IPSA
Process & Laboratory

PROCESS ANALYZER & SAMPLING SYSTEMS 2026

October 5-8, 2026
Kuala Lumpur, Malaysia

INSTRUCTOR
DIRK HORST

HRDCORP CLAIMABLE

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INSTRUCTOR

DIRK HORST
Freelance Trainer Process Analyzers & Sampling Systems and Custody Transfer / Fiscal Metering
North Holland, Netherlands

Since 2012, **Dirk Horst** has been delivering training courses worldwide, mainly focused on **Process Analyzers & Sampling Systems** and **Custody Transfer / Fiscal Metering**. He delivers both public courses and customized in-house training for multiple international training providers, particularly in the Middle East. Dirk holds a **Certificate in Industrial Sampling Systems Engineering**, having completed the 36-week **Tony Waters** training at the highest level, and has also served as an Instrument Trainer at the **National Training Institute of Oman** and as an instructor for **Haward Technology** in Abu Dhabi.

Mr Horst brings extensive hands-on international experience from major LNG and refinery projects, including **Sakhalin LNG (Russia)**, **Nigeria LNG (six trains)**, **Reliance Refinery (India)**, and **Shell Harburg Refinery (Germany)**. His roles have included Process Analyzer Engineer, Trainer, Consultant, Competence Assessor, and Internal Verifier for City & Guilds. He has led analyzer system design, commissioning, startup, maintenance, ISO-compliant custody transfer upgrades, and the development of competence and progression systems. Dirk is also known for building strong local maintenance teams and leading the successful engineering and startup of advanced QMI in-line blending and quality measurement systems, delivering significant operational and financial benefits.

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COURSE OBJECTIVES

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

- Describe the purpose, operation of sample handling and application of a Process Analyzer system, Quality Monitoring systems and Spectroscopic Analyzer systems
- Describe all the design steps and requirements like response, conditioning, phase envelope that are essential issues involved with Gas and Liquid sampling
- Describe the principles of the applied types of Physical Property analyzers and Gas Chromatography
- Understanding of the basic rules and tools for Analytical Accuracy, Performance & Quality Assurance.

WHO SHOULD ATTEND

This course is intended for professionals who are regularly involved with process analyzer systems like quality measurement instrumentation technicians and engineers, production & operation engineers and supervisors as well as laboratory personnel.

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COURSE DESCRIPTION

Analytical instruments used for online chemical analysis of process streams or plant environments are generally called Process Analyzer Systems or Quality Measuring Instruments. Reliable online analytical data is crucial for a safe and efficient operation is not limited to the Oil & Gas and Chemical Industry but also for Pharmaceutical, Power Generation and other industries. Legislative requirements, economic as well as health and safety, emissions control and energy conservation are setting increasing stringent limits for reliable analyzer data which may result in huge losses or fines to the operating company.

For latter reasons it is obvious that sustainable optimum performance of online instrumentation, sample-handling systems and correct data handling is indispensable which requires continual professional attention from the analyzer engineers and maintenance staff.

To achieve optimal performance a thorough understanding of design and operating principles, possible interferences and practical skills are key requirements.

In this course complete analyzer systems are discussed while special attention is given to applied sampling systems next to the main types and principles of currently applied Process Analyzers ranging from Physical Properties, online Chromatography, Water type analysis to the promising future of Spectroscopic type of on-line analysis while advantages and disadvantages are clarified with the aim to enhance the understanding the operational ranges and limitations of each type of analysis system.

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TRAINING AGENDA

PROGRAM – DAY 1

Section 01: Introduction to the world of QMI

- Why Instruments
- Where do we need it
- What types are there
- What is measurement
- Measurement Standards
- Traceability
- Quality Assurance
- Response related issues.

Section 02: Measurement Accuracy & Quality Assurance

- Measurement Standards
- Units & Systems
- Introduction Quality Assurance
- Traceability & Organization
- Definitions Accuracy, Systematic Errors and Precision
- Factors influencing Accuracy
- Measurement Calibration procedure
- Hysteresis Accuracy, Precision, Standard Deviation & Variance
- "Playing Darts"
- Repeatability and Reproducibility
- Variability & Probability
- Statistical Control & Normal Distribution
- STD & Systematic Error
- Control Chart Tool
- Setting up a Control Chart for Performance Monitoring
- Warning & Control Limits
- Statistical Decision Rules
- Historical STD
- Reproducibility Rate

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Section 03: Analyser Sampling System & Design

- Off and online Sampling
- The 6 GOALS of optimal sampling
- How to deal with Pressure Drop?
- Important Practical Notes
- Compatibility issues
- Required Timely Response
- How to deal with 'Dead-Legs' and 'Dead-Volumes'?
- Sampling Best Practices
- Summary of Sampling Design Steps
- Flow Profile
- Maintaining the sample temperature
- Essential function of a Sampling Probe
- Gas / Liquid Sample take-off configuration
- Main Calculations for Sampling System Design
- Fast Loop Design for Liquid sample
- Darcy Equation and Friction factor
- Sampling System Configuration options
- XL spreadsheet for design of sampling system

Section 04: Vaporization, Phase Diagrams & Fractionation

- Significance and Definitions
- Vapor Pressure Properties
- Relation Boiling Point and Saturated Pressure
- Vapor Pressure Measuring Methods
- Phase Diagrams – Single and Multi-Component
- Different compositions of Vapor and Liquid
- Design related issues / recommendations
- Example of huge time delay in liquid sample design
- Vaporization of multi-component liquid
- Fractionation and spoiling of sample analysis
- Example of LNG Vaporizer development

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PROGRAM – DAY 2

Section 05: Sample Filtration Methods and applied Tools for Conditioning / Analyzer Housing

- Types of filtrations applied
- Blow-back feature
- Removing gas bubbles from liquid sample
- Fast Loop filtering system
- Coalescing filtration
- Analyzer House options

Section 06: Three Exercises concerning the Design of a Sampling & Conditioning System

Section 07: Discussion Answers 3 exercises

Section 08: Principles of Gas Chromatography

- Introduction
- Combinations of GC and MS
- What is Chromatography
- Retention phenomena
- Separation factors
- Retention factor
- Types of Chromatographic columns
- Band broadening and column efficiency
- Theoretical Plate Model • Temperature influence on separation
- Van 'Deemter' efficiency curve
- Selection of the type of carrier gas
- Peak Selectivity and Resolution
- Base line properties, Noise and LOD

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Section 09: Types of GC Detectors and Peak Quantitation Methods

- Thermal Conductivity Detector and measurement
- Flame Ionization Detector
- Dynamic Range of Detectors
- Application of Make-up gas
- Electron Capture Detector
- Flame Photometric Detector
- Detector and Relative Response Factors
- Integration Methods
- Analysis Data Processing
- Standard Calibration Methods

Section 10: Heating Value Measurements

- Introduction Calorimetry
- Types of Calorimeters
- Determination of Heating Values
- Higher and Lower Heating Value
- Wobbe Index and CARI
- Online Wobbe Index analyzer
- NMR application

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PROGRAM – DAY 3

Section 11: Oxygen Analysis

- Main applied methods for Oxygen measurement
- Principle of Electrochemical cell
- Introduction to Combustion Control
- Stoichiometric ratio
- ZrO2 type Oxygen analyzers
- Operating principle ZrO2 analysis
- Nernst Equation
- Combustion possible interferences
- Paramagnetic type Oxygen analyzer
- Background gas interference
- Sampling and installation
- Magnetic wind type analysis
- Trouble shooting
- 'LaserGas' Single Path Oxygen analyzer

Section 12 : Moisture Theory & Analysis Methods • Dew Point / Frost Point

- Water Vapor properties,
- Dalton's Law
- Dew Point / Pressure relationship
- Relative Humidity
- Psychrometric RH measuring method
- Moisture Analysis methods
- SiO2 and AlOx sensors
- Electrolytic type moisture sensor
- Quartz crystal (Ametek) Moisture analysis
- Chilled Mirror DP analysis
- New Developments
- Spectroscopic Moisture analysis
- IR / NDIR Moisture analysis
- Tunable Diode Laser Moisture sensor
- Moisture Sample Conditioning

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Section 13: pH measurement

- Reasons for pH analysis
- Introduction to pH measurements
- Construction of the glass measuring electrode
- Types of pH electrodes and their application
- pH measuring circuit
- pH measuring principle and Nernst equation
- Potentials present in a pH loop
- Asymmetry potential
- pH practical notes and Measuring Range
- pH buffers and calibration conditions
- pH -Temperature compensation clarification in relation to Process temperature
- Conditioning, storage and Cleaning of pH sensors
- Checking and Calibration of pH system

PROGRAM – DAY 4

Section 14 : Spectroscopic Analysis IR, UV and FTIR

- Types of Spectral Absorptions
- Spectral Ranges
- Relation frequency and wavelength
- Diffraction methods
- Principles & Techniques applied
- Types of Spectroscopy
- Lambert Beer's Law
- NIR spectrum
- Industrial Non Dispersive IR analysis
- UV analysis
- FT-IR and FTNIR
- How are FTIR results obtained
- Practical Differences FTIR and IR
- Raman Spectroscopy
- Spectrometers for CEMS
- NMR application

Section 15: Summary of issues to optimize the GC analysis

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SCHEDULE

4 Days Training Course
Start: 9:00 AM on Monday, October 5th, 2026
End: 5:00 PM on Thursday, October 8th, 2026

TRAINING LOCATION

Hotel / Venue Location TBD

Kuala Lumpur, Malaysia

CANCELLATION POLICY

Substitute Attendees: You can send a substitute attendee at any time without any extra charge.
Class Cancellation: We reserve the right to cancel any class with low enrollment. If this happens, you will receive a full refund.

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COURSE FEE

Fee: RM 9,900 per attendee (nett).
Payment: Fees must be paid in advance.
Inclusions: The fee covers all instructional materials, textbooks, lunch, and refreshments each day.
Offer: Discount of 5% for companies who register more than 2pax per company.
Note: Course Fee is applicable for HRDF Claimable Courses.

CERTIFICATION

Each participant will receive a certificate upon successful completion of the training course, recognizing their achievement.

REGISTRATION

To register for our training course, please email or call us with the following details:

- Name
- Contact number
- Company Name
- Number of Participants Joining

You may also scan our QR code to fill up the form.

Process Analyzer & Sampling Systems 2026 by Dirk Horst (Oct 5th - 8th 2026, KL)

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