TRAINING CATALOGUE · CATEGORY E

Process Control & Alarm Management

Loop tuning, control-valve diagnostics, alarm management, advanced process control, monitoring, plant analytics and safe operation of safety instrumented systems.

7 COURSES

9.5 TRAINING DAYS

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Category E · Process Control & Alarm Management

CODE	COURSE	DURATION	LEVEL	PRIMARY AUDIENCE
E · Process Control & Alarm Management				
TR-E01	**Alarm Management — ISA-18.2 Lifecycle** Philosophy, rationalisation workshop and performance monitoring	2 days	Intermediate	Control and instrument engineers
TR-E02	**PID Loop Tuning Fundamentals** Model-based tuning, loop assessment and the reasons most loops on a unit are still in manual	2 days	Intermediate	Control and instrument engineers
TR-E03	**Control Valve Performance and Loop Diagnostics** Sizing basics, positioner behaviour, stiction and hysteresis testing, and separating valve problems from tuning problems	1 day	Intermediate	Instrument and control engineers
TR-E04	**Advanced Process Control (MPC) Principles and Maintenance** How multivariable predictive controllers work, how to design and step-test them, and why most of them end up switched off	2 days	Advanced	APC and control engineers
TR-E05	**Process Monitoring, Soft Sensors and Early-Warning Limits** Turning historian data into inferentials, monitoring limits and alerts that fire before the alarm does	1 day	Intermediate	Process
TR-E06	**Data Analytics and AI for Plant Operations** What machine learning and agentic AI can and cannot do in a plant, and how to deploy them without losing control	1 day	Foundation	Operations
TR-E07	**Safety Instrumented Systems Operation and Bypass Management** What operators and supervisors must know about trips, testing and the control of overrides	½ day	Foundation	Panel and field operators

CONTROL & ALARMS · INTERMEDIATE · 2 DAYS

Alarm Management — ISA-18.2 Lifecycle

Philosophy, rationalisation workshop and performance monitoring

DURATION	LEVEL	FORMAT	LANGUAGE	MAX. PARTICIPANTS
2 days	Intermediate	On-site classroom · virtual instructor-led	English	16

1 rationalisation workshop on your alarms

6 ISA-18.2 KPIs

1 priority matrix template

Overview

Nuisance alarms are a symptom; the disease is an alarm system nobody owns. The course walks the ISA-18.2 lifecycle from philosophy to audit, then runs a real rationalisation workshop on the participants' own alarm list so they leave with a documented method, a priority matrix and the first rationalised loops.

Learning outcomes

- Write or improve a site alarm philosophy document
- Set priorities with a consequence/time-to-respond matrix
- Rationalise alarms: cause, consequence, operator action, set-point and priority
- Use advanced techniques — state-based alarming, shelving, flood suppression
- Measure performance against ISA-18.2 and EEMUA 191 benchmarks
- Manage change so the database does not decay

Who should attend

Control and instrument engineers, console operators and shift supervisors, alarm-management champions

Course outline

DAY 1

Alarm-related incidents · ISA-18.2 lifecycle · philosophy and priority matrix · alarm database and documentation · rationalisation method

DAY 2

Rationalisation workshop on participants' alarm list · KPIs: rate, floods, standing alarms · state-based and dynamic alarming · HMI and ISA-101 principles · monitoring with ProcessVision · MOC for alarms

Standards referenced

ANSI/ISA-18.2 · IEC 62682 · EEMUA 191 · ISA-101

Tools & exercises

Alarm KPIs and rationalisation records in ProcessVision

What's included

- ✓ Course manual and slide pack
- ✓ Software access for the course
- ✓ Post-course Q&A with the instructor
- ✓ Exercise and case-study pack
- ✓ Competency quiz and certificate
- ✓ Templates used in the exercises

PREREQUISITES
Familiarity with DCS operation or configuration

CERTIFICATION
Certificate of completion

INSTRUCTORS
Practising engineers — TÜV HAZOP Leader, CCPSC and IEC 61511 Functional Safety certified — with 200+ years of cumulative plant experience.

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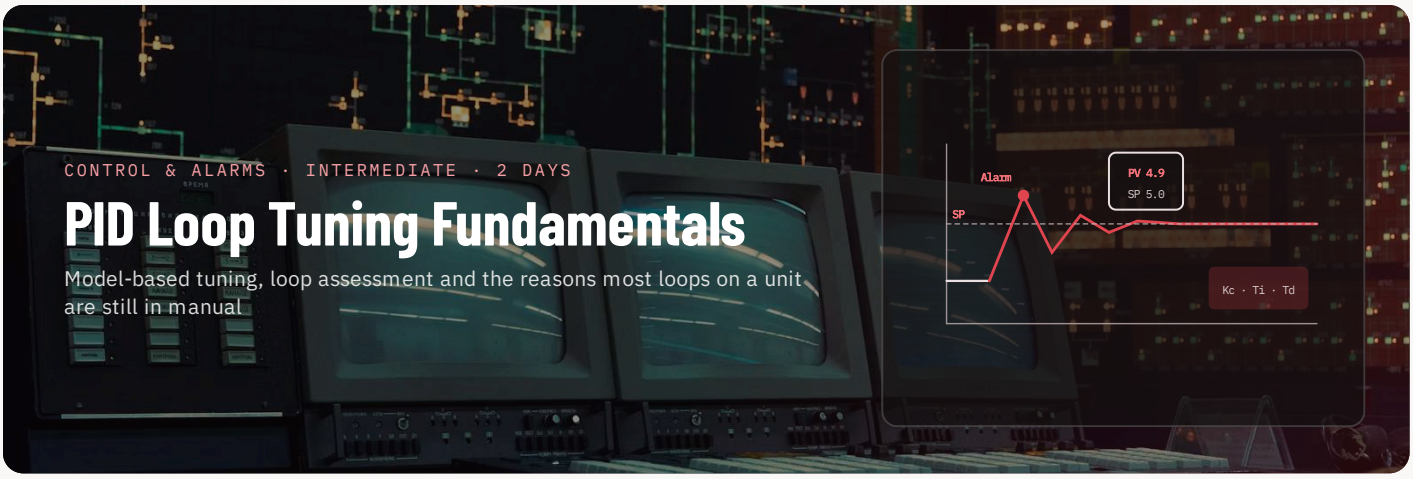

CONTROL & ALARMS · INTERMEDIATE · 2 DAYS

PID Loop Tuning Fundamentals

Model-based tuning, loop assessment and the reasons most loops on a unit are still in manual

DURATION	LEVEL	FORMAT	LANGUAGE	MAX. PARTICIPANTS
2 days	Intermediate	On-site classroom · virtual instructor-led	English	16

Your own loops assessed in CeraPID

8 tuning exercises on live-data models

1 loop KPI baseline for the unit

Overview

On a typical unit a third of the loops are in manual, a third oscillate and the rest were last tuned at commissioning. This course teaches tuning as an engineering method rather than a trial-and-error art: identify a process model from a bump test, choose a closed-loop response with a defensible lambda, and check the result on the trend. Participants work on their own loops exported from the historian, so the second day doubles as the first loop-assessment pass for their unit.

Learning outcomes

- Recognise the PID forms, units and options implemented in the site DCS and convert between them
- Run and interpret a bump or step test and fit FOPDT and integrating models
- Tune with IMC/lambda and SIMC rules for self-regulating, integrating and dead-time-dominant loops
- Diagnose oscillation, stiction, hysteresis and poor tuning from routine trend data
- Tune cascade, ratio, feedforward and override schemes in the right order
- Set loop KPIs and a review cycle so tuning does not decay

Who should attend

Control and instrument engineers, DCS configuration engineers, process engineers responsible for unit performance; experienced panel operators

Course outline

DAY 1

What a loop is for: variability, constraints and money · PID algorithm forms, units and DCS-specific options · process dynamics: gain, time constant, dead time, integrating processes · bump testing on a live loop · model identification in CeraPID · IMC/lambda and SIMC tuning · robustness and aggressiveness trade-off

DAY 2

Level, flow, pressure and temperature loop characteristics · cascade, ratio and feedforward tuning order · override and split-range schemes · stiction, hysteresis and valve issues seen from the controller · loop-assessment KPIs: variance, oscillation index, saturation, time in manual · workshop on participants' own loops · tuning records and MOC

Standards referenced

ISA-5.1 · ISA-51.1 · IEC 61131-3 · ISA-75.25.01 / .02 · API RP 554

Tools & exercises

Model identification, tuning and loop KPIs in CeraPID on participants' own historian data

What's included

- ✓ Course manual and slide pack
- ✓ Software access for the course
- ✓ Post-course Q&A with the instructor
- ✓ Exercise and case-study pack
- ✓ Competency quiz and certificate
- ✓ Templates used in the exercises

PREREQUISITES
Familiarity with DCS operation or configuration; basic control theory helpful but not required

CERTIFICATION
Certificate of completion

INSTRUCTORS
Practising engineers — TÜV HAZOP Leader, CCPSC and IEC 61511 Functional Safety certified — with 200+ years of cumulative plant experience.

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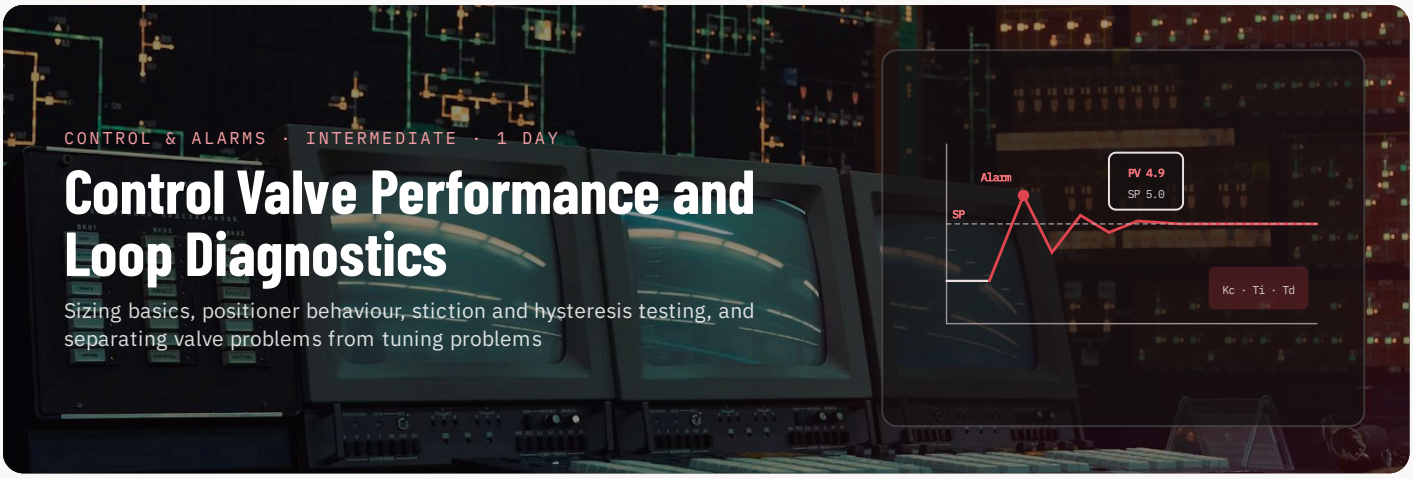

CONTROL & ALARMS · INTERMEDIATE · 1 DAY

Control Valve Performance and Loop Diagnostics

Sizing basics, positioner behaviour, stiction and hysteresis testing, and separating valve problems from tuning problems

DURATION	LEVEL	FORMAT	LANGUAGE	MAX. PARTICIPANTS
1 day	Intermediate	On-site classroom · virtual instructor-led	English	16

20 valve signatures interpreted

5 diagnostic tests you can run yourself

1 bad-actor list for the unit

Overview

Half the loops blamed on tuning are actually valve problems, and retuning a sticking valve only makes it oscillate more slowly. This course covers what a control valve has to do — capacity, characteristic, rangeability, response — and how to prove from controller output and process variable trends whether it is doing it. Participants learn the field tests defined in ISA-75.25, read positioner and valve signatures, and build a bad-actor list from their own unit's data.

Learning outcomes

- Check a valve sizing calculation for Cv, choked flow, cavitation and noise per IEC 60534
- Match inherent and installed characteristics to the loop and explain why a wrong choice limits tuning
- Run step-response, resolution and dead-band tests to ISA-75.25.01 and interpret the results
- Recognise stiction, hysteresis, backlash and positioner problems on PV/OP plots
- Read smart-positioner diagnostics and decide whether the valve goes to the workshop
- Rank valves for maintenance from loop-assessment data rather than complaints

Who should attend

Instrument and control engineers, valve and instrument technicians, reliability engineers; process engineers who sign valve data sheets

Course outline

MORNING

Valve function and the loop: what the controller sees · sizing basics: Cv, pressure recovery, choked flow, cavitation and flashing (IEC 60534-2-1) · inherent vs installed characteristic and rangeability · actuators, positioners and bench range · noise and trim selection overview

AFTERNOON

Response testing per ISA-75.25.01: step, resolution, dead band, overshoot · stiction and hysteresis on PV-OP plots · smart-positioner diagnostics and valve signatures · separating valve, tuning and process issues · bad-actor ranking on participants' loop data in CeraPID · field checks and maintenance hand-over

Standards referenced

ISA-75.25.01 / ISA-75.25.02 · IEC 60534-2-1 / 60534-8 · ISA-75.01.01 · ISA-5.1 · API RP 554

Tools & exercises

Valve diagnostics and stiction detection in CeraPID; participants' own loop data

What's included

- ✓ Course manual and slide pack
- ✓ Software access for the course
- ✓ Post-course Q&A with the instructor
- ✓ Exercise and case-study pack
- ✓ Competency quiz and certificate
- ✓ Templates used in the exercises

PREREQUISITES
Basic instrumentation or loop-tuning experience; TR-E02 recommended

CERTIFICATION
Certificate of completion

INSTRUCTORS
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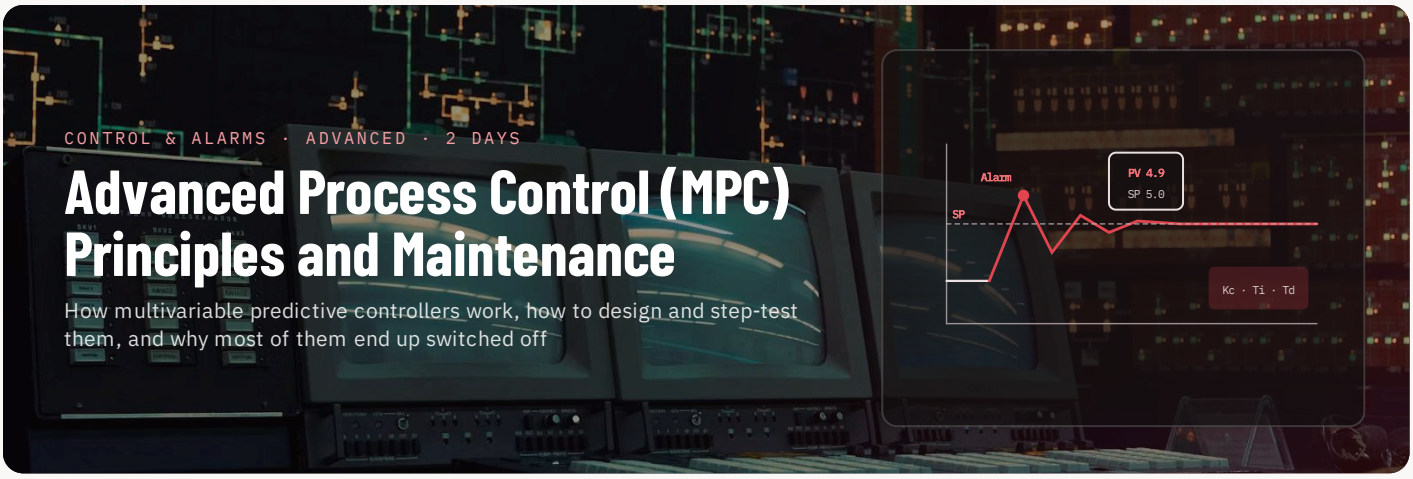

CONTROL & ALARMS · ADVANCED · 2 DAYS

Advanced Process Control (MPC) Principles and Maintenance

How multivariable predictive controllers work, how to design and step-test them, and why most of them end up switched off

DURATION	LEVEL	FORMAT	LANGUAGE	MAX. PARTICIPANTS
2 days	Advanced	On-site classroom · virtual instructor-led	English	16

1 MPC design built end to end

3 step-test plans reviewed

12 monitoring KPIs for an APC application

Overview

An MPC application is a set of models, limits and economics that must be maintained like any other piece of equipment; the industry's experience is that half of them are off within three years. The course explains what a predictive controller actually does with its models and objective function, then works through the lifecycle that keeps it on: benefits estimation, base-layer preparation, step-test planning, model identification, commissioning, and the monitoring that detects model mismatch before the operators lose confidence. Exercises use a distillation column case in ProcessVision.

Learning outcomes

- Explain prediction, move suppression, constraint handling and LP/QP steady-state optimisation in operator and manager terms
- Estimate benefits and define the constraint set and economics for a candidate application
- Prepare the base layer: loop tuning, valve health, inferentials and instrument checks
- Plan and supervise a step test and identify models with adequate quality
- Commission an application: tuning weights, limit ranges, operator interface and hand-over
- Monitor service factor, constraint activity and model quality and decide when to re-identify

Who should attend

APC and control engineers, process engineers supporting APC applications, console supervisors and operations engineers who own the benefits

Course outline

DAY 1

Why APC pays: variability reduction and constraint pushing · MPC anatomy: models, prediction horizon, control horizon, move suppression · steady-state optimiser and economics · benefits estimation and functional design · base-layer audit with CeraControl · inferential and soft-sensor requirements · step-test planning: signals, amplitude, duration, PRBS

DAY 2

Model identification and model-quality judgement · controller tuning weights and limit ranges · operator interface, alarms and ISA-101 considerations · commissioning and benefit verification · monitoring KPIs: service factor, limits active, prediction error, model mismatch · sustaining: MOC for APC, re-identification triggers, roles · workshop on a column application in ProcessVision

Standards referenced

ISA-95 / IEC 62264 · ISA-101 · ISA-18.2 · API RP 554 · IEC 61131-3

Tools & exercises

Base-layer analytics, step-test planning and model discovery in ProcessVision (CeraControl) with CeraTrace historian trends

What's included

- ✓ Course manual and slide pack
- ✓ Software access for the course
- ✓ Post-course Q&A with the instructor
- ✓ Exercise and case-study pack
- ✓ Competency quiz and certificate
- ✓ Templates used in the exercises

PREREQUISITES
Control engineering background and loop-tuning experience; TR-E02 or equivalent

CERTIFICATION
Certificate of completion

INSTRUCTORS
Practising engineers — TÜV HAZOP Leader, CCPSC and IEC 61511 Functional Safety certified — with 200+ years of cumulative plant experience.

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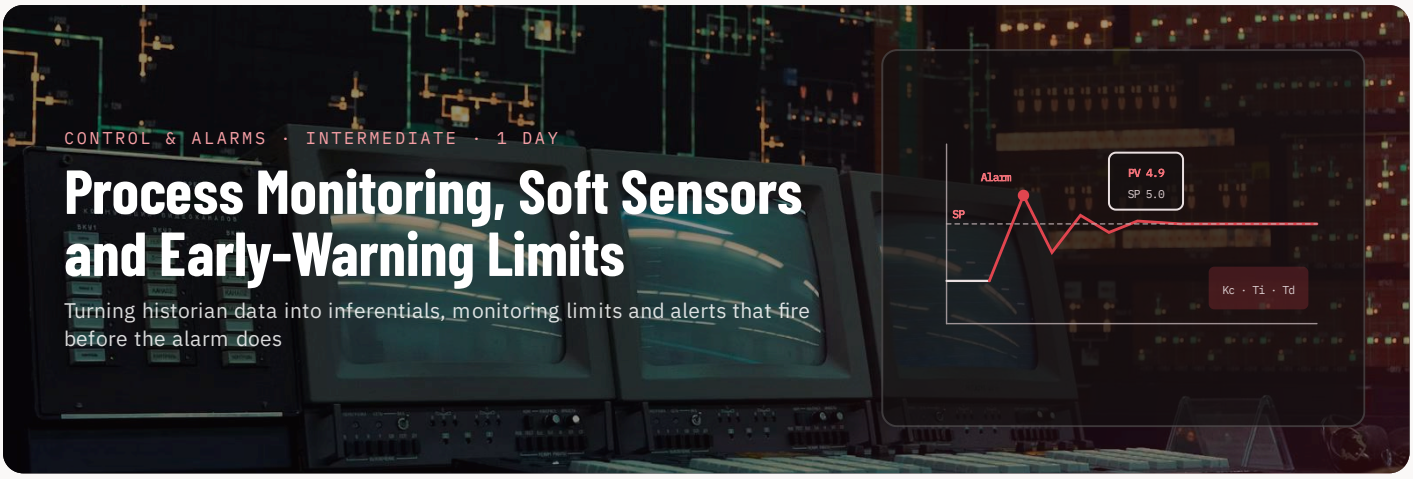

CONTROL & ALARMS · INTERMEDIATE · 1 DAY

Process Monitoring, Soft Sensors and Early-Warning Limits

Turning historian data into inferentials, monitoring limits and alerts that fire before the alarm does

DURATION	LEVEL	FORMAT	LANGUAGE	MAX. PARTICIPANTS
1 day	Intermediate	On-site classroom · virtual instructor-led	English	16

1 soft sensor built and validated

Your own historian tags trended in CeraTrace

3 early-warning limit methods

Overview

Every plant historian holds years of data that nobody looks at until something has already tripped. This course teaches practical monitoring: which variables actually indicate unit health, how to build and validate a regression or first-principles soft sensor for a lab-measured property, and how to set early-warning limits that catch drift in fouling, catalyst activity or column loading days before the alarm. Participants work on their own tags in CeraTrace.

Learning outcomes

- Select and clean historian data: sampling, compression, outliers and steady-state detection
- Build a linear or PLS inferential for a lab property and validate it against lab samples with bias update
- Distinguish operating envelopes, safe operating limits and early-warning limits and set each correctly
- Apply statistical limits, trend-based and multivariate (PCA) methods to detect abnormal drift
- Design monitoring displays and daily reports that operations will actually use
- Maintain soft sensors and limits under management of change

Who should attend

Process, control and operations engineers responsible for unit monitoring; APC support engineers; anyone setting operating envelopes and daily-report limits

Course outline

MORNING

What to monitor: key performance variables, constraints and degradation indicators · historian data quality: compression, sampling, time alignment with lab data · steady-state detection and data reconciliation basics · building an inferential: variable selection, regression, PLS, first-principles · validation, bias update and lab-sample handling

AFTERNOON

Operating envelope vs safe operating limits vs early-warning limits · statistical and trend-based limits · multivariate monitoring with PCA and contribution plots · early-warning alerts and their relationship to ISA-18.2 alarms · dashboards and daily reports in ProcessVision · workshop on participants' own unit data · maintenance and MOC

Standards referenced

ISA-18.2 · ISA-101 · ISO 13374 · ISO 17359 · API RP 554

Tools & exercises

Historian trending, soft-sensor building and monitoring limits in ProcessVision (CeraTrace and CeraControl)

What's included

- ✓ Course manual and slide pack
- ✓ Software access for the course
- ✓ Post-course Q&A with the instructor
- ✓ Exercise and case-study pack
- ✓ Competency quiz and certificate
- ✓ Templates used in the exercises

PREREQUISITES
Process engineering background; familiarity with the site historian

CERTIFICATION
Certificate of completion

INSTRUCTORS
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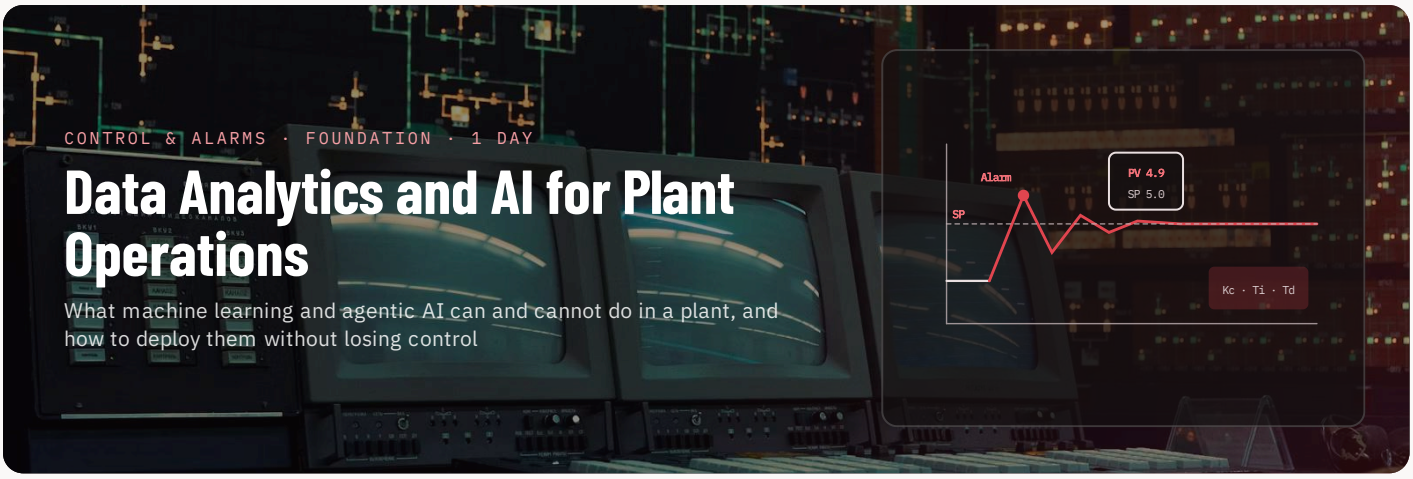

CONTROL & ALARMS · FOUNDATION · 1 DAY

Data Analytics and AI for Plant Operations

What machine learning and agentic AI can and cannot do in a plant, and how to deploy them without losing control

DURATION	LEVEL	FORMAT	LANGUAGE	MAX. PARTICIPANTS
1 day	Foundation	On-site classroom · virtual instructor-led	English	16

4 worked use cases: assets, process, energy, quality

1 explainability exercise on a real alert

1 guardrail checklist for agents

Overview

Most plant AI projects fail on data, not algorithms, and most of the rest fail because the operators do not trust an alert they cannot explain. This course gives engineers enough understanding of anomaly detection, predictive models and large-language-model agents to judge a vendor's claims, scope a use case, and set the guardrails a safety-critical facility needs. It uses Kairos as the worked example, from condition-monitoring data models to explained alerts and agent permissions.

Learning outcomes

- Describe the main analytics types — descriptive, anomaly detection, predictive, prescriptive — and match each to a plant problem
- Assess data readiness: historian coverage, tag quality, context data, lab and maintenance records
- Explain how asset and process health models are trained, validated and drift over time
- Read an explained alert and decide what action, if any, an operator should take
- Define guardrails for agentic AI: read-only vs write actions, approvals, audit trails, cybersecurity
- Build a business case and a pilot plan with measurable success criteria

Who should attend

Operations, process and reliability engineers, control-room supervisors, digitalisation leads and managers evaluating AI projects for the plant

Course outline

MORNING

Analytics landscape for plants: from trends to agents · data foundations: historian, OPC UA, context and asset hierarchy (ISA-95) · condition monitoring and health indices per ISO 13374 and ISO 17359 · anomaly detection and predictive models: how they learn and how they fail · worked cases: rotating equipment health, heat-exchanger fouling, energy and quality

AFTERNOON

Explainability: why an alert fired and what it means for the operator · human-in-the-loop design and alarm-system integration (ISA-18.2) · agentic AI: what an agent may read, recommend and do · guardrails, approvals and IEC 62443 zones for AI systems · pilot scoping and success metrics · Kairos walkthrough on a plant dataset

Standards referenced

ISO 13374 · ISO 17359 · IEC 62443 · OPC UA (IEC 62541) · ISA-95 / IEC 62264 · ISA-18.2

Tools & exercises

Worked examples and hands-on session in Kairos: health models, explained alerts and agent guardrails

What's included

- ✓ Course manual and slide pack
- ✓ Software access for the course
- ✓ Post-course Q&A with the instructor
- ✓ Exercise and case-study pack
- ✓ Competency quiz and certificate
- ✓ Templates used in the exercises

PREREQUISITES
None; plant operations or engineering experience assumed

CERTIFICATION
Certificate of completion

INSTRUCTORS
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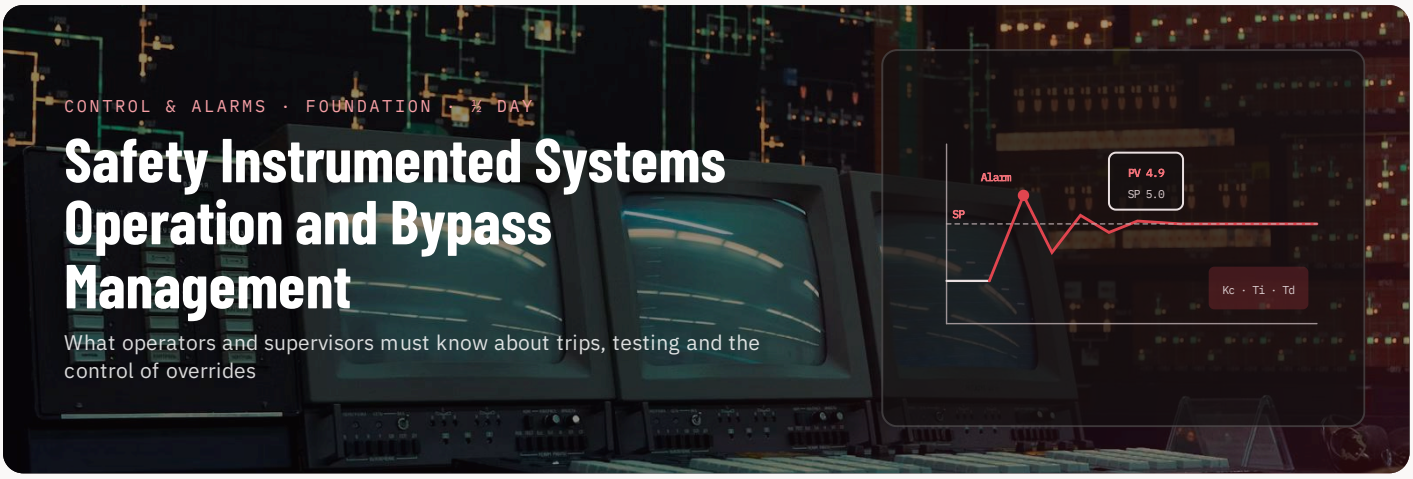

CONTROL & ALARMS · FOUNDATION · ½ DAY

Safety Instrumented Systems Operation and Bypass Management

What operators and supervisors must know about trips, testing and the control of overrides

DURATION	LEVEL	FORMAT	LANGUAGE	MAX. PARTICIPANTS
½ day	Foundation	On-site classroom · virtual instructor-led	English	16

1 bypass procedure reviewed against IEC 61511

6 operator responsibilities for SIS

1 override register template

Overview

A safety instrumented function that is bypassed is a hole in the safety case, and most sites cannot say at any moment how many holes are open. This half-day session explains in plain terms what an SIS is, why its trips are set where they are, what a proof test does and what IEC 61511 requires when a function is bypassed, overridden or found to have failed. It ends with a review of the participants' own override procedure and register.

Learning outcomes

- Explain the difference between the BPCS, alarms and the SIS, and why the SIS is independent
- Read the trip settings and demand rate of a SIF and relate them to the hazard it protects against
- Apply the site rules for bypass authorisation, time limits, compensating measures and logging
- Recognise dangerous failures, degraded voting and diagnostics alarms and respond correctly
- Support proof testing and partial-stroke testing without introducing new hazards
- Keep the override register current and report bypasses as a leading indicator

Who should attend

Panel and field operators, shift supervisors, maintenance technicians and operations engineers who authorise or apply SIS bypasses

Course outline

SESSION 1

Layers of protection and the role of the SIS · SIF anatomy: sensor, logic solver, final element, voting · SIL, PFD and why trips must not be moved casually · demand, spurious trip and degraded modes · diagnostics alarms and what operators should do

SESSION 2

IEC 61511 clause 11 and 16 requirements for bypass and maintenance · bypass authorisation, time limits, compensating measures · override register and shift-handover practice · proof testing and partial-stroke testing from the operator's side · review of the site's own procedure · quiz and certificate

Standards referenced

IEC 61511 · IEC 61508 · ISA-84.91.01 · ANSI/ISA-18.2 · API RP 754

Tools & exercises

Exercises on the site's own SIS cause-and-effect matrix and override register

What's included

- ✓ Course manual and slide pack
- ✓ Software access for the course
- ✓ Post-course Q&A with the instructor
- ✓ Exercise and case-study pack
- ✓ Competency quiz and certificate
- ✓ Templates used in the exercises

PREREQUISITES
None

CERTIFICATION
Certificate of completion; competency record for the training matrix

INSTRUCTORS
Practising engineers — TÜV HAZOP Leader, CCPSC and IEC 61511 Functional Safety certified — with 200+ years of cumulative plant experience.