COURSE OVERVIEW IE0030

Process Control & Instrumentation

Course Title
Process Control & Instrumentation

Course Date/Venue
September 08-12, 2024/Chill Out Meeting Room, Pullman Doha West Bay, Doha, Qatar

Course Reference
IE0030

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.

Process control is becoming an increasingly important engineering topic, since the subject plays a crucial role in the design, operation and maintenance in areas such as power plants and chemical and industrial process plants. Control systems 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 reliability.

The course is designed to update participants with the latest technologies in instrumentation and process control. The course will describe the various types of sensors relating to level, pressure, flow and temperature. Also included is an in-depth look at control valves, actuators with associated accessories together with practical valve sizing and selection techniques. The topics of digital field communications and Smart transmitters form an integral part of this course.

A major part of the course is devoted to a detailed exposition of currently used control valves, the associated terminology, valve performance, valve and actuator types, control valve accessories as well as to the correct selection and sizing of control valves for a wide range of applications.

The course addresses the important issues related to valve installation and maintenance. In addition, this training course also utilizes an extensive collection of state-of-the-art, externally generated process management and video material concerned with all aspects of plant management, including smart wireless solutions to the collection of plant data. In addition, the subjects of digital control systems will be discussed with sections on Distributed Control Systems (DCS), Programmable Logic Controllers (PLC), SCADA systems and Safety Instrumented Systems (SIS).

Course Objectives

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

- Apply an in-depth knowledge and skills in process control and instrumentation
- List down the different technologies currently in use in pressure, temperature, level flow measurement
- Identify the types of control valve and use a system approach in actuator selection
- Determine the various process considerations for the instrumentation for industrial applications
- Review and apply the different types of control loop strategies and identify the features and application of Distributed Control System (DCS)
- Discuss the system components and operation of the Programmable Logic Controllers (PLC) and apply the configuration of the SCADA systems
- Maintain control systems for rotating equipment and acquire knowledge on Process Safeguarding including safety instrumented systems (SIS), safety integrity level (SIL) and loop safety considerations
- Identify the various trends in flow calibration and apply meter proving
- Maintain field instruments, become acquainted with field communications and employ proper testing and commissioning of field instruments

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 for all significant aspects and considerations of process control and instrumentation for process control engineers and supervisors, instrumentation and control system engineers, automation engineers, instrumentation engineers and technologists. Further, process engineers, electrical engineers and supervisors and those involved in the design, implementation and upgrading of industrial control systems will also benefit from the practical aspects of 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:-

- 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.

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 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. John Vorster, MSc, BTech, is a **Senior Instrumentation**, **Control & Energy Engineer** with over **25 years** of industrial experience within the **Oil**, **Gas**, **Process**, **Refinery**, **Power** and **Nuclear** industries. His wide expertise includes Programmable Logic Controller (**PLC**), **Process Control** Design & Plant Modelling, **Instrumentation**, **Automation**, **Process Control** Instrumentation, **Process Control**, **SCADA** System, Introduction to **SCADA**, **PLC & SCADA** for Automation & Process Control, Distributed Control System (**DCS**), **Instrumentation & Safeguarding**, **Process Control Measurement**, **Pressure** Measurements, **Temperature** Measurements, **Level** Measurement, **Flow** Measurement, **Control Valves & Actuators**, **Energy Management** System Awareness, **Renewable Energy**, **Energy** Conservation & Technologies, **Utility Systems**, **Nuclear** Energy, **Distributed Energy Systems**, **Natural Gas Distribution**, **Field Indication Instruments**, **P&ID** & Technical Specification, **Test Equipment Calibration**, **Field Bus** & **Field Communications**, Testing, Calibration & Maintenance of **Flow**, **Level**, **Pressure & Temperature**, **Loss Control** & **Multiphase Flowmetering**, **Custody Measurement** & **Loss Control**, **Flow Measurement** & **Custody Measurement**, **Flow Computer**, **Turbine Flowmeters**, **Ultrasonic Flowmeter**, **Positive Displacement Flowmeter**, **Coriolis Flowmeter**, **Flow Rate Corrections**, **Pressure Flow Transmitters**, **Pressure Methods**, **Flow Nozzles**, **Orifice Plates**, **Venturi Tubes**, **Pitot Tubes**, **Analyzer** Measurement Systems, **Pressure** Management, Selection & Sizing of all Instrumentation, **SIL** Criteria, Calibration & Configuration of Installed Instrumentation, **Bearing Replacement** and **Control Valves**. Further, he is also well-versed in HAZOP, LOPA Studies, Radiation Protection, Hazardous Substances, Hazardous Area Classification, Nuclear Devices Maintenance, Loop Drawings, Loop Calculations, Engineering Drawings, Shutdown Maintenance & Planning, Asset Management, Six Sigma, Energy Management & Measurements, Project Management, Strategic Resource Planning, Budget Preparation, ISO 9001, ISO 14000 and ISO 18000 standards. He is currently the **Instrumentation Analyzer & Engineer** of **Sasolburg** wherein he is in-charge of the design and monitoring of the analyzer measurement systems.

During his career life, Mr. Vorster has gained his practical and field experience through his various significant positions and dedication as the **Project Manager**, **Senior Trainer/Instructor**, **Senior Instrumentation Engineer**, **Instrumentation Engineer**, **Green Belt Project Leader**, **Instrumentation Technologist**, **Senior Instrumentation/Electrical Artisan**, **Instrumentation Artisan** and **Apprentice Instrumentation** for numerous international companies including **Sasolburg**, **DOW Chemical Company**, **Safripol** and **Iscor**.

Mr. Vorster has a **Master's** degree in **Engineering Development & Management**, as well as a **Bachelor's of Technology** degree and a **National Diploma** in **Electrical Engineering**. Further, he is a **Certified Instructor/Trainer**, a **Certified Internal Verifier/Assessor/Trainer** by the **Institute of Leadership & Management** (**ILM**), an **Appointed Radiation Protection Officer** and a **Qualified Instrument Mechanician**. Moreover, he is an active member of Project Management Institution (**PMI**) and South African Institute of Measure and Control (**SAIMC**) and has delivered numerous courses, workshops, conferences and seminars internationally.

Course Fee

US$ 5,500 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 course for technical reasons with no prior notice to participants. Nevertheless, the course objectives will always be met:

Day 1: ***Sunday, 08th of September 2024***

0730 - 0800	*Registration & Coffee*
0800 - 0815	*Welcome & Introduction*
0815 - 0830	***PRE-TEST***
0830 – 0900	***Introduction*** *Course Content ● Objectives of Course*
0900 – 0930	***Introduction to Process Control*** *Control History ● The Process of Control ● Basic Measurement Definitions ● P&ID Symbols ● Control Loops ● Typical Applications*
0930 – 0945	*Break*
0945 – 1100	***Pressure Measurement*** *Basic Principles ● Definition of Terminology ● Pressure Elements ● Pressure Transducers ● Installation Considerations ● Summary*
1100 - 1230	***Temperature Measurement*** *Principles ● Thermocouples ● RTD's ● Thermistors Thermometer ● Infra-Red Thermometry ● Installation Considerations*
1230 - 1245	*Break*
1230 - 1330	***Level Measurement*** *Main Types ● Sight Glass Method ● Buoyancy Tape Systems ● Hydrostatic Pressure ● Ultrasonic Measurement ● Radar Measurement ● Electrical Measurement ● Installation Considerations*
1330 – 1420	***Video Presentation*** *Radar Level Measurement*
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, 09th of September 2024***

0730 – 0830	***Flow Measurement*** *Differential Pressure Flowmeters ● Oscillatory Flow Measurement ● Non-Intrusive Flowmeters ● Mass Flow Meters ● Positive Displacement Meters ● Installation Considerations ● Selection Guidelines*
0830 – 0930	***Video Presentation*** *Coriolis Effect Mass Flowmeter*
0930 – 0945	*Break*

0945 – 1100	***Control Valve Types*** *Rotary ● Linear ● Control Valve Selection*
1100 – 1230	***Actuator Selection*** *Introduction ● Types of Actuators ● Linear Actuators ● Rotary Actuators ● Actuator Forces ● Positioners ● Fail Safe Actuators*
1230 – 1245	*Break*
1245 – 1330	***Process Considerations*** *End Connections ● Face to Face Criteria ● Materials Selection ● Modes of Failure ● Leakage Rates*
1330 - 1420	***Practical Session*** *Control Valve Sizing*
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, 10th of September 2024***

0730 – 0830	***Control Loop Strategies*** *Introduction ● Variables ● Basic Elements ● Manual Control ● Feedback Control ● System Responses ● ON-OFF Control ● Three Term Control*
0830 – 0930	***Video Presentation*** *Three Term Control*
0930 – 0945	*Break*
0945 – 1030	***Distributed Control Systems*** *Introduction ● Traditional Process Controllers ● Three Term Control ● Architecture of Controllers ● Software ● Programming ● Execution Time ● Programming vs. Configuration ● Function Blocks*
1030 – 1130	***Video Presentation*** *Distributed Control Systems*
1130 - 1230	***Programmable Logic Controllers*** *Introduction ● Today's Position ● Principles of Operation ● System Components ● I/O Interfaces ● Configuration*
1230 - 1245	*Break*
1245 – 1345	***SCADA Systems*** *Basic Definitions ● Level of Hierarchy ● Communication Systems ● SCADA Configuration*
1345 - 1420	***Maintain Control Systems for Rotating Equipment***
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, 11th of September 2024***

0730 – 0830	***Safety Instrumented Systems (SIS)*** *Introduction ● Overview ● Ensuring Safety ● Layers of Safety ● Factors Affecting Safety ● Anatomy of a Disastaer ● Disaster Prevention*
0830 – 0930	***Safety Integrity Level (SIL)*** *Introduction ● Definition ● Selection Procedure ● Practical Examples*
0930 – 0945	*Break*
0945 – 1100	***Loop Safety Considerations*** *Intrinsic Safety ● Explosion-Proof ● Approval Standards ● Oxygen Service*

1100 - 1230	***Flow Calibration*** *General ● Trends in Calibration ● Types of Calibration Test Rigs ● In-Situ Calibration ● Turbine Meters*
1230 – 1245	*Break*
1245 - 1420	***Meter Proving*** *Practical Exercise*
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, 12th of September 2024

0730 – 0800	***Field Communications*** *Analogue Signals ● Digital Communications ● Fieldbus Technologies ● Future Trends*
0800 – 0830	***Maintain Field Instruments***
0830 – 0900	***Video Presentation*** *HART Protocol*
0900 – 0930	***Testing & Commissioning Field Instruments***
0930 – 0945	*Break*
0945 – 1100	***Case Studies*** *Bhopal Gas Tragedy ● Piper Alpha Disaster ● Chernobyl Catastrophe ● Buncefield Oil Depot Explosion*
1100 – 1230	***Video Presentation*** *BP Texas City – Refinery Explosion*
1230 – 1245	*Break*
1245 - 1345	***Addendums*** *Review of Course ● Valve Sizing Exercise ● Choke Valves ● Any Other Subjects*
1345 – 1400	***Review Session & 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 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

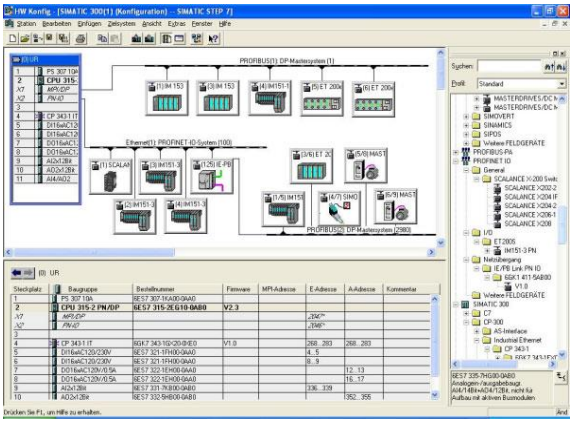
Siemens S7-1200 Simulator

Siemens S7-400 Simulator

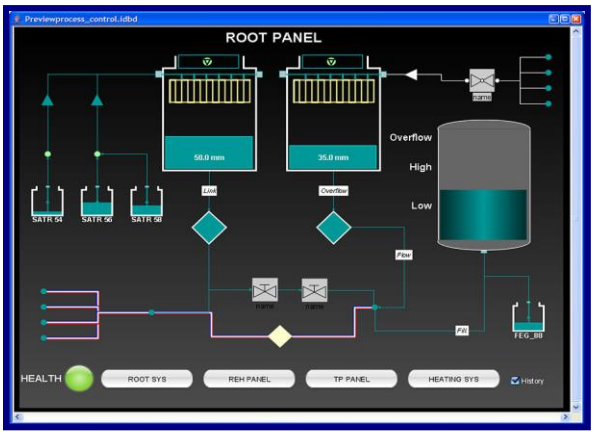
Siemens SIMATIC S7-300

Siemens S7-200 Simulator

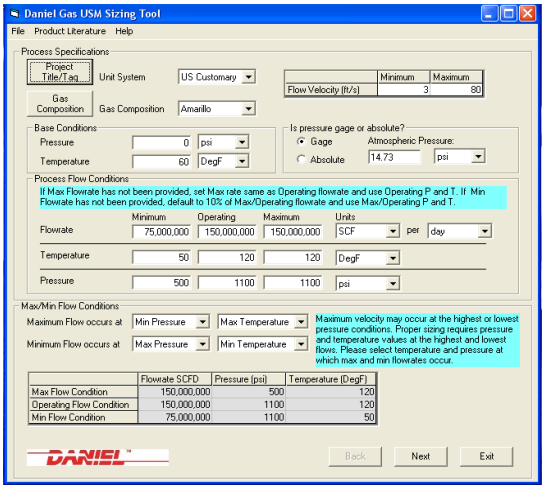
GE Fanuc Series 90-30 PLC Simulator



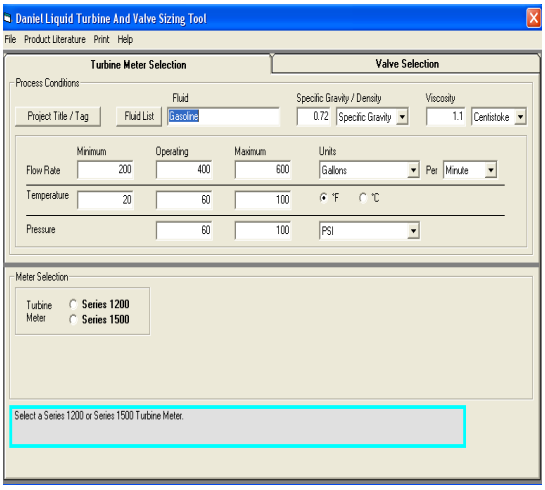
Siemens SIMATIC Step 7 Professional Software



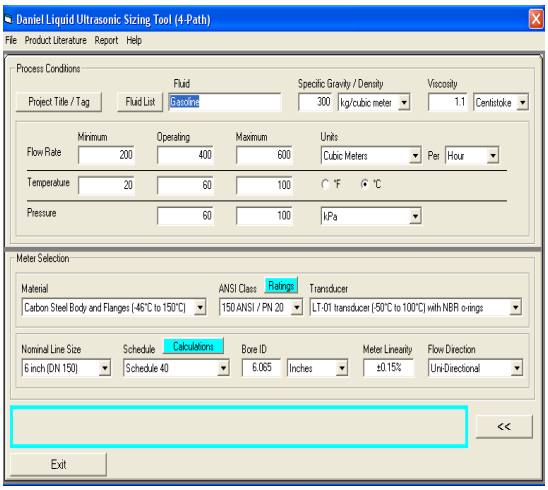
HMI SCADA



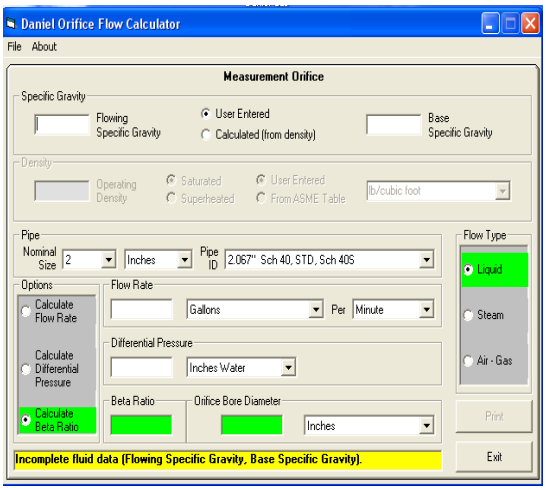
Gas Ultrasonic Meter (USM) Sizing Tool Simulator



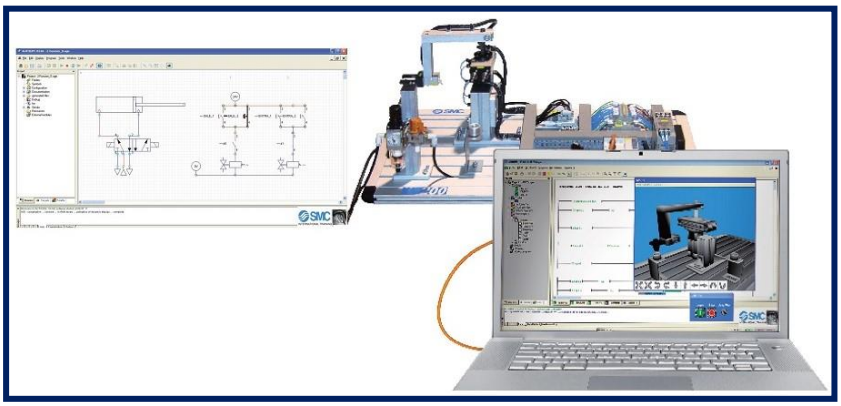
Liquid Turbine Meter and Control Valve Sizing Tool Simulator



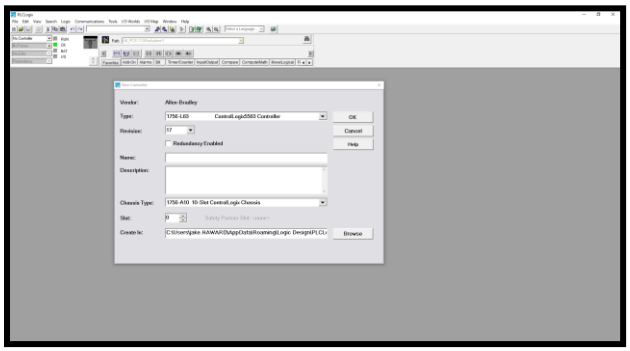
Liquid Ultrasonic Meter Sizing Tool Simulator

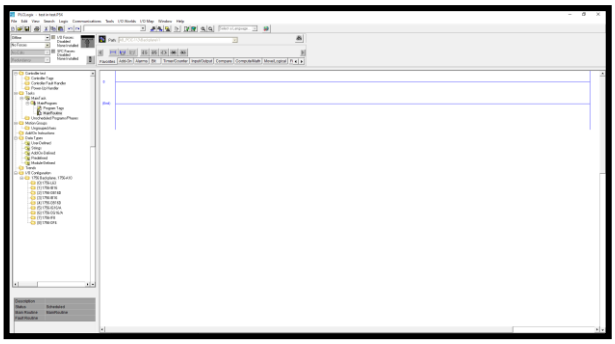


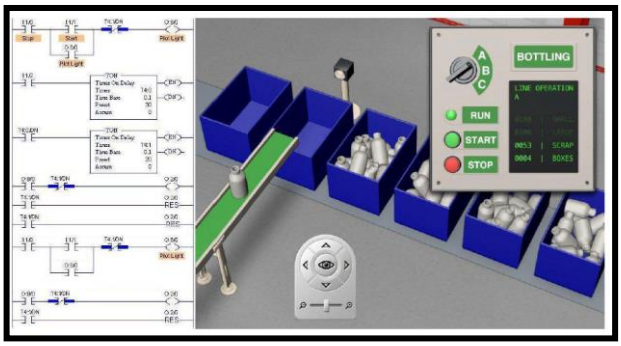
Orifice Flow Calculator Simulator

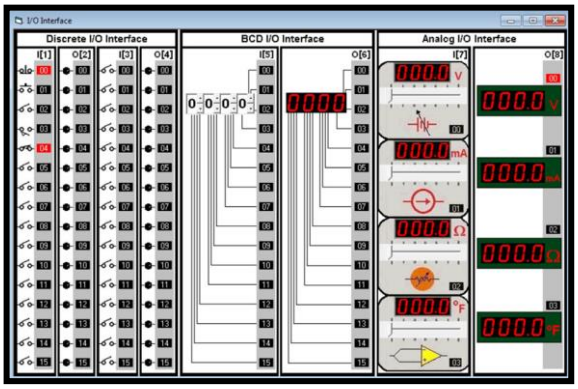


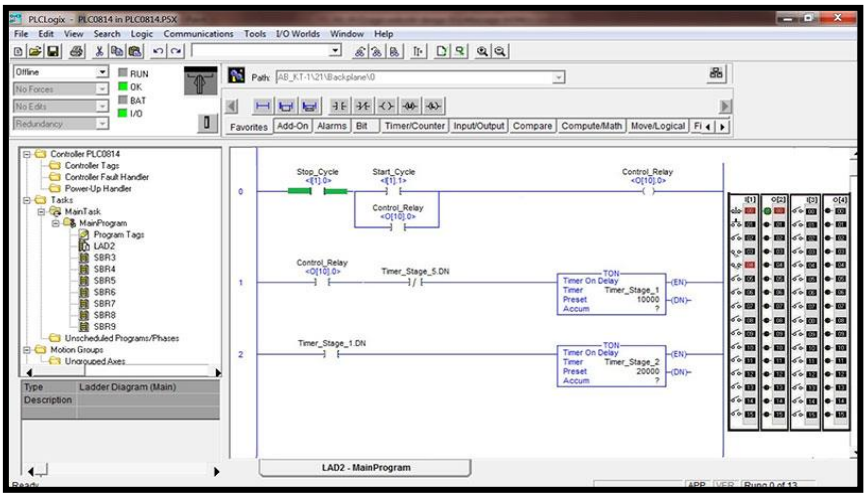
AutoSIM – 200 Automation Simulator











PLCLogix 5000 Software

Course Coordinator

Jaryl Castillo, Tel: +974 4423 1327, Email: jaryl@haward.org