



Online Process Analyzers and Sample Conditioning Systems Training Course



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Introduction:

Online process analyzers and sample conditioning systems training is a 10-day course for instrument, analyzer and process engineering teams in refining, gas processing, petrochemicals and utilities that ends with an Analyzer System Specification and Maintenance Plan. Organisations lose product value, control performance and custody revenue when analyzers sit on slow sample loops, drift without statistical validation or stay out of service for lack of spares and skills. Nominees already engineer or maintain field instruments, and the course is taught through case studies built on stream data, analyzer records and sample system drawings. CoreConcept Training Center delivers this online process analyzers course.

Course Objectives:

- Select process gas chromatograph, moisture, oxygen, sulphur, pH, conductivity, NIR and tunable diode laser analyzers to match each stream and measurement duty
- Design sample take-off, probe, fast loop and transport arrangements that keep total lag time within the control requirement
- Specify sample conditioning panels for filtration, pressure and temperature control and liquid vaporisation without changing sample composition
- Validate analyzer results against reference values with ASTM D3764 practice and ASTM D6299 control charts
- Integrate analyzer values, status and validation flags into the DCS and agree reporting rules with operations and laboratory teams
- Organise analyzer maintenance with reliability KPIs, preventive routines, staffing and critical spares

Target Audience:

- Analyzer engineering teams responsible for specifying and commissioning online analyzer systems
 - Instrument engineering teams responsible for analyzer houses, sample systems and hazardous area installation
 - Process engineering teams responsible for quality control loops and stream composition targets
 - Analyzer maintenance teams responsible for calibration, validation and repair of online analyzers
 - Maintenance planning teams responsible for analyzer preventive routines, consumables and spare parts
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Course Outline:

Day 1: Role of Online Analyzers in Control and Custody Transfer

- Analyzer Duties in Closed-Loop Quality Control and Optimisation
- Custody Transfer Gas Quality and Calorific Value Measurement Duties
- Online Versus Laboratory Results and Measurement Delay Impact
- API RP 555 Analyzer System Scope from Tap to DCS
- Current-State Analyzer Inventory and Criticality Ranking Exercise

Day 2: Process Gas Chromatographs and Moisture Analyzers

- Process Gas Chromatograph Oven, Valve Switching and Column Trains
- TCD and FID Detector Selection for Process Streams
- Cycle Time, Backflush and Heart-Cut Configuration Decisions
- Capacitance and Quartz Crystal Moisture Analyzer Operating Principles
- Water and Hydrocarbon Dew Point Measurement in Gas Streams

Day 3: Oxygen, Sulphur, pH and Conductivity Analyzers

- Paramagnetic and Zirconia Oxygen Analyzers for Combustion Control
- Lead Acetate Tape and Electrochemical H₂S Measurement Methods
- Total Sulphur Analysis by Hydrogenation and Oxidation Routes
- pH and Conductivity Electrode Selection for Water and Effluent
- Electrode Fouling, Reference Junction and Temperature Compensation Checks

Day 4: Spectroscopic Analyzers, Tunable Diode Laser, NIR and CEMS

- Beer-Lambert Law Applied to Process Spectroscopy Measurements
- Tunable Diode Laser Absorption Spectroscopy for Oxygen and Moisture
- NIR Spectroscopy with Chemometric Models for Fuel Properties
- CEMS Architecture for SO₂, NO_x, CO and Particulate Overview
- CEMS Daily Calibration Error Checks and RATA Audit Preparation

Day 5: Guided Case Study on Analyzer Technology Selection for a Gas Plant

- Case Stream Data Pack with Composition and Process Conditions
 - Analyzer Technology Selection Matrix Against Each Measurement Duty
 - Guided Exercise Comparing Gas Chromatograph and Laser Analyzer Duties
 - Guided Exercise Reviewing Sulphur and Moisture Measurement Points
 - Week-One Findings Log and Capstone Case Unit Scope
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Day 6: Sample Take-Off, Probes, Fast Loops and Lag Time

- Sample Tap Location and Probe Insertion Depth Decisions
- Retractable and Filtered Probes for Dirty or Wet Streams
- Sample Transport Lag Time Calculation from Line Volume
- Fast Loop Return Points and Pressure Differential Sizing
- Heat Tracing and Tubing Bundles Preventing Sample Condensation

Day 7: Sample Conditioning Panels, Analyzer Shelters and Hazardous Areas

- Conditioning Panel Filter, Coalescer and Membrane Separator Selection
- Pressure Reduction and Temperature Control on Conditioning Panels
- Liquid Sample Vaporisation Without Fractionation or Composition Change
- Analyzer Shelter Layout, HVAC and Utility Supply Design
- Hazardous Area Classification, Purged Enclosures and Shelter Gas Detection

Day 8: Analyzer Validation, DCS Integration and Operations Interfaces

- ASTM D3764 Analyzer Versus Laboratory Result Validation Practice
- ASTM D6299 Control Charts for Analyzer Quality Assurance
- Validation Blend Injection and Automatic Calibration Sequence Design
- Analyzer Values, Status Flags and Alarms in the DCS
- Analyzer Reporting Agreements with Operations and Laboratory Teams

Day 9: Analyzer Reliability KPIs, Maintenance Organisation and Spares

- Analyzer Availability and Control Utilisation KPI Definitions
- Bad Value Rate and Validation Failure Trend Analysis
- Preventive Maintenance Routines Set by Analyzer Technology Type
- Analyzer Maintenance Team Structure, Skills Matrix and Workload Planning
- Critical Spares List and Consumables Stock Level Planning

Day 10: Case Study Capstone Analyzer System Specification and Maintenance Plan

- Capstone Analyzer Datasheet for the Case Unit Stream
 - Capstone Sample System Lag Time and Conditioning Panel Design
 - Capstone Validation Plan with Control Charts and Reference Results
 - Capstone Maintenance Routines, Reliability KPIs and Spares Schedule
 - Analyzer System Specification and Maintenance Plan Peer Review
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Skills You Will Gain:

- Analyzer Technology Selection
- Sample Lag Time Calculation
- Sample Conditioning Design
- Statistical Analyzer Validation
- Analyzer Shelter Engineering
- Analyzer Data Integration
- Analyzer Reliability Measurement
- Analyzer Spares Planning

Why Attend This Course:

- Deliver an Analyzer System Specification and Maintenance Plan for a case unit to the instrument manager, the analyzer maintenance lead and the process owner
- Decide which analyzer technology, sample system and validation method suits a stream before purchase orders are placed
- Avoid off-specification product, custody disputes and lost control utilisation caused by slow sample loops and unvalidated analyzer readings
- Share lag time calculations, validation chart templates and analyzer KPI definitions with instrument and maintenance colleagues

Conclusion:

Back at work, the participant gives the instrument manager, the analyzer maintenance lead and the process owner an Analyzer System Specification and Maintenance Plan that sets technology choice, sample system design, validation method, DCS signals, reliability KPIs and spares for a unit. Managers use it to approve new analyzer purchases, fix sample loops that respond too slowly and justify analyzer staffing and stock levels. After the first quarter under the plan, the unit should review analyzer availability, validation failures and bad value rates against the targets it sets.

Frequently Asked Questions FAQ:

What should participants know before the online process analyzers and sample conditioning systems course?

Participants should already work with field instruments, P&IDs and plant control systems. Prior hands-on work with at least one online analyzer helps. Bringing a sample system drawing or analyzer list from their own unit lets them apply the case studies to familiar streams.

How does online process analyzers and sample conditioning systems training differ from a laboratory chromatography or general instrumentation course?

It covers the whole analyzer system from tap point to DCS, including sample transport, conditioning, shelters, statistical validation and analyzer maintenance management. Laboratory chromatography courses focus on bench methods, and general instrumentation courses treat pressure, flow, level and temperature loops.

Why does sample lag time matter for online process analyzers and sample conditioning systems?

An analyzer can only control what it sees in time. Long sample lines, oversized filters and slow fast loops add dead time, so a control loop reacts late, product drifts off specification and operators stop trusting the reading.

What do participants take back from the online process analyzers and sample conditioning systems course?

Participants take back an Analyzer System Specification and Maintenance Plan with an analyzer datasheet, a sample system lag time and conditioning design, a validation plan with control charts, preventive routines, reliability KPIs and a critical spares list for a case unit.
