

The background of the entire page is a dark blue color. It features a complex, semi-transparent white line-art illustration of an industrial process. This illustration includes various components such as pipes, valves, tanks, and gauges. A prominent feature is a large circular gauge with a needle, positioned on the left side. In the center-right, there is a vertical stack of several cylindrical components, possibly representing a multi-channel sampling system. The overall aesthetic is technical and industrial.

Process Analyzer Sampling Systems (PASS Subsystems) Training

Designed for Analytical Instrumentation System Engineers, Technicians, and Industry Professionals

**Sharpen your
sampling system skills.
Make your sampling
systems more reliable.**

Swagelok®

Optimize your process analyzer sampling systems in just five days

If you're a sample system designer or troubleshooter, you know each system's differences can pose its own set of challenges in design, operation, and maintenance. What if there was a training class that could help you make better sense of the variables which affect sampling systems so that you could head off problems before they arise? What if you could learn to assess and analyze sample systems and their designs holistically? With the Process Analytical Sampling Systems Training (PASS Subsystems) Training Course, you can.

PASS Subsystems is a five-day course which breaks down design elements of industrial sample systems into subsystems then further separates them into discrete function blocks. Through an effective blend of lecture, class exercises, and a team design project delivered in a small class environment, you learn how to assemble these function blocks into complete system designs or employ them as analytical tools to assess and improve in-service systems.



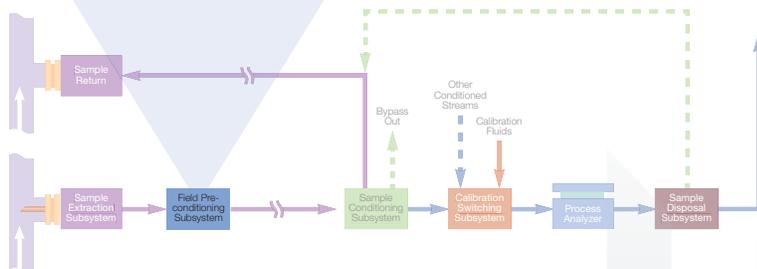
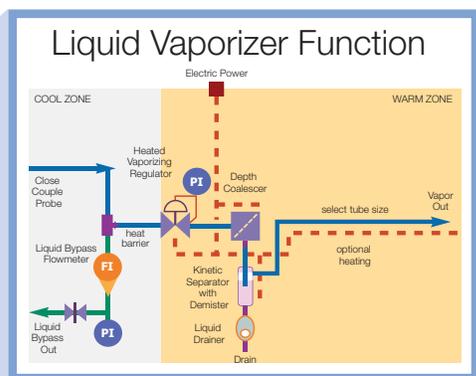
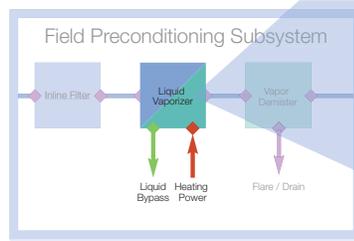
Students participate in an interactive exercise, learning to optimize a sampling system.

Course Objectives

Learn to:

- Clearly differentiate the functions that a sampling system performs and learn how each function is best achieved in practice
- Create reliable sample systems
- Analyze a complex system to understand it better and troubleshoot problem designs, no matter if they are in the field or still on the drawing board.

[Learn more about PASS Subsystems training at swagelok.com.](http://swagelok.com)



This five-day training course focuses on the intricacies of the subsystems and their unique sets of elements.

DAY 1

Group Project: Common team exercise

- I. Key Principles of Sampling
- II. Basic Calculations for Sampling Systems
- III. Introduction to Sampling Subsystems
 - SXS: Sample Extraction System
 - FPS: Field Preconditioning Subsystem
 - SCS: Sample Conditioning Subsystem
 - CSS: Calibration and Switching Subsystem
 - SDS: Sample Disposal Subsystem

DAY 2

Group Project: Common team exercise and team design project

- IV. The Sample Extraction Subsystem
 - Process Isolation Function Block
 - Sampling Probe Function Block
 - Stack Filter Function Block
 - Fall Back Function Block
 - Reflux Sampler Function Block
- V. The Field Preconditioning Subsystem
 - Heat Exchange Function Block
 - Liquid Pump Function Block
 - Liquid Vaporizer Function Block
 - Pressure Reducer Function Block

DAY 3

Group Project: Common team exercise and team design project

- VI. The Sample Conditioning Subsystem
 - Fast Loop Function Block
 - Particle Filter Function Block
 - Dual Filter Function Block
 - Phase Separator Function Block
 - Gas Sparger Function Block

DAY 4

Group Project: Common team exercise and team design project

- VI. The Sample Conditioning Subsystem (continued)
 - Cool Impinger Function Block
 - Vapor Demister Function Block
 - Permeation Dryer Function Block
 - Gas Diluter Function Block
- VII. The Calibration and Switching Subsystem
 - Automatic Switching Function Block
 - Manual Switching Function Block
 - Flow Control Function Block
 - Calibration Fluid Function Block
 - Grab Cylinder Function Block
 - Grab Vial Function Block

DAY 5

Group Project: Team design project

- VIII. The Sample Disposal and Utility Subsystem
 - Vent Header Function Block
 - Vent Control Function Block
 - Liquid Recovery Function Block
 - Vapor Recovery Function Block
 - Enclosure Control Function Block
 - Utility Headers Function Block
- IX. Team design project
 - Team project presentations
 - Presentation of certificates

About the Instructors

Tony Waters

Industry Expert and Consultant



Tony Waters brings over 45 years of experience with process analyzers and sampling systems to his numerous training programs, which have been presented in many countries. Mr. Waters has also founded three companies, and has worked in engineering and marketing roles for an analyzer manufacturer, end-user, and a systems integrator. Mr. Waters holds a Bachelor's degree in Systems Engineering from The Open University, Milton Keynes, United Kingdom.

Mr. Waters has authored a technical reference book, *Industrial Sampling Systems*, an indispensable resource for designing and maintaining sampling systems.

Phil Harris

Industry Expert and Consultant



In over 30 years of experience in industry and academia, Phil Harris has provided expert insight and analysis for a variety of applications. Mr. Harris is the author of many papers on analyzer systems and routinely presents at industry conferences and technical seminars.

With extensive experience in research, development and project management, Mr. Harris has supported many industries, including nuclear energy, oil refining, and alternative fuels. Mr. Harris earned both his Bachelor's and Master's degrees from the University of Manitoba.

[See the additional courses available at swagelok.com](http://swagelok.com)

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