

Learn to recognize and eliminate the issues that might be compromising your sample and analyzer systems

**SAMPLING SYSTEM TRAINING
2019**

SSM

October 31 - November 1

Trainer is Phil Harris

PASS

November 4-8

Trainer is Phil Harris

PASS SUBSYSTEM

November 11-15

Trainer is Tony Waters

Training is in
English language and at
Swagelok Nederland location

Better sample system design means more representative samples.

You will learn to...

- gain a better understanding of sample system components, such as valves and regulators
- diagnose and troubleshoot sample system errors
- learn sample system maintenance techniques
- diagnose and fix time delay problems
- understand sample system performance
- learn why and how samples change phase and how to manage your systems to control it
- though hands-on exercises and team projects using fluid system components such as regulators, apply course knowledge to solve real life problems

For...

Maintenance and Reliability Personnel, Analytical System Engineers new to use of sampling systems

Date

October 31- November 1 2019

Sharpen your Skills and Meet Demanding Requirements in just two days

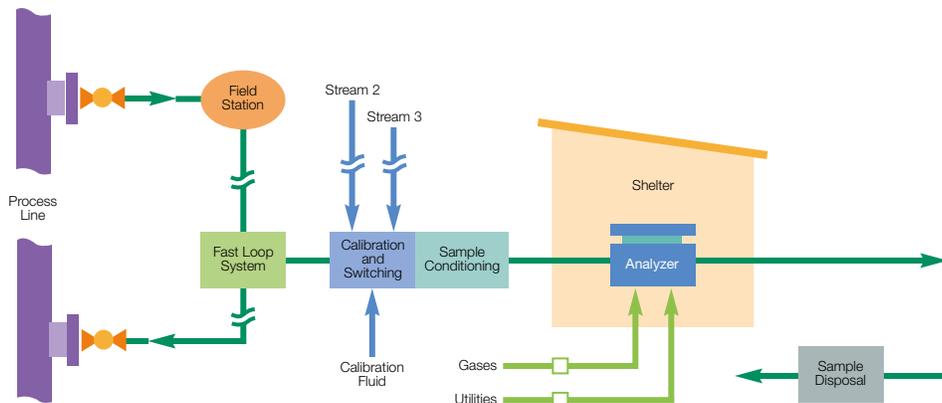


Students participate in an interactive exercise; learning to troubleshoot a sampling system.

If your job is maintaining a sampling system, you may not have the time or resources to come up to speed on the system. Achieving the results you need depends on deepening your understanding of the system, as well as fine-tuning the system for optimum performance.

You can eliminate mistakes in your sampling system. And you don't have to do it alone. Swagelok Training prepares analytical instrumentation technicians and maintenance personnel to catch mistakes before they happen and recognize existing problems in installed sampling systems.

Our Sampling System Problem Solving and Maintenance Training (SSM) teaches fundamental and advanced practices in analytical instrumentation operation and maintenance, empowering you to maintain your sampling system with minimal error and greater system integrity.



This two-day training course covers aspects of a sample system, from process line and tap through transport lines, stream switching, sample conditioning, analyzer and disposal.



Sampling System Problem Solving and Maintenance Training - **SSM**

Phil Harris

Industry expert, consultant

Phil has worked in industry and academia for over 30 years, providing expert insight and analysis for a variety of applications. Phil has authored many papers on analyzer systems and routinely presents at industry conferences and technical seminars. He has significant experience in research and development as well as project management.



Phil has worked in and supported a number of industries throughout his career, including nuclear energy, oil refining, and alternative fuels. Phil earned both his bachelor's and master's degrees from the University of Manitoba.

DAY 1 Fundamentals: Classwork and Basic Exercises

- I. Performance of Sample Systems
 - Maintenance techniques
 - Sample compatibility with analyzer
 - Time delay in sampling
 - Mixing and contamination
- II. Diagnosing and Fixing Time Delay Problems
 - Sample transport time calculations for liquids and gases
 - Gas compressibility and time delay
- III. System Components
 - Flow valve basics and the effects of water hammer
 - Pressure measurement devices
 - In-depth look at pressure regulators and common problems
 - Pumps and temperature regulation

DAY 2 Sample Conditioning Techniques

- Proper use of filters and coalescers
- Understanding and controlling phase change
- Liquid, vapor, and gas separation devices
- Design of field stations and fast loops
- Troubleshooting sample systems
- Group projects

Here's what graduates of this course have to say ...

"The broad scope of material covered helped me tie in many new concepts. I learned A LOT!"

"Good for helping me understand how the theoretical relates to real-life applications."

"The class lectures were very helpful. Using real life experiences and situations made it very interesting!"

You will learn to...

- diagnose sample transport problems
- evaluate and determine sample tap location, select an appropriate probe
- calculate and optimize sample transport lag (or time delay) for liquids and gases
- calculate pressure drop in a fast loop or return line
- calculate flow rate for a gas and liquid
- avoid or account for adsorption and permeation
- predict how much vapor will condense in a sampling system
- prevent or control phase separation
- vaporize a sample, if and when it is appropriate
- avoid deadlegs in a sampling system
- read and create sampling system schematics
- design and build a sampling system

For...

Analytical System Engineers, System Design Engineers, Instrumentation Engineers, Integrators, Chemists who may not be experienced in working with sampling systems

Date

November 4-8, 2019

Five Days to the Optimization of Your Process Analyzer Systems

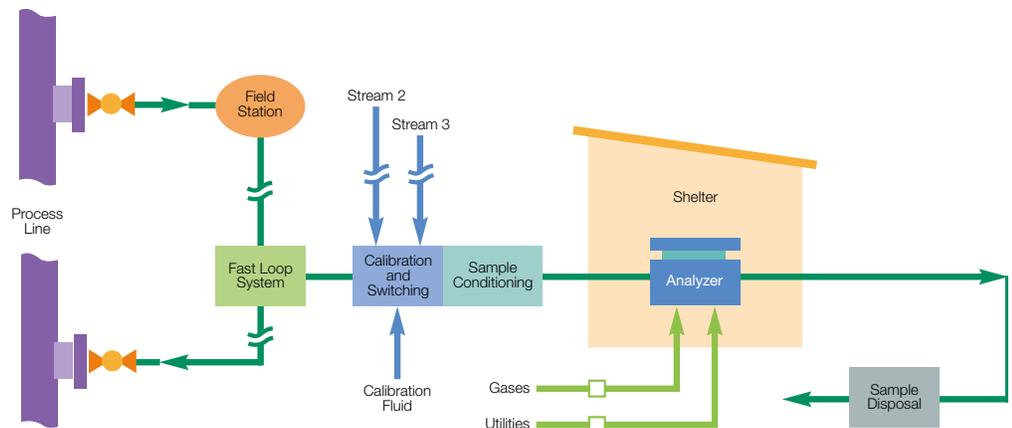


Students participate in an interactive exercise; learning to troubleshoot a sampling system.

Swagelok has serviced the process analyzer market for more than 60 years. As a global company, we have addressed all kinds of process analyzer sampling system challenges in a range of industries.

To help optimize your own system success, this expertise is now being presented in a five-day course specially developed for technicians, chemists, engineers or anyone involved in the design, building, operation or maintenance of process analyzer sampling systems.

Our experience tells us that, more often than not, inaccurate results from an analyzer indicate a problem with the sampling system itself, not the analyzer. Our goal is to teach you how to tell the difference. This course will show you how to recognize and diagnose common sampling system design flaws. You will learn how to employ formulas, calculations, and engineering principles rather than rely on guesswork or approximations. In the end, you will design, build, and present your own sampling system.



This five-day training course covers all aspects of a sampling system, from the process line and tap through transport lines, stream switching, sample conditioning, analyzer, and disposal.



Phil Harris

Industry expert, consultant

Phil has worked in industry and academia for over 30 years, providing expert insight and analysis for a variety of applications. Phil has authored many papers on analyzer systems and routinely presents at industry conferences and technical seminars. He has significant experience in research and development as well as project management. Phil has worked in and supported a number of industries throughout his career, including nuclear energy, oil refining, and alternative fuels. Phil earned both his bachelor's and master's degrees from the University of Manitoba.



Attendees of the PASS training keep the course workbook and receive the technical reference book, *Industrial Sampling Systems*, authored by Tony Waters—a € 245,- value.

Here's what graduates of this course have to say ...

"Whether you're troubleshooting or building a sampling system, these classes can deliver what you need to succeed."

"The material we covered in this class should greatly improve our reliability in sampling systems and analyzers."

Process Analyzer Sampling System Training - **PASS**

DAY 1 Fundamentals: Classwork and Basic Exercises

- I. Basic performance criteria and challenges
 - Sample compatibility with analyzer
 - Time delay in sampling
 - Mixing and contamination, including deadlegs
- II. Diagnosing and fixing time delay problems
 - Sample transport time calculations for liquids and gases
 - Gas compressibility and time delay

DAY 2 Classwork and Basic Exercises Group Project: Design a Complete Sampling System

- III. Sample Conditioning Techniques
 - Proper use of filters and coalescers
 - Liquid, vapor, and gas separation devices
 - The difference between vapor and liquid concentration
- IV. Sample Tap Design
 - Understanding process conditions, analyzer characteristics, and sample requirements
 - Location and design of process nozzle
 - Probe selection and design

DAY 3 Advanced Design Concepts Group Project: Design a Complete Sampling System

- V. Phase Preservation
 - How to condense or vaporize a sample (or avoid it)
 - How to use phase diagrams
 - Design of field stations and fast loops

DAY 4 Advanced Design Work Group Project: Prepare Group Design Presentations

- VI. Advanced Calculations
 - How to determine fluid velocity in line segments
 - Laminar and turbulent flow (Reynolds Number)
 - Effect of temperature and pressure
 - Calculating the pressure drop in each line segment

DAY 5 Stream and Calibration Selection

- VII. Techniques of Stream Switching
 - Avoiding deadlegs and mixing volumes
 - Modular sample conditioning systems
 - Design and build a modular sampling system
- VIII. Group Presentations
 - Group presentations and instructor comments

You will 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.

For...

Experienced sampling system engineers, design engineers, integrators, highly trained technicians and industry professionals with a working knowledge of principles related to sampling system design and troubleshooting.

Date

November 11-15, 2019

Tony Waters

Industry expert, consultant

Tony Waters brings over 50 years of experience with process analyzers and sampling systems to his numerous training programs, which have been presented in many countries. He 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. He is an ISA Analysis Division Fellow.



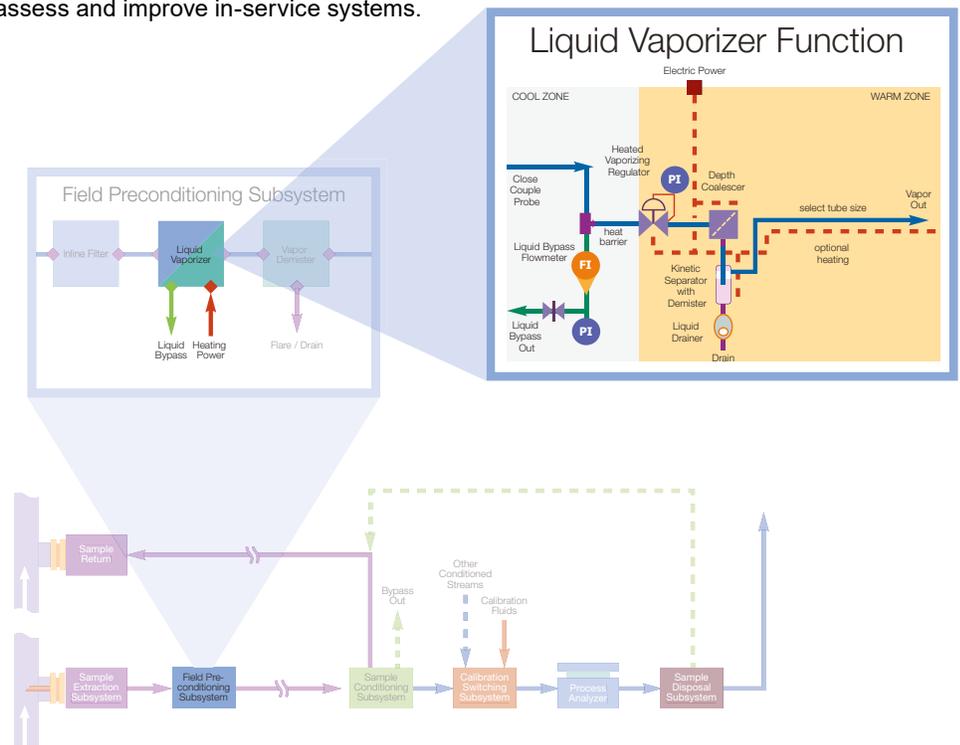
Five Days to the Optimization of Your Process Analyzer Systems & Subsystems



Students participate in an interactive exercise; learning to troubleshoot a sampling system.

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 Subsystem) Training Course, you can.

PASS Subsystem 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.



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

Process Analyzer Sampling System Training - **PASS Subsystem**

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 (II)
 - 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

Contact us for more information:
+31 (0) 88 9090 707 event@swagelok.nl
or register directly on nederland.swagelok.com.

Swagelok
Swagelok Nederland

Swagelok Terms and Conditions For Training Services



1. Terms

The terms (the "Terms") set forth herein govern the provision of the training services (the "Training Services") provided by Swagelok Company or its subsidiaries and any Swagelok Authorized Distributor (collectively, "Swagelok") to the user or recipient of the Training Services (individually and collectively the "User"). Any User response to, or confirmation of, these Terms which states different or additional terms is specifically rejected unless specifically agreed to in writing by Swagelok. Swagelok's failure to object to provisions contained in any communication from User will not be deemed a waiver of the Terms contained herein.

2. Warranty

(a) The Training Services shall be performed in a professional and workmanlike manner. The User's remedies shall be limited to a refund of the fees paid for such Training Services.
(b) IT IS EXPRESSLY AGREED THAT THIS WARRANTY IS IN LIEU OF ANY AND ALL OTHER WARRANTIES AND LIABILITIES, EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PURPOSE.

3. Limitation of Liability

IN NO EVENT, REGARDLESS OF CAUSE, SHALL SWAGELOK ASSUME RESPONSIBILITY OR BE LIABLE FOR:

(a) PENALTIES OR PENALTY CLAUSES OF ANY DESCRIPTION, (b) TO THE EXTENT PERMITTED BY LAW, INDEMNIFICATION OF USER OR OTHERS FOR COSTS, DAMAGES, OR EXPENSES EACH ARISING OUT OF OR RELATED TO THE TRAINING SERVICES PROVIDED, (c) CERTIFICATION, UNLESS OTHERWISE SPECIFICALLY PROVIDED FOR IN WRITING BY SWAGELOK, OR (d) INDIRECT, SPECIAL OR CONSEQUENTIAL DAMAGES UNDER ANY CIRCUMSTANCE, INCLUDING ANY LOST PROFITS, BUSINESS INTERRUPTION, OR OTHER DAMAGES. IN NO EVENT SHALL SWAGELOK LIABILITY EXCEED THE PURCHASE PRICE FOR THE TRAINING SERVICES REGARDLESS OF THE FORM OF ACTION, WHETHER IN CONTRACT OR TORT, INCLUDING NEGLIGENCE. THE FOREGOING WARRANTY AND LIMITATION OF LIABILITY STATES USER'S ENTIRE AND EXCLUSIVE LIABILITY AND SOLE REMEDY.

4. Release of Claims

User hereby waives, releases, and relinquishes any and all claims for liability and causes of action, including, but not limited to, personal injury, property damage or wrongful death, arising out of participation in the Training Services or activities incidental thereto, whenever or however they occur, regardless of fault.

User acknowledges, understands and assumes all risks relating to User's participation the Training Services, and understands that the Training Services involve risks including, but not limited to, death or bodily injury.

5. Intellectual Property

All intellectual property contained in the training materials delivered to the User as part of the Training Services shall remain the exclusive property of Swagelok and may not be disclosed to, or relied upon by any third party unless approved in writing by Swagelok. Swagelok hereby grants User a limited, non-exclusive license to use the training materials solely for User's internal business use.

6. Choice of Law and Venue

The laws of the State of Ohio, USA shall govern and be used to construe Terms and any claims or disputes related to these Terms or the Training Services. Such laws shall exclude conflict of law provisions and the UN Convention on Contracts for the International Sale of Goods. All actions or proceedings under or relating to this agreement shall be resolved in a state, or federal Northern District of Ohio court located in that jurisdiction; provided, however, that in Swagelok's discretion such an action may be heard in some other place designated by Swagelok if necessary to acquire jurisdiction over third parties to consolidate the dispute into one action. User hereby agrees to appear in any such action, consents to the jurisdiction of such courts, and waives any objections it might have as to venue in any such court.

7. Exclusive Terms and Conditions

It is expressly agreed that these Terms contain the complete agreement between User and Swagelok, and no agreement or other understanding purporting to modify them shall be binding upon Swagelok without Swagelok's written consent.

Course Cancellations:

Swagelok reserves the right to cancel a course in its sole discretion. Registered students will be notified and refunded no later than 30 days prior to course date. Swagelok is not responsible for fees incurred with cancelled travel. Students needing to cancel an enrollment may change enrollment to another course date, send someone in your place, or request a refund. Refund requests must be received 3 weeks prior to the start day of the enrolled training course. Course cancellations, refunds and changes may be requested by contacting your authorized Swagelok sales and service center or by emailing analyticaltraining@swagelok.com

