

2014 ISA Water/Wastewater and Automatic Controls Symposium

August 5 to 7, 2014.....Crowne Plaza Orlando-Universal Hotel.....Orlando, Florida, USA
Presented by the ISA Water/Wastewater Industries Division – www.isawwsymposium.com
Technical co-sponsors: Florida AWWA Section, the WEF Automation and Info Tech Committee ,
Florida Water Environment Association, Instrumentation Testing Association, and ISA Tampa Bay Section



August 4-5, 2014 – Optional Short Course

Troubleshooting Instrumentation and Control Systems

ISA Course TC10

Course Description

Length: 2 days

Date: Mon-Tues, August 4-5, 2014

CEU Credits: 1.4

Course Hours: 8:00 a.m. – 4:00 p.m., includes lunch both days

Price: \$1,305 for ISA Members, \$1,630 List

Description:

This course presents a systematic approach to troubleshooting and start-up of single and multi-loop control loops. You'll see how pressure, level, flow, and temperature loops operate to maintain good process control systems. A knowledge of instrumentation and control is assumed.

You will be able to:

- Develop a systematic approach to troubleshooting
- Identify why a systematic approach to troubleshooting is most effective
- Follow specified procedures for proper loop check-out
- Verify, locate, and identify performance problems and the causes of the problems
- Take or recommend appropriate follow-up procedures to minimize problem recurrence
- Identify the common causes of sensor, transmitter, controller, and final control element problems
- Troubleshoot control systems
- Apply distributed control system (DCS) functions for troubleshooting
- Interpret pneumatic and electronic loops
- Apply safety practices for start-up
- Check and utilize control loop documentation
- Discuss applications and procedures to troubleshoot conventional analog control systems
- State the general operation features of a HART™ control system
- State the general operations features of a FIELDBUS control system
- Compare general troubleshooting procedures for conventional, FIELDBUS, and HART™ control systems

You will cover:

- **Introduction:** Purpose of Troubleshooting | Reasons for Troubleshooting
- **Approaches to Troubleshooting:** Equipment History | Input/Output (Serial) | Shotgun Approach | Logical Analysis
- **Logical Analysis Troubleshooting:** Verify | Identify | Repair | Test | Follow-up on Problems
- **Review of ISA Standard Diagrams and Symbols:** Process and Instrument Drawings | Loop Drawings | Process Flow Diagrams

- **Single-Loop Feedback Control Troubleshooting:** Measurement Concerns | Valve Concerns | Controller Operations | Signal Conditioners | Troubleshooting Simulation
- **Multi-Loop Control Systems Troubleshooting:** Ratio (Controlled Stream, Wild Stream) | Cascade (Primary and Secondary Loop) | Three-Element Drum Level Control | Troubleshooting Simulation
- **Introduction to Digital Control Systems:** Advantages | Digital Control (DDC) | Supervisory | Supervisory Plus DDC | Analog Back-up | HART™ Systems | FIELDBUS™ Systems
- **Distributed Control Functions for Troubleshooting:** Elements | Displays (Graphic, Trend, Alarm)
- **Start-up Concerns:** Safety | Documentation | Tuning Review | Component Check-out

Classroom/Laboratory Exercises:

- Diagnose and solve problems with single-loop control loops
- Diagnose and solve problems with ratio, cascade, and three-element control loop systems
- Diagnose problems using DCS displays for information
- Troubleshoot several single control loop problems

Recommended Resources: [*Troubleshooting: A Technician's Guide, 2nd Edition.*](#)

About the Instructor



Don Lovell is currently an automation consultant assisting customers in defining their automation road map to meet their business objectives. Don has been involved in the process automation field for 40 years with experience in batch and continuous applications. Industries included beverage, cement, fine chemical, food, paper and industrial boilers. Employer history includes Honeywell, ITT Education Services, Kellogg, Invensys and Rockwell Automation.

Don worked for Kellogg Company for 11 years. First as a Corporate Technical Trainer responsible for technical and craft training skills of new technologies for plant expansions, and new plant startups. He completed his career with Kellogg as the Maintenance Resource in the process and utility areas. Don worked for the Foxboro Company for 19 years in the following positions, Food and Beverage Industry Marketing, Technical Sales Engineer, and National Account Manager in sales. With Rockwell Automation, he was a Batch Consultant, and a Business Consultant in the process industry.

Don has a degree in Electronics Engineering and is a Senior Life member of ISA, having served in local and national positions. He has authored numerous papers and presentations, process/operational training and maintenance manuals, and developed a four-year apprentice program for automation technicians. He is also a member of the Master Brewers Association of the Americas, where he lectures on brewery automation and Reliability Maintenance. Additionally, he has lectured both nationally and internationally for professional organizations such as ISA, IEEE, Distilled Spirits Council, American Oil and Chemist Society, and American Society of Sugar Cane Technologist.

Course Schedule

DAY	Topics, Exercises, Etc.	Time
Day 1 A.M.	Course Introductions Pre Instructional Survey Section 1- Troubleshooting techniques Section 2 – Review of Diagrams & Symbols Section 3 Common Problems	0.25 hours 1.50 hour 0.75 hour 1.00 hour
Day 1 P.M.	Application Exercise 1 Overview of Portable trainer Laboratory Exercise 1	1.00 hour 0.50 hours 2.00 hours
Day 2 A.M.	Review/questions from daily progress report Section 4 Troubleshooting Safety Section 5 Startup Laboratory Exercise 2 Section 6 Digital Communications Section 7 Digital Control Systems	0.25 hours 0.25 hours 0.25 hours 2.00 hours 0.50 hour 0.50 hour
Day 2 P.M.	Laboratory Exercise 3 Section 8 Multi-Loop Systems Section 9 Interlocks and Safety Systems Post Instructional Survey Final Course Evaluation	2.00 hours 0.50 hour 0.50 hours 0.25 hours
		14 hours = 1.4 CEUs