in oil and gas production and identify the types of equipment used in oil and gas plants covering pumps, compressors and turbines
- Recognize basic components and functions of control systems used in oil and gas operations
- Explain principles of equipment protection and other international safety standards applicable in oil and gas operations
- Carryout basic techniques for assessing and managing risks associated with equipment and control systems
- Identify the different types of control systems (DCS, SCADA, PLC) as well as the types, functions and importance of various sensors and transmitters in system control
- Recognize control system communication protocols like MODBUS, Profibus and ethernet in plant communications
- Access cybersecurity threats and protection mechanisms and troubleshoot control systems
- Employ techniques for protecting pumps, compressors and valves against mechanical failures
- Apply electrical protection for plant equipment covering fuses, circuit breakers and relays in protecting electrical equipment
- Discuss the environmental factors and the impact of environmental conditions on equipment and mitigation strategies
- Carryout routine monitoring techniques and preventative maintenance planning as well as use protective gear and equipment in the field
- Illustrate PID control, feedforward control and other advanced control strategies and utilize condition monitoring and predictive diagnostics for early problem detection
- Carryout instrument calibration and validation and integrate control system with enterprise resource planning

- Identify tools and techniques for decision-making based on real-time data and discuss the importance, components and operation of emergency shutdown systems (ESDs) in oil and gas production
- Apply the hazardous area classification and protection, fire and gas detection systems and emergency response procedures

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, sample video clips of the instructor's actual lectures & practical sessions during the course conveniently saved in a **Tablet PC**.*

Who Should Attend

This course provides various troubleshooting techniques of plant equipment and control system protection for field operators.

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 Participants Pack (Folder, Manual, Hand-outs, etc.), 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:-

- 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.

- 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:

Dr. Ahmed El-Sayed, PhD, MSc, BSc, is a **Senior Electrical & Instrumentation Engineer** with **35 years** of extensive experience within the **Oil**, **Gas**, **Power**, **Petroleum**, **Petrochemical** and **Utilities** industries. His experience widely covers in the areas of **Plant Equipment & Control System Protection**, **Bently Vibration Rack 3500 Training**, Maintenance & Troubleshooting of **11KV Breaker ABB type VD4**, **Rotork make MOVS** Operation & Maintenance, **Air Compressor "Atlas Copco"**, Advanced Distributed Control System (**DCS**), **DCS** Operation & Configuration, **DCS** Troubleshooting, **DCS Yokogawa** ProSafe-RS Safety Instrumented System, **DCS Yokogawa** Centum VP, **DCS Emerson** DeltaV, **DCS GE Mark VI**, Programable Logic Controller (**PLC**), Supervisory Control & Data Acquisition (**SCADA**) Systems, Siemens **PLC Simatic S7-400/S7-300/S7-200**, **Siemens SIMATIC S7** Maintenance & Configuration, **Siemens WINCC**, SCADA System: Siemens **SIMATIC & WinCC**, **Process Control**, **Control Systems & Data Communications**, **Instrumentation**, **Automation**, **Valve Tuning**, Safety Instrumented Systems (**SIS**), Safety Integrity Level (**SIL**), Emergency Shutdown (**ESD**), **Telemetry** Systems, **Boiler Control & Instrumentation**, Advanced Process Control (**APC**) Technology, Practical **Fiber-Optics** Technology, **Compressor** Control & Protection, **GE Gas Turbines**, **Alarm** Management Systems, **Fieldbus** Systems, **NEC** (National Electrical Code), **NESC** (National Electrical Safety Code), **Electrical Safety**, **Electrical Hazards** Assessment, **Electrical Equipment**, Electrical Transient Analysis Program (**ETAP**), Power **Quality**, Power **Network**, Power **Distribution**, **Distribution Systems**, **Power System** Planning, Control & Stability, **Power Flow** Analysis, **Smart Grid & Renewable** Integration, **Power System Protection & Relaying**, Economic Dispatch & Grid Stability Constraints in Power Plants, Electrical Demand Side Management (DSM), Electrical **Substations**, **Substation Automation** Systems & Application (IEC 61850), **Distribution Network Load**, Electrical **Distribution** Systems, **Load Forecasting** & System Upgrade (Distribution), **Overhead Power Line** Maintenance & Patrolling, High Voltage **Switching** Operations, Industrial **UPS Systems & Battery** Power Supplies, **Generator** Maintenance & Troubleshooting, **Generator** Excitation Systems & AVR, Lock-Out & Tag-Out (**LOTO**), Confined Workspaces and **Earthing & Grounding**, He is currently the **Systems Control Manager** of **Siemens** where he is in-charge of Security & Control of Power **Transmission Distribution** & **High Voltage** Systems and he further takes part in the Load Records Evaluation & Transmission Services Pricing.

During his career life, Dr. Ahmed has been actively involved in different Power System Activities including Roles in Power System Planning, Analysis, Engineering, **HV Substation** Design, Electrical Service Pricing, Evaluations & Tariffs, Project Management, Teaching and Consulting. His vast industrial experience was honed greatly when he joined many International and National Companies such as **Siemens**, **Electricity Authority**, Egyptian Electricity Holding, Egyptian Refining Company (ERC), **GASCO**, Tahrir Petrochemicals Project, and **ACETO** industries as the **Instrumentation & Electrical Service Project Manager**, **Energy Management Engineer**, **Department Head**, **Assistant Professor**, **Project Coordinator**, **Project Assistant and Managing Board Member** where he focused more on dealing with Technology Transfer, System Integration Process and Improving Localization. He was further greatly involved in manufacturing some of **Power System** and **Control & Instrumentation Components** such as Series of Digital Protection **Relays**, MV **VFD**, **PLC** and **SCADA** System with intelligent features.

Dr. Ahmed has **PhD**, **Master's** & **Bachelor's** degree in **Electrical Engineering** from the **University of Wisconsin Madison**, **USA** and **Ain Shams University**, respectively. Further, he is a **Certified Instructor/Trainer**, a **Certified Internal Verifier/ Assessor/Trainer** by the **Institute of Leadership and Management** (**ILM**), an active member of IEEE and ISA as well as numerous technical and scientific papers published internationally in the areas of Power Quality, Superconductive Magnetic Energy Storage, SMES role in Power Systems, Power System **Blackout** Analysis, and Intelligent Load Shedding Techniques for preventing Power System Blackouts, HV **Substation Automation** and Power System Stability.

Course Program

The following program is planned for this course. However, the course director(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 – 0930	***Overview of Oil & Gas Production Processes**: Understanding the Basic Operations & Flow of Processes in Oil & Gas Production*
0930 – 0945	*Break*
0945 – 1045	***Fundamentals of Plant Equipment:** Types of Equipment Used in Oil & Gas Plants, Such as Pumps, Compressors & Turbines*
1045 – 1145	***Introduction to Control Systems**: Basic Components & Functions of Control Systems Used in Oil & Gas Operations*
1145 – 1230	***Principles of Equipment Protection:** Introduction to Protection Methods & Devices for Mechanical & Electrical Equipment*
1230 – 1245	*Break*
1245 – 1330	***Safety Standards & Compliance:** Overview of International Safety Standards Applicable in Oil & Gas Operations*
1330 - 1420	***Risk Assessment & Management:** Basic Techniques for Assessing & Managing Risks Associated with Equipment & Control Systems*
1420 - 1430	***Recap***
1430	*Lunch & End of Day One*

Day 2

0730 – 0830	***Control System Architectures:** Detailed Discussion on Different Types of Control Systems (DCS, SCADA, PLC)*
0830- - 0930	***Sensor & Transmitter Technologies:** Types, Functions & Importance of Various Sensors & Transmitters in System Control*
0930 – 0945	*Break*
0945 – 1100	***Control System Communication Protocols:** Understanding Protocols Like Modbus, Profibus & Ethernet in Plant Communications*
1100 – 1230	***Cybersecurity for Control Systems:** Introduction to Cybersecurity Threats & Protection Mechanisms*
1230 – 1245	*Break*
1245 – 1330	***Troubleshooting Control Systems:** Common Issues & Troubleshooting Techniques for Field Operators*
1330 - 1420	***Hands-On Simulation:** Practical Session on Interacting with a Simulated Control System*
1420 - 1430	***Recap***
1430	*Lunch & End of Day Two*

Day 3

0730 – 0830	***Mechanical Equipment Protection Methods**: Techniques for Protecting Pumps, Compressors & Valves Against Mechanical Failures*
0830- - 0930	***Electrical Protection for Plant Equipment**: Understanding Fuses, Circuit Breakers & Relays in Protecting Electrical Equipment*
0930 – 0945	*Break*
0945 – 1100	***Environmental Factors & Equipment Protection**: Impact of Environmental Conditions on Equipment & Mitigation Strategies*

1100 – 1230	***Monitoring & Maintenance Strategies:*** *Routine Monitoring Techniques & Preventative Maintenance Planning*
1230 – 1245	*Break*
1245 – 1330	***Use of Protective Gear & Equipment:*** *Training on the Correct Use of Personal Protective Equipment (PPE) in the Field*
1330 - 1420	***Case Study Review****: Examining Past Incidents of Equipment Failure & Learning from these Scenarios*
1420 - 1430	***Recap***
1430	*Lunch & End of Day Two*

Day 4

0730 – 0830	***Advanced Control Algorithms:*** *An Introduction to PID Control, Feedforward Control & Other Advanced Control Strategies*
0830- - 0930	***Predictive Maintenance Technologies:*** *Utilizing Condition Monitoring & Predictive Diagnostics for Early Problem Detection*
0930 – 0945	*Break*
0945 – 1100	***Instrument Calibration & Validation:*** *Procedures for Ensuring the Accuracy & Reliability of Control System Instruments*
1100 – 1230	***Integration of Control Systems with ERP:*** *How Control Systems Integrate with Enterprise Resource Planning for Optimized Operations*
1230 – 1245	*Break*
1245 – 1330	***Decision Support Systems****: Tools & Techniques for Decision-Making Based on Real-Time Data*
1330 - 1420	***Workshop: Diagnostic Techniques:*** *Practical Exercises on Diagnosing & Correcting Issues in Control Systems*
1420 - 1430	***Recap***
1430	*Lunch & End of Day Three*

Day 5

0730 – 0830	***Emergency Shutdown Systems (ESD)****: Importance, Components & Operation of ESDs in Oil & Gas Production*
0830 - 0930	***Hazardous Area Classification & Protection:*** *Understanding Zones & Requirements for Equipment in Hazardous Areas*
0930 – 0945	*Break*
0945 – 1100	***Fire & Gas Detection Systems****: Overview of Systems Used for Early Detection of Fire & Gas Leaks*
1100 – 1230	***Emergency Response Procedures****: Detailed Action Plans for Different Types of Emergencies*
1230 – 1245	*Break*
1245 – 1345	***Simulation Exercise:*** *Real-Life Emergency Response Simulation Involving Equipment & Control Systems*
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 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", "Gas Ultrasonic Meter Sizing Tool", "Liquid Turbine Meter and Control Valve Sizing Tool", "Liquid Ultrasonic Meter Sizing Tool" , "Orifice Flow Calculator", "Automation Simulator" and "PLCLogix 5000 Software".

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

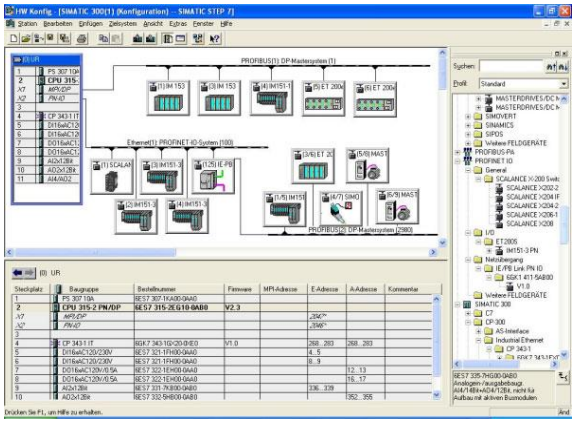
Siemens S7-1200 Simulator

Siemens S7-400 Simulator

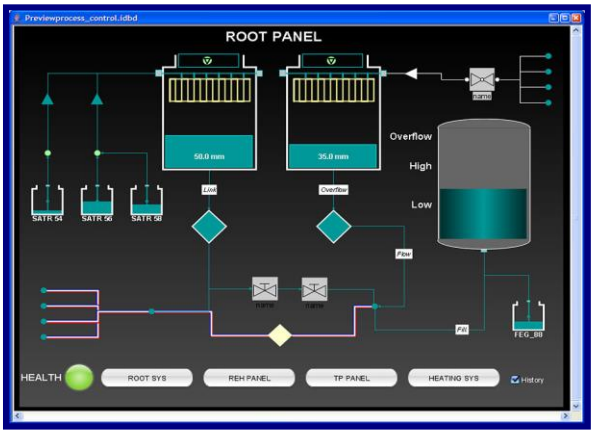
Siemens SIMATIC S7-300

Siemens S7-200 Simulator

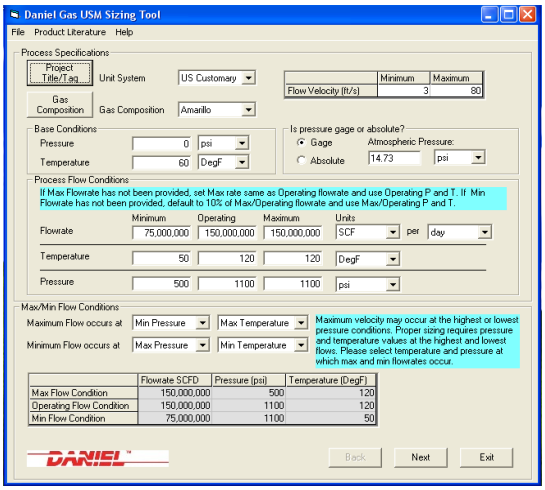
GE Fanuc Series 90-30 PLC Simulator



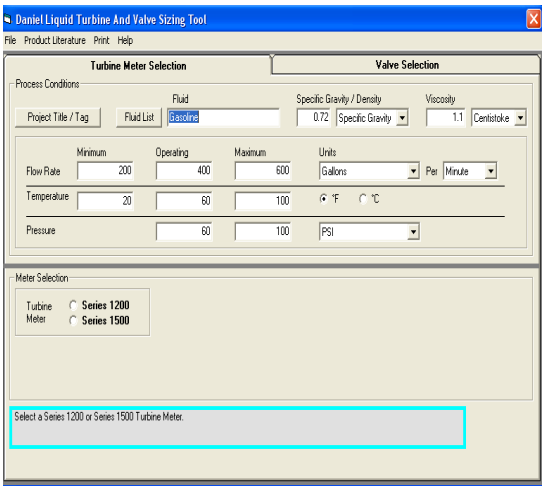
Siemens SIMATIC Step 7 Professional Software



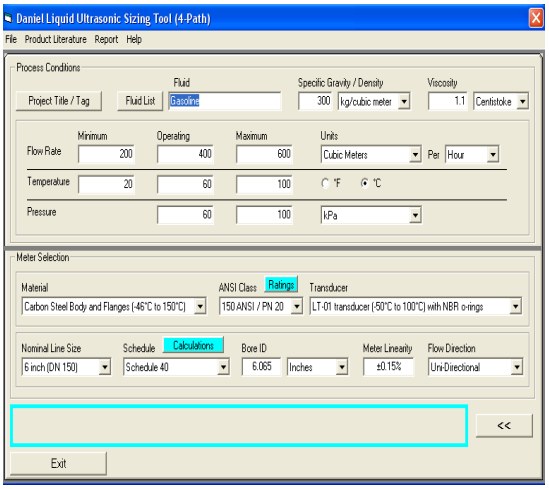
HMI SCADA



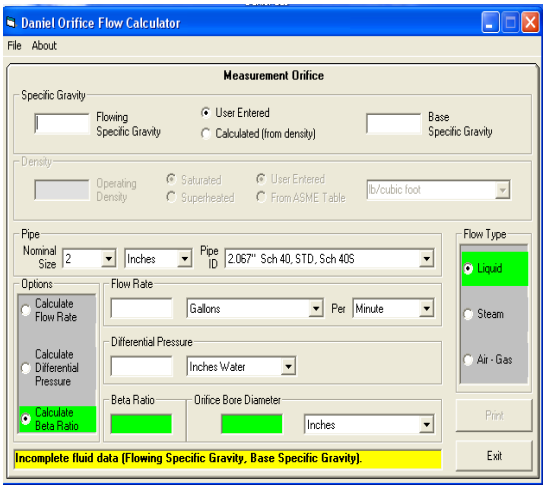
Gas Ultrasonic Meter (USM) Sizing Tool Simulator



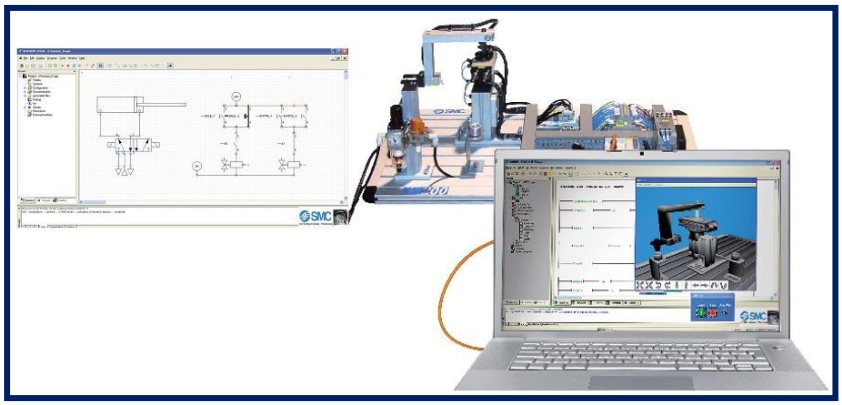
Liquid Turbine Meter and Control Valve Sizing Tool Simulator



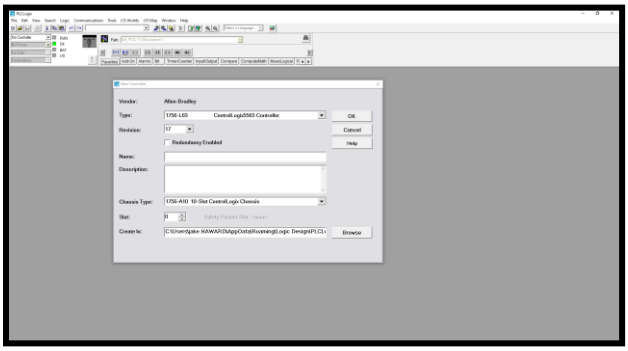
Liquid Ultrasonic Meter Sizing Tool Simulator

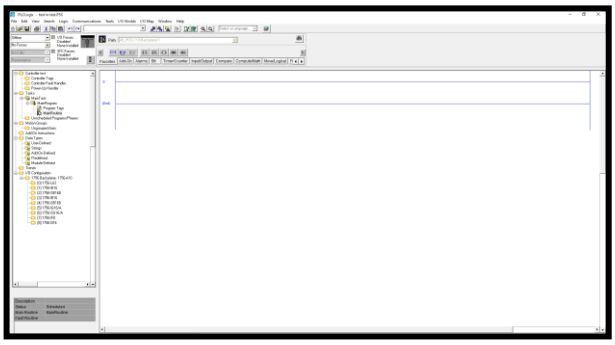


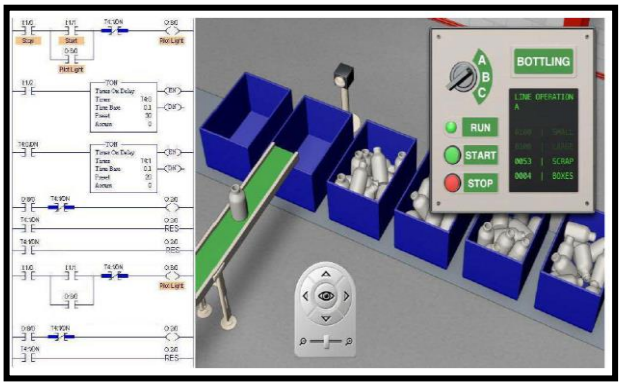
Orifice Flow Calculator Simulator

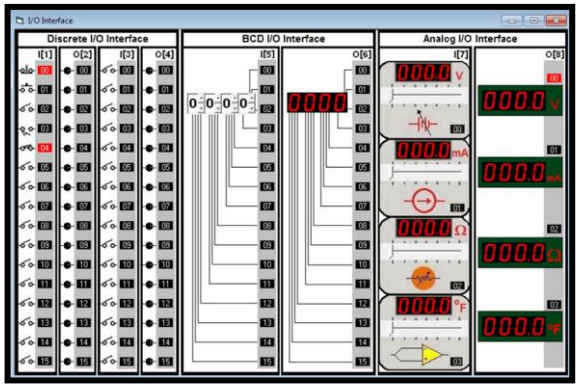


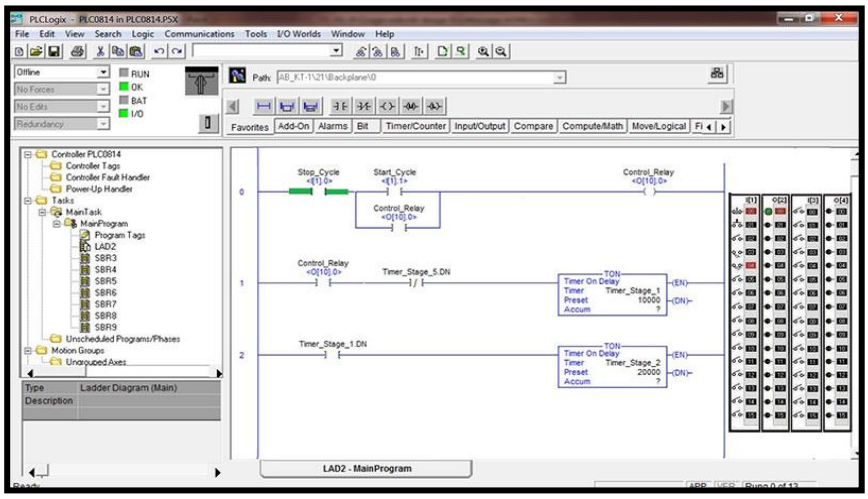
AutoSIM – 200 Automation Simulator











PLCLogix 5000 Software

Course Coordinator

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