



2022-2023

Process Control Technology and

**Industrial Best Practices** 



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## Co-innovating tomorrow<sup>™</sup>

Since its foundation in 1915, Yokogawa has contributed to society by providing leading-edge products and solutions centering on its measurement, control, and information technologies. To ensure that it continues to meet changing needs and stays on track for another century of steady growth, Yokogawa has instituted reforms and is now working to transform itself in a number of other ways.

Under the corporate brand slogan of "Co-innovating tomorrow," Yokogawa seeks to establish ever greater levels of trust with its customers and to work with them to create new value for a brighter future, both for its customers and society.

### THE YOKOGAWA PHILOSOPHY

As a company, our goal is to contribute to society through broad-ranging activities in the areas of measurement, control and information.

individually, we aim to combine good citizenship with the courage to innovate.

#### **GLOBAL LEADERSHIP**

#### Corporate Data\*

Corporate Name Yokogawa Electric Corporation

President & CEO Hitoshi Nara
Headquarters Tokyo, Japan

Founded September 1, 1915
Incorporated December 1, 1920
Paid-in Capital 404.308 million USD

Number of employees 18,329 (consolidated) 2,537 (non-consolidated)

Subsidiaries and Affiliates 13 subsidiaries and 1 affiliate in Japan

75 subsidiaries and 2 affiliates outside Japan

\*As of March 31, 2018





# YOKOGAWA MIDDLE EAST & AFRICA Local partnership, Global capabilities

Company name: Yokogawa Middle East & Africa B.S.C. (c)

President and CEO: Kunimasa Shigeno

Regional Headquarters: PO Box 10070, Manama, Kingdom of Bahrain

**Founded:** 15 May, 1990

**No of staff:** 1200 (Highly-skilled multinational workforce)

Profile: Process Control and Automation Solutions provider. Activities include

Sales, Project Execution, Engineering, Sub-assembly, Manufacturing, Integration, Startup & Commissioning, Electrical and Instrumentation, After-sales service support (Lifecycle Agreement, Spare parts warranty management and Training), R&D, and participation in Human Capital

Development Initiatives for Local Nationals

Middle East & Africa Network: 10 Affiliate Companies; 7 Engineering Centres, 24 Sales/Service offices and

12 Training Centres.

Yokogawa Middle East & Africa B.S.C. (c) (YMA) headquartered in Bahrain, is a wholly owned subsidiary of Yokogawa Electric Corporation in Japan. The company serves as Yokogawa's regional HQ, supporting users through a team of 1200 professionals operating from our network of local offices spread across the Middle-East and Africa.

Yokogawa executes Process Automation projects locally providing engineering, commissioning, training and Lifecycle Maintenance Services.









- The acute angle and sharp straight edges of the top half of the diamond symbol represent Yokogawa's cutting-edge technology while the gentle curvature of the bottom half represents the warm-hearted nature of Yokogawa's people.
- By balancing these two elements, Yokogawa aims to contribute toward the realization of a thriving global society in much the same way as the sun
- This property is reflected in the bright yellow of the diamond
- Corporate trademark since 1986

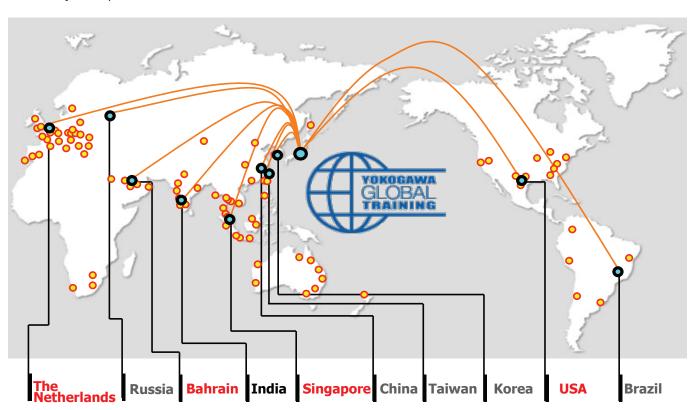
Our Vision: To be a socially responsible and profitable regional centre of excellence, achieving customer satisfaction by adding value through quality products and services and continuous improvement

### Yokogawa Human Development Academy

Yokogawa Human
Development Academy
(YHDA) helps to maximize
the return on your most
significant investment: Human
Resources.

Our training programs are designed to help your workforce to become more proactive and deliver greater value to your operations. Our training solutions have been developed and validated by our customers over a century of experience.

Our worldwide Global Training Committee (GTC) supports and controls our evolution and change management.



### **International Certifications**



Yokogawa Middle East and Africa has been approved by ATLAS as an IMIST invigilation Centre



Certified by TUV Rheinland, Yokogawa is accredited to deliver Functional Safety Certifications for **Engineers and Technicians** in the domain of Safety Instrumented Systems (SIS).

#### Whatever your industrial domain, YHDA offers the Response to your training needs

### **Industries**



#### Oil & Gas

- Upstream
- Offshore (FPSO FLNG & FSRU)
- Pipeline



#### Oil & Gas Downstream

- Refining
- Terminal
- Lube Oil



#### **LNG Supply Chain**

- LNG Liquefaction
- LNG Carrier
- LNG Regasification & Storage



#### Chemical

- Petrochemical
- Base Chemical
- Specialty & Fine Chemical
- Biofuel
- Bulk & Petrochemical



#### Power

- Nuclear
- Thermal
- Combined Cycle
- Cogeneration
- Renewable Energy



#### Water & Wastewater

- Water Treatment
- Desalination
- Water Pipeline
- Water Distribution
- Wastewater Treatment
- Industrial Water



Mining & Metal



**Pharmaceutical** 



Food & Beverage



Pulp & Paper

Iron & Steel

- Comprehensive and validated training solutions
- Applied Professional Training developed over a century of experience
- I&C Professional Trainers
- Training content supported by training textbooks
- Change and evolution management controlled by a worldwide Global Training Committee

YHDA will provide you with the highest expert level content, targeted to your needs and delivered in the most convenient and cost-effective way. Our 12 training centers are spread over Middle East and Africa and conduct training for more than 2,000 participants every year. They use interactive instructional methodologies to test and assess your personnel performances and skills.

At your site or within our own training premises, YHDA will offer you integrated applied specialization programs and solutions to develop your technical personnel skills and competences for:

- Plant / Process Engineers,
- Control Room Operators and Supervisors.
- Maintenance Personnel
- (I&A Maintenance Technicians / Engineers)
- Laboratory and Analyzer Technicians,
- IT / Control System Administration

YHDA may also offer you integrated Training management and solutions - in partnership with:



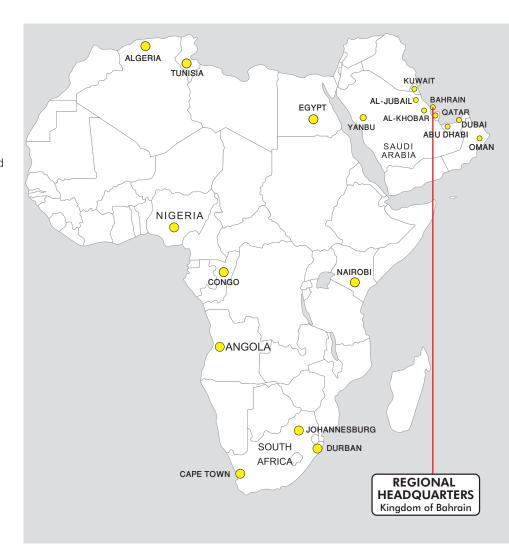
#### A Yokogawa Company

- Training Systems Assessment
- Training Management
- Accelerated Capability Transformation Programs

## YHDA Key Strengths

#### Staff Expertise

Strong from a staff of permanent instructors and of a pool of 200+ Service Engineers and Process Solutions Specialists, our teams will develop and deliver standard and customized courses that fit within your project lifecycle and meet your specific process automation requirements, to maximize your systems and operations performances.



#### **Partnerships**

Our longstanding training experience allowed us to set up tight ties and partnerships with National and Private major training institutes and Universities all over Middle East and Africa.

#### **Educational tools**

- E-Learning and On Line Virtual Training
- Generic Process Dynamic Simulators
- Operator Training Simulators (OTS)
- 3D simulators with immersive environment
- Instrumentation training skids

	YHDA Tı	raining pro	ogressions	s		
Course Reference	Course title	Plant / Process Engineers	Operators	Maintenance Personnel	IT /Control System Administration	Management
	Foundation courses					
EEE	Electrical & Electronics essentials for Instrumentation	F		F		
PMENG	Specialized Physics, Measurement & Engineering Units for Instrumentation	F		F		
EPMC	Essentials of Process Measurement and Control	F	F	F	F	F
PDD	Process Documents & Drawings in Oil & Gas Instrumentation	F	F	F		F
Fie	eld Instrumentation Courses					
PCIF	Field Instruments Measurement Principles	F	F	F		F
OMPCI	Operation, Calibration & Maintenance of Field Instruments			Р		
AFIT	Advanced Field Technology Instruments			Р		
HAI	Instrumentation and Hazardous Areas installations			Р		
ISZB	Intrinsic Safety galvanic isolation, Zener barriers technology & applications			Р		
YSTX	Yokogawa Smart Transmitters			Р		
FMOR	Fieldmate Orientation			Р		
F	Functional Safety Courses					
LOPA	Layers of Protection Analysis on Safety Systems			Р		
TUVFST	TUV Certification for Operations (SIS)	Р		P/T		Р
TUVFSE	TUV Certification for Engineers (SIS)	P/E		P/E		
RSEM	Safety Instrumented Systems: ProSafe- RS Engineering and Maintenance	Р		P/E		
	Process Control Courses					
PCP	Process Control Principles	F	Р			F
VPOF	DCS operation		Р		F	
CAMS	Consolidated Alarms Management	Р	Р			А
PIDBL	PID characteristics and Controllers	F	F	P/E		F
APC	Introduction to Advanced Process Control	Р	А			А
PAGE	Procedures Automation	Р	А			А
RPO	Real Time Process Optimization	А	А			А
Data Historia	n and Plant Information Management					
EQAD+EQDA	Data Historian Management and Administration	Р	А		А	А
ARAP	Alarm Reporting and Analysis	Р	А			А

	Distributed Control System					
VPGR	DCS Graphics	Р		А	А	
VPMT	DCS Maintenance			P/E	Р	
VPEG	DCS Engineering			P/E	А	
Field	dbus and Asset Management					
PRM	Plant resources Manager (PRM)			Р		А
FBEG	Fieldbus Engineering			Р	А	
Control	System Courses - Administration					
VNETIP	Control System Networking	А			Р	
SSI	Control System Substation Integration (Modbus & OPC)	А			Р	
PCNS	Process Control Network Cyber Security	А			Р	А
Real Tim	ne Units (RTU) and Signal Conditioning	And Data A	Acquisition (	(SCADA)		
STEG+STMT	Real Time Unit (RTU) Engineering & Maintenance	А	Р		А	
FTEG	SCADA Operation, Engineering & Maintenance	А	Р	Р	А	А

Legend					
F	Foundation Information	Т	Technician		
Р	Professional Training	Е	Engineer		
Α	Additional Competency / Training	0	Optional		

Available E	-Learning Supports associated to programs					
Course Reference	Course title	Plant / Process Engineers	Operators	Maintenance Personnel	IT /Control System Administration	Management
	Operator Responsibilities: Basic Operator Responsibilities	0		0		0
	Instrumentation and Control: Introduction to Process Control	0	0	0	0	0
	Instrumentation and Control: All Measurements: Pressure / temperature / Level / Flow / liquids –	0	0	0		0
	At least one module per unit					
	Distributed Control System (3 Modules)	0	0	0	0	0
	Automated Process Control (2 parts)	0	0			0
	Introduction to Safety Systems (2 parts)	0	0	0	0	0
	Process Control & fault diagnosis	0	0	0	0	0
	PLC Programming (2 modules)	0		0	0	
	Centum VP Virtual Operator Trainer		0			
	Centum VP Virtual Engineering Machine	0		0		
	ProSafe-RS Virtual Engineering Machine	0		0		

### **COURSE INDEX**

#### Foundation courses

	Code	page	Duration (days)
Essentials of Process Measurement & Control	EPMC	15	5
Process Control System Overview	PCS	15	5
Specialized Physics, measurement & Engineering Units for instrumentation	PMENG	16	2
Electrical & Electronics essentials for instrumentation	EEE	16	4
Process Documents & Drawings Instrumentation in Oil & Gas	PDD	17	3
Instructors, Coaches and Mentors training: Train the Trainer	ПТ	17	5

#### **Field Instrumentation Courses**

	Code	page	Duration (days)
Distributed Control System (DCS) and Process Logic Controllers (PLC) operations	DPO	24	1
Yokogawa Smart Transmitters Course	YSTX	25	2
PID Characteristics of Controllers and Control Optimization	PIDBL	25	3
Control Valves Engineering	CVEG	26	4
Wireless Communication Technology: Basic Course	WFIB	26	1
Wireless Communication Technology Advanced Course	WFIA	27	2

### Field Instrumentation Courses

	Code	page	Duration (days)
Field Instruments Measuring Principles	PCIF	19	5
Operation, calibration & maintenance of field instruments	OMPCI	20	5
Instrumentation, calibration and Maintenance	ICM	20	2
Transmitters and signal transmission	TNT	21	1
Flowmeters: Selection & sizing	FMS	21	2
Coriolis Mass Flowmeter Operation, Maintenance and Troubleshooting Training	CMFT	22	2
Advanced field instruments communication technology	AFIT	23	2
Instrumentation and hazardous area installations	HAI	23	2
Intrinsic safety galvanic isolation, zener barriers technology & application	ISZB	24	2

### **Functional Safety Courses**

	Code	page	Duration (days)
Introduction to Safety Systems Training	ISST	29	1
Functional Safety for End- users	FSEU	29	2
TUV SIS Functional Safety Certification for Operation	TUVFST	30 Certification	3
TUV SIS Functional Safety Certification for Engineers	TUVFSE	30 Certification	4
Functional Safety of Machinery Certification	TUVFSM	31 Certification	5

#### **Process Control**

#### Duration Code page (days) PCP **Process Control Principles** 33 Introduction to advanced APC 34 3 process control techniques **MVCT** 35 5 Multivariable control techniques Tuning Concepts and "Tune VP" TVP 35 2 application Tune VP: PID Control, tuning **TVPA** 36 5 and optimization Advanced alarms Management **AAMS** 37 3 System Introduction to Procedures PAGE 37 3 Automation using Exapilot Real Time Process Optimization **RPO** 3 38 **Applied Process Control** Operator Training Simulator for OTSO 39 10 Operators (Customized course) Tank Inventory Management **ETIM** 40 3 Operator Training Simulator (OTS) Operator Training Simulator OTS 41 4 (OTS) Engineering Training Operator Training Simulator OTSI 42 4 (OTS) Instructor Training Operator Training Simulator 42 (OTS) System Management OTSM 3 Training

### **Control Systems**

	Code	page	Duration (days)
Control Systems Networking and	Cyber Sec	curity	
Plant Control Network Security	PCNS	44	5
Centum VP Networking	VNETIP	44	3
Subsystems Integration (Modbus & OPC)	SSI	45	4
OPC Communication essentials	OPC	45	2
Data Acquisition Historian and Pla Systems	ant Informa	ation Mar	nagement
Exaquantum Technical Overview seminar	EQTS	47	1
Exaquantum System Administrator	EQAD	47	4
Exaquantum data access from third party package	EQDA	47	1
Exaquantum User	EQUS	48	2
Exaquantum Explorer Overview	EQEO	48	1
ExaOPC/Exaquantum Engineering & Maintenance	Exa- OPC/ ExaQ	49	5
Exaquantum Alarms Reporting and Analysis Package	ARAP	49	5
Sequence of Events Recorder	SER	50	1
Alarms Reporting and Analysis	ARA	50	1
Alarm Master Database	AMD	51	1
PI Clients Application	PI	51	3

## YOKOGAWA Products and Instruments courses (Continued)

	Code	page	Duration (days)
Distributed Control Systems (DC	CS)		
Introduction to Distributed Control Systems (DCS)	DCSI	53	2
Centum VP Operation & Monitoring	VPOF	53	5
Centum VP fundamentals for Engineering	VPEF	54	3
Centum VP Engineering	VPEG	54	5
Centum VP AD Suite Engineering	VPAD	55	5
Centum VP Maintenance	VPMT	55	3
Centum VP Engineering & Maintenance	VPEM	56	5
Centum VP Fundamentals of Operation & Maintenance	VPFM	56	5
Centum VP Graphics	VPGR	57	3
Consolidated Alarm Management System (CAMS) overview	CAMS	57	2
Consolidated Alarm Management System (CAMS) Engineering	CAMSE	58	3
DCS Maintenance on site training	SYMS	58	5
Centum VP Essentials with Batch Process	VPBA	59	3
Batch Programming	BATCH	59	5
CS 3000 Fundamentals for Operations	3KOF	60	5
CS 3000 Fundamentals for Engineering	3KEF	60	3
Fieldbus & Asset Management S	Systems		
Fieldbus Orientation	FBOR	62	2
Fieldbus Engineering	FBEG	62	5
Fieldbus Engineering and Plant Resources Manager (PRM)	FPRM	63	5

	Code	Page	Duration (days)
Plant Resources Manager (PRM)	PRMF	63	2
Fieldmate Orientation	FMOR	64	2
Safety Instrumented Systems (SI	S): PROSA	FE	
Fundamentals of ESD Systems	ESD	66	2
ProSafe-RS Engineering	RSEG	66	4
ProSafe-RS Maintenance	RSMT	67	3
ProSafe-RS Engineering & Maintenance	RSEM	67	5
ProSafe-RS Advanced Engineering	PAEG	68	5
ProSafe-RS for Operators (On site Training)	RSOP	68	3
ProSafe-SLS - HIPPS	SLS	69	3
Supervisory Control And Data Ad	cquisition (S	SCADA)	
STARDOM & FAST/TOOLS Basic Engineering	STFTBE	71	5
STARDOM Engineering	STEG	72	4
STARDOM Maintenance	STMT	72	1
FAST/TOOL Engineering	FTEG	73	5
Analyzers and Detectors			
Introduction to process analyzer & sample handling systems	PASHS	75	2
Essentials of analyzers and gas chromatographs	ANZGC	75	2
GC8000 Operation and Maintenance	GCOM	76	3
GC8000 Operation and Maintenance with Network management	GCOMN	76	4
GC8000 Advanced Operation and Maintenance with Network and SCS	GCAOM	77	5
Liquid Analyzer Operation and Maintenance	LAOM	77	2
TDLS 200/220 Operation and Maintenance	TDOM	78	2
IR400 operation and Maintenance	IROM	78	2



### **Essentials of Process Measurement & Control**

# Training Module Code: EPMC

**Duration: 5 Days** 

#### **Objectives**

The workshop will enable participants to:

- Comprehend the concepts of Process Measurement & Control Technology
- Know the role of major components of a process control system ranging from sensors, transmitters, controllers and final control elements
- Envisage the application of the technology in the industry
- Appreciate the potential of the technology and consider ways on optimum utilization

#### **Target Beneficiaries**

Personnel from Instrumentation, Electrical, Electronics, Chemical, Process Engineering & Plant Operations departments

#### **Prerequisites**

- Awareness of process industry and/or instrumentation
- Basic math and science background

### Day 1 - Essentials of Process Control

- Instrumentation & Control Concepts
- Typical parameters used in process control
- Sensors & Transducers
- Transmitters
- Final Control Elements

#### Day 2 - Control Philosophy

- Controller definition
- Types of Control Cascade, Ratio, Split & Feed forward
- Controller Modes
- PID Algorithm
- Direct & Reverse Control

## Day 3 – Overview of Process Control Systems

- Distributed Control System (DCS)
- Safety Instrumented System (SIS)

- Programmable Logic Controller (PLC)
- Supervisory Control & Data Acquisition (SCADA)
- Sub-System Communication Protocol

#### Day 4 – Role of Process Control in safety, quality, production, shipping, custody transfer

- Safety
- Alarms rationalization
- Trending (Real time / Historical)
- Reporting
- Quality
- Productivity
- Custody Transfer & Flow metering

# Day 5 – Applications in Process Industry (Examples & Case Studies)

- Material & Heat Balance
- Flow Transfer
- Heat Transfer
- Distillation Process
- Centrifugal Compressor

## **Process Control Systems Overview**

# Training Module Code: PCS

**Duration: 5 Days** 

#### **Objectives**

The workshop will enable participants to:

- Understand the system architecture and basic engineering concepts of various control systems like PLC, DCS, SCADA & SIS
- Understand control strategies and concepts related to Pressure, Temperature, Level and Flow

#### **Target Beneficiaries**

Personnel from Instrumentation, Electrical, Electronics, Chemical, Process Engineering & Plant Operations departments

#### **Prerequisites**

 Basic understanding of a Process is preferred

#### Day 1 – Distributed Control System (DCS) – Architecture

#### & Engineering

- · Introduction to DCS
- DCS System Architecture
- Basic Engineering in a DCS Environment
  - 1. Monitoring Loop
  - 2. Single Loop using PID Control
  - 3. Building a Cascade Loop
  - 4. Building a Split Control Strategy
  - 5. Building a Ratio Control Strategy

# Day 2 – Supervisory Control & Data Acquisition System (SCADA)

- Introduction to SCADA
- Understanding the SCADA Architecture
- SCADA Functions
  - 1. I/O Processing
  - 2. I/O Update
  - 3. Alarming
  - 4. History
  - 5. Reporting

#### Day 3 – Programmable Logic Controller (PLC)

- Introduction to PLC
- Understanding the Architecture of PLC
- Ladder Logic Programming
- Solving real life examples using Ladder Logic

## Day 4 – Safety Instrumented System (SIS)

- Introduction to SIS
- Understanding the Architecture of SIS
- Programming a SIS

## Day 5 – Pressure Control Simulation

- Understanding a Pressure Process
- Evaluating Controllability through tutorial
- Understanding the effect of disturbance on Pressure Control
- Appropriate Control Parameters to be set when controlled by outlet gas flow rate
- Summary of important points related to pressure control

# Specialized Physics, Measurement & Engineering Units for Instrumentation

# Training Module Code: PMENG

# Duration: 2 Days Objective

The participants will receive:

- An overview of the concepts of physics, measurement techniques & Engineering Units applied in the process control instrumentation
- Refresh their knowledge on physics & measurement techniques and relate the application in process instrumentation.
- This will enable them to comprehend the science behind instrumentation, products & systems & utilize the features to the maximum benefit

#### **Target Beneficiaries**

Personnel from Instrumentation, Electrical, Electronics, Chemical, Process Engineering & Plant Operations departments

#### **Prerequisite**

- Awareness of process industry and/or instrumentation
- Basic math and science background

## Day 1 – Important applications of Physics

- Common Physics Units in Instrumentation – Density, Viscosity, Specific Gravity, Mass, Force, Energy, Volume, Area, Circumference, Distance, Power & Torque.
- Conservation Laws
- Role of Classic Mechanics in Instrumentation

- Fluid Mechanics- significance in process measurement & control
- Digital Electronics Gates, Sequential & Combinational Logics as applied in continuous process industry

#### Day 2 – Measurement Principles & Essentials of Engineering Units

- Basic Measurement Concepts
- Definition of Terminology
- Measurement principles of Level, Pressure, Temperature & Flow
- International System of Units & Conversion factors
- Engineering Units Comparison of Imperial & Metric Standards

## Electrical & Electronics Essentials for Instrumentation

# Training Module Code: EEE

# Duration: 4 Days Objectives

The workshop will enable participants to:

- Understand the Generation,
   Transmission & Distribution principles
   Equipment involved
- Overview of the characteristics of direct current (DC) & Alternating Current (AC) parameters
- Comprehend the properties of resistors, inductors and capacitors
- Learn the importance & practice of earthing & grounding
- Understand the functions & applications of various electronic components

#### **Target Beneficiaries**

Personnel from Instrumentation, Electrical, Electronics, Chemical, Process Engineering & Plant Operations departments

#### **Prerequisites**

- Awareness of process industry and/or instrumentation
- Basic math and science background

#### Day 1 – Applied Electricity

- Overview of electrical devices Transformers, Voltage Regulators, Inverters
- Power Supplies: Types, Operation Principle, UPS & Backup Generators
- Earthing & Grounding concepts & practices
- Protective Devices Switchgear, Relays, Circuit Breakers & Fuses
- Power Distribution
- Control Circuits: Study of Interlock logics
- PLC Vs. Hard Wired Relay Logic

## Day 2 – Applied Electronics Part 1 of 3

- Solid State Principles
- Electronic Devices Zener Diodes, SCRs, Triacs, Op Amps & ICs

 Basic Electronic Circuits – Power Supplies, Amplifiers, Attenuators, Filters & Bridges etc.

## Day 3 – Applied Electronics Part 2 of 3

- · Essentials of Digital electronics
- Number Systems
- Signal Transmission 2 Wire & 4 Wire Transmitters, Wireless Transmitters
- Radio Frequency Interference(RFI), Electromagnetic Interference (EMI), S/N Ratio, Shielding Techniques

## Day 4 – Applied Electronics Part 3 of 3

- Network Fundamentals Communication Systems, Telemetry,
- Protocols
- Computing (Analog Vs. Digital)
- Electronics in Measurement & Instrumentation

# Process documents & drawings – Instrumentation in Oil & Gas

# Training Module Code: PDD

Duration: 3 Days Objectives

This course provides a deep understanding of plant documentation and diagrams that will enhance the understanding of the process, & improve the operation & maintenance performance. The module delivers the utility of each diagram type detailing where & when the document should be used, enabling the trainee to respond & resolve situations promptly & efficiently

Upon completion of this course participants will be able to:

Work with process flow diagrams, P&IDs, instrument lists, specification forms, logic diagrams, location plans, installation

details, instrument loop diagrams, instrument hook ups and other vital documentation

#### **Target Beneficiaries**

Personnel from Instrumentation, Electrical, Electronics, Chemical, Process Engineering & Plant Operations departments

#### Day 1 – Design Diagrams

- Essentials of Process flow diagrams (PFD)
- · Overview of ISA Symbol System
- Essentials of Piping & Instrumentation Diagrams (P&ID)
- Control loops on the P&ID

## Day 2 – Instruments Drawing

Instrument lists

- Specification Plan
- Logic Diagrams
- Location Maps
- Installation Details

## Day 3 – Engineering Drawing

- Block Diagrams
- Loop Diagrams
- · Wiring diagrams
- · Control System Schematics
- Representation of Process Control Devices
- Commonly used terms
- Updating changes on documentation

# Instructors, coaches & mentors training: Train the Trainer

# Training Module Code: TTT

# Duration: 5 Days Objectives

This workshop will enable the participants to:

- Identify the training needs of learners
- Define realistic and measureable training outcomes
- Design appropriate training to achieve objectives
- Plan, prepare and present participative skills and knowledge-based training activities for delivery both at the workplace and/or in a training room.
- Facilitate group learning activities

Construct performance metrics to measure the competence of learners

- Assess review and report on learners' progress
- Utilize best practices and tools to conduct participative and effective training
- Develop and use live scenarios from

the workplace to impart relevant knowledge.

#### **Target Beneficiaries**

Trainers, Subject Matters Experts, Coaches, Mentors who are required to train and/or participate in Competency Development Programs Individuals required to convey knowledge transfers to colleagues, new joiners and interns through formal classroom instructional training and/or in a work based learning environment.

#### Certification

Participant who attains at least 75% attendance will be awarded Certification of Attendance.

# Day 1 - Reinforcing the key concepts for effective training

- Getting started & defining objectives
- Training vs facilitation
- Laying a solid foundation for effective results

## Day 2 – Design and build the course

Create a lesson plan

- Material, media & activities to achieve the objectives
- Prepare to implement

#### Day 3 – Time to act

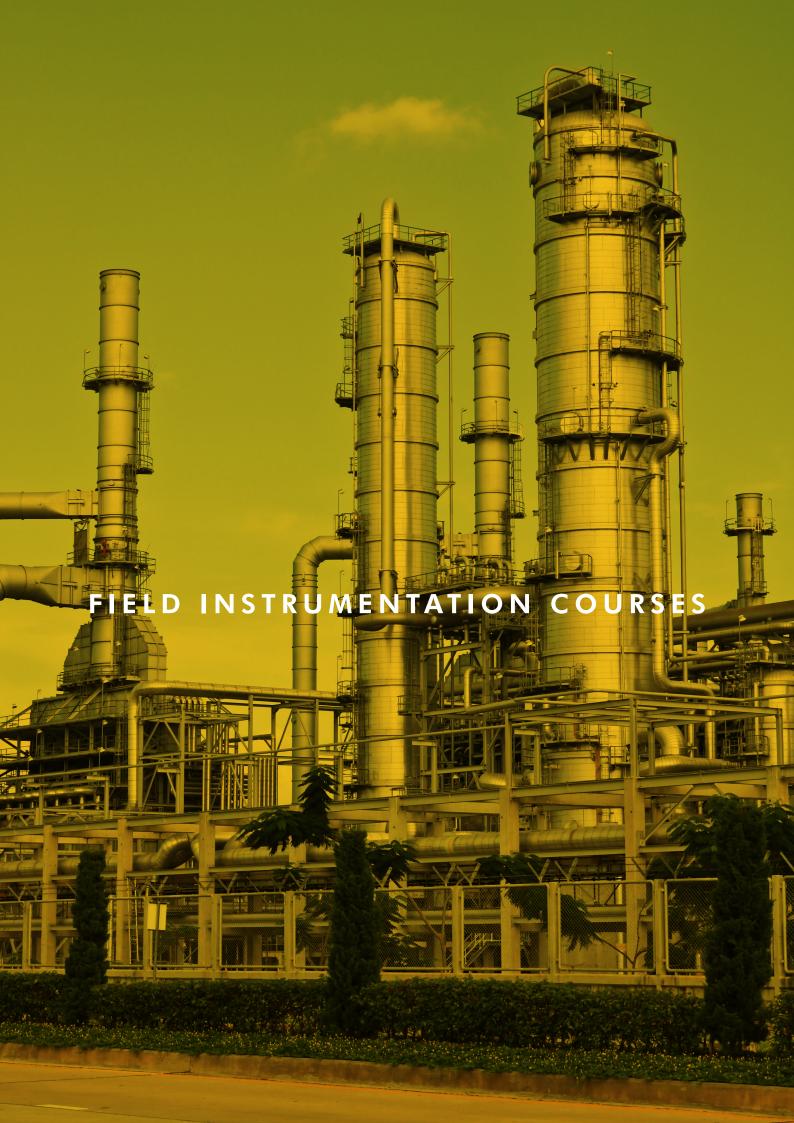
- · Kick off: Start with a Bang!
- Delivery: Tools, techiques and Best Practices

#### Day 4 – Participative Learning – the critical success factor

- · Methods to enhance interaction
- Overcoming hurdles and challenges

## Day 5 – Measuring the outcomes

- Feedback and evaluation
- Assigned courses delivered by trainees
- Measuring effectiveness
- Creating long term action plan



### Field Instruments Measuring Principles

# Training Module Code: PCIF

Duration: 5 Days
Objectives

The training course is designed to provide the delegates with necessary skills to understand and improve measurements solutions facilitated in the Industrial Automation Industry. Enable delegates to understand the fundamental and terminology of Field Instrumentation plus Process control technology and strategies.

The training / facilitation will include history and overview of terminology, principle of operation, standard applications and solutions for different industries, installation requirements, electrical connections, verification of the products, maintenance of the products and safety instruction. The Field Instrumentation Product Training includes the following main methods of measurement: Pressure, Temperature, Flow, Level and Liquid / Gas Analysis. Other topics covered are communications protocols and process control technology and strategy.

#### **Target Beneficiaries**

The course is suitable for Supervisors, Project Engineers, Engineers, Technologists, Technicians, Artisans, Apprentices, and Operators who required a practical knowledge for selection and implementation of Industrial Automation measurement systems



#### **Prerequisites**

Minimum requirement is a grade 12 with related Engineering subjects.

Delegates with minimum of five years industrial orientated plant knowledge can participate in the course.

#### Day 1 - Pressure

- Atmospheric pressure measurement
- · Gauge pressure measurement
- Absolute pressure measurement
- Differential pressure measurement
- Hydrostatic pressure measurement
- Dynamic pressure measurement
- Static pressure measurement
- Pressure in flow measurement
- Pressure in level measurement

#### Day 2 – Temperature

- Thermocouple temperature measurement
- Resistance Temperature Detector RTD Pt100/500/1000 temperature measurement
- Pyrometer temperature measurement

#### Day 3 - Flow

- Electromagnetic flow
- Coriolis Mass flow
- Vortex flow
- Ultrasonic flow
- Differential Pressure flow
- Variable Area flow
- Thermal flow
- · Positive Displacement flow
- Turbine flow

#### Day 4 – Level

- Bubbler pipe method
- Hydrostatic method
- Vibration method (Tuning fork)
- · Conductive level switching
- Capacitance level
- Ultrasonic Time of Flight method
- Microwave Time of Flight (RADAR)
- Gamma Radiation method

#### Day 5 – Liquid (Wet) & Gas (Dry) Analysis

- pH measurement
- · Conductivity measurement
- Zirconia Oxygen Analyzer

# Operation, Calibration & Maintenance of Field Instruments

# Training Module Code: OMPCI

#### **Duration: 5 Days**

#### **Objectives**

The workshop will enable participants to:

- Comprehend the essentials of Installation, Calibration & Maintenance of Field Instruments
- Define calibration
- Recognize if an instrument is properly calibrated by examining the instrument input and output
- Understand Performance Assurance and how it affects the Quality, Productivity & Safety
- Understand the use of Vibration Monitoring Systems
- Compare various types of Analyzers and their applications

#### **Target Beneficiaries**

Personnel from Instrumentation, Electrical, Electronics, Chemical, Process Engineering & Plant Operations departments

#### **Prerequisites**

- Participants should be familiar with instruments and their functions within a typical feedback/control loop
- An understanding of Basic math and science background is preferred

## Day 1 – Fundamentals & Application

- Fluid Mechanics & Flowmeter principles
- Operating Principles of Pressure Instruments
- Operating Principles of Temperature Instruments
- Operating Principles of Level Instruments

#### Day 2 – Performance Assurance

- Performance Accuracy & Error Calculations
- Calibration Essentials
- Temperature, Pressure, Flow & Level Calibration
- Operation & Configuration of SMART Transmitters

## Day 3 – Operations & Maintenance

- Safety Concepts & Working in Hazardous Areas
- Hazardous Area Classification & Types
- Maintenance & Troubleshooting Techniques
- Safety First Safe Operations Equipment & Process Isolation

## Day 4 – Final Control Elements

- Insight into Control Valve Operations & Maintenance
- Valve Positioners
- I/P & P/I Converters
- Actuators

#### Day 5 – Vibration Monitoring & Online Analyzers Essentials

- Vibration Monitoring Systems
- Sensor Maintenance
- Gas Analyzers
- Liquid Analyzers
- Gas Chromatographs
- · Sampling Systems

## **Instrumentation Calibration & Maintenance**

# Training Module Code: ICM

# Duration: 2 Days Objectives

Participants will gain knowledge in the following areas:

- Instrument Calibration Concepts & Terminology
- Learning to Perform Calibration & Loop Check by hands on exercises
- Polish the existing skills on maintenance of various instruments
- Learn the importance of documentation in performance assurance

#### **Target Beneficiaries**

Maintenance Technicians / Foremen, Instrument & Control System Engineers who are responsible for installing, commissioning and maintaining Field Instruments

#### **Prerequisites**

- Participants familiar with instruments and their functions within a typical feedback/control loop
- An understanding of basic math & science is also preferred

## Day 1 – Principles of Calibration

- Principles of Temperature, Flow, Pressure & Level measurement
- Introduction to Calibration Concepts & Definitions
- Installation & Calibration of Instruments

• Loop Check & Documentation

#### Day 2 – Maintenance schedule in Field Instrumentation

- Types of Maintenance Preventive, Predictive & Periodical
- Maintenance Schedules for Control Instrumentation
- Maintenance Schedules for Safety Equipment
- Documentation of incidents and its effects on maintenance

## **Transmitters and Signal Transmission**

# Training Module Code: TNT

**Duration: 1 Day** 

#### **Objectives**

The Course is designed to provide the attendees with the fundamentals of Process Signal Transmitters & Transmission techniques

#### **Target Beneficiaries**

Instrumentation and process control personnel involved in Engineering & Maintenance of Field Instruments

#### Content

- Transducers & Transmitters
- Sensors for Pressure Measurement
- Trends for Pressure Transmitters
- Evolution of Industrial Communication Protocols & Standards
- Types of field Communication & Communication Models

- 4-20 ma signal Transmission Vs. HART Technology
- · Fieldbus introduction & Benefits
- User application and standard blocks:
- Resource block.
- Transducer block.
- · Function block.
- Basic Fieldbus components
- Advantages of Foundation Fieldbus
- Capacity & limitation of Fieldbus system

## Flowmeter - Sizing & Selection

# Training Module Code: FMS

**Duration: 2 Days** 

#### **Objectives**

The workshop will enable participants to:

- Thoroughly understand the salient features of flow meters like accuracy, performance, sizing, specification, selection, and installation considerations
- Make decisions as on when, and how to use the technologies looking at measuring flow, the effect of fluid properties and engineering practices

required to optimize flow meter performance

 Understand the basic principles through practical examples

#### **Target Beneficiaries**

Instrumentation and process control personnel involved in Engineering & Maintenance of Field Instruments

#### **Prerequisites**

Awareness of flow metering principles and fluid mechanics is preferred

## Day 1 - Flowmeter Sizing & Selection

- Flow meter considerations
- General Installation

- Flow meter performance
- Flow meter types
- 1. Ultrasonic Flow meter
- 2. Positive Displacement Flow meters
- 3. Insertion Flow meters
- 4. Oscillatory Flow meters
- 5. Differential Pressure
- 6. Mass Flow Meter
- 7. Magnetic Flow Meter

#### Day 2 – Selection Criteria

- Selection criteria
- Selection of various types of flow meters
- Sizing of flow meters
- Case Studies & work sheets

# Coriolis Mass Flowmeter Operation, Maintenance and Troubleshooting Training

# Training Module Code: CMFT

# Duration: 2 Days Objective

This course will enable participants the understand in detail and enhance their knowledge on

- 1. Principle of Coriolis Flowmeters
- 2. Operation & Maintenance of Coriolis Flowmeters
- 3. Troubleshooting of Coriolis Flowmeters
- 4. Choosing Right Flowmeter for Specific Application
- Multiphase Flow Measurement Practical
- Net Oil and Concentration Measurement

#### **Participants**

Field Instrument Project Engineers, Field Instrument Maintenance Engineers Plant Operators and Operation Managers

#### **Prerequisite**

Participants should preferably have some basic knowledge on process measurement and control.

#### Certification

Participant who attains at least 75% attendance will be awarded Certification of Attendance.

#### **Course Highlight**

- Concepts of Flow Covered from basics even beginners to Flowmeter can participate
- Concepts of Advanced Flow is Covered for the Most experienced people to attend.
- 3. Hands on Practical and Theory are in proper blend 50-50 for a well balance training.



 State of Art Lab and only lab to have hands on practical to Understand Multiphase Flow and Net Oil Computation and Concentration Measurement

#### Day 1

This course will enable participants the understand in detail and enhance their knowledge on following

- 1. Fundamentals of Flowmeter
- 2. Why Mass Flow Measurement
- 3. Coriolis Mass Flowmeter Principle
- 4. Construction and Design of Coriolis Meter
- Process Factors affecting accuracy and Stability of Coriolis Mass Flowmeters
- a. Pump and Pipe Vibration
- b. Pipe Stress
- c. Process and Ambient Temperature effects
- d. Aeration
- e. Solving the Problems that affect the Performance of Coriolis Flowmeter

#### Day 2

- Practical or Hands on Operating and Parameter setting on Coriolis Flowmeter
- 2. How to Troubleshoot Coriolis Mass Flowmeter
- 3. Problem Scenario Will be simulated and Participants should solve it
- Flow lab understanding Multiphase
   Flow practically and problems caused
   by Multiphase flow and how to
   overcome.
- 5. Net Oil Computation Practical hands on training

## Advanced Field Instrument Communication Technology

# Training Module Code: AFIT

# Duration: 2 Days Objectives

Participants will be able to:

- Appreciate the advantages of Digital Communication against the conventional signal Standards
- Comprehend the state of the art wireless transmission technology & enable them to contribute in the design, operation and maintenance of the Digital Instrumentation Platform and related components

#### **Target Beneficiaries**

Instrumentation and process control personnel involved in Engineering & Maintenance of Field Instruments

#### **Prerequisites**

Participants should preferably have working experience in process plant instrumentation and should strong basic knowledge on Transmitters, Sensors and their working principle

#### Day 1 – FieldBus Essentials

- Introduction to Foundation Fieldbus (FF)
- Comparing FF with 4-20ma standard
- Wiring Implementation
- Understanding the communication technique
  - 1. Scheduled Communication
  - 2. Unscheduled communication

- 3. Macro Cycle
- 4. Execution Order
- 5. Link Active Scheduler (LAS) and its functions

## Day 2 – Essentials of Wireless Technology

- Concepts of wireless communication
- Overview of the various wireless technologies like RF, IR, Ultrasonic,
- Microwave etc. and their Frequency Bands
- Wireless Technology in Field Instruments: Popular Protocols, their Comparison and advantages
- Understanding the various important terms and concepts used in Wireless Transmitters like Latency, Subnets, Fresnel Zone, Routers,
- Topologies

## Instrumentation and Hazardous Area Installations

# Training Module Code: HAI

# Duration: 2 Days Objectives

The workshop will enable participants to acquire:

- A general understanding of Installation & Maintenance of equipments in Hazardous Areas
- Understand the additional importance of permit to work systems and safe isolation in relation to explosion protection
- A "Safety First" mindset and be aware of the strategies and tools

#### **Target Beneficiaries**

Personnel from Instrumentation, Electrical, Electronics, Chemical, Process Engineering & Plant Operations departments who are required to operate maintain and Inspect instrumentation Installations in Hazardous areas

#### **Prerequisites**

Awareness of concepts of Safety Requirements

#### Day 1 – Working in Hazardous Area Installations

- Overview of Hazards in chemical processes
- The risk from electricity in hazardous areas
- Hazardous Area Classification Zones & Groups
- Explosion Protection Philosophy and Equipment Classification Systems & standards
- Overview of Installation Standards & Codes
- Complying with standards during installation
- Protection Concepts Ex i, Ex d etc.
- Installation Requirements for Explosion Protection equipment
- Role of Protection Systems
- Typical specifications of Explosion Protection equipment
- Identifying protection properties from the instrument's name plate

#### Day 2 – Inspection, Maintenance & Permit To Work (PTW) as Preventive Measures

- · Best practices during installation
- General requirements for Operation & Maintenance of Explosion Proof equipment
- Fault finding & testing
- Typical cycles for Inspection Schedule
- Permits to Work
- Safe Isolation Lock out, Tag out procedures
- Gas Tests
- Strategies for "Safety First" Tools, Tackles & PPE (Personal Protective Equipment)

# Intrinsic Safety Galvanic Isolation, Zener Barriers Technology & Applications

# Training Module Code: ISZB

#### **Duration: 2 Days**

#### **Objectives**

The workshop will enable participants to:

- Understand the Standards prevalent to intrinsic Safety & their comparison
- Review the Hazardous are classification into zones & groups
- Learn the importance of selecting equipment, based on "T" Rating
- Understand the principle of Galvanic Isolation, & impact of ground Loops in installations
- Appreciate the various protection concepts and "safe" selection criteria for equipment
- Review Ingress Protection classification
- Be aware of various principles & application of Galvanic Isolation & Safety Barriers
- Familiarize with the guidelines for selecting barriers that will match the

application

Learn best practices in the O&M of IS systems

#### **Target Beneficiaries**

Personnel from Instrumentation, Electrical, Electronics, Chemical, Process Engineering & Plant Operations Departments who are involved in Intrinsic Safety, Galvanic Isolation and Zener Barriers Technology & Applications.

#### **Prerequisite**

Awareness of concepts of Safety Requirements

## Day 1 - Intrinsic Safety & Galvanic Isolation

- Basic hazards of chemical processes
- Flammability characteristics, ignition sources and the use of electricity
- Hazardous Area Classification zones and Groups
- Standards for Hazardous Area classification - ATEX & IEC Ex
- Complying with IEC requirements
- Protection concepts -Ex I, Ex d etc.

- Ingress Protection (IP) systems for enclosures
- Auto ignition temperatures and temperature class ratings
- Galvanic Isolation concepts and applications
- · Origin & principles of Intrinsic Safety
- Intrinsic Safety concepts
- Electrical theory behind Intrinsic Safety
- Implementation of Intrinsic Safety
- Operation and Maintenance of IS equipment

#### Day 2

- Introduction to Zener Barriers
- Earthing and Bonding
- Ground Loops
- Diodes vs Zener Barriers
- Zener Barriers characteristics and types
- Mounting and Mechanics of barriers
- Selection criteria for barriers
- Application of Zener Barriers with different types of Process Instruments
   / Instrument Loops

# Distributed Control Systems (DCS) & Process Logic Controllers (PLC) Operations

# Training Module Code: DPO

#### Duration: 1 Day Objectives

The workshop will enable participants to:

- Familiarize with operational procedures of DCS & PLC.
- Appreciate the difference between DCS & PLC.
- Understand typical applications of both systems in the industry.
- Know the basic configuration & engineering procedures.

#### **Target Beneficiaries**

Personnel from Instrumentation, Electrical, Electronics, Chemical, Process Engineering & Plant Operations departments

#### **Prerequisites**

None

## Day 1 – Operation of DCS & PLC

- Introduction to Control Systems
- DCS & PLC Definitions & Differences
- Basic Components of DCS
- Human Interface Station (HIS)
- Field Control Station (FCS)
- Communication Protocols
- PLC System Configuration
- PLC operation principles
- PLC programming concepts

## Yokogawa Smart Transmitters Course

# Training Module Code: YSTX

**Duration: 2 Days** 

**Objective** 

This course is designed to provide participants with advance smart transmitter industrial measurement technology used in process instrumentation and control.

#### **Participants**

For process instrumentation & control engineers, supervisors and technicians.

#### **Prerequisite**

Participants should preferably be experienced in process industry

with basic knowledge of process measurement and control.

#### Certification

Participant who attains at least 75% attendance will be awarded Certification of Attendance.

#### Day 1

Introduction to Process Control Instrumentation communications & networks types.

Yokogawa field products overview. Typical measurement loops. EJA\* Differential Pressure Transmitter.

#### **Laboratory Work:**

Loop connection of smart transmitters to DCS.

#### Day 2

YTA\* Temperature Transmitter. Other selected transmitter. Transmitter adjustment, calibration & troubleshooting.

#### **Laboratory Work:**

Online adjustment & diagnosis using available tools.

- PRM.
- HART475 Communicator.
- Fieldmate.
- Brain Terminal BT200.

# PID Characteristics of Controllers and Control Optimization

# Training Module Code: PIDBL

Duration: 3 Days
Objectives

The workshop will enable participants to:

- Comprehend the theoretical & practical aspects of PID Control & base layer control strategies
- Implement tuning on various processes like Level, Temperature etc. as well as gain knowledge on complex tuning

#### **Target Beneficiaries**

Process Control and Instrument Engineers, Operations Personnel, Process Engineers who are:

Responsible for tuning the control loops and ensure performance Responsible for achieving higher levels of Process Performance

#### **Prerequisites**

- Participants should be aware of Process Control Fundamentals
- Basic knowledge of DCS engineering

## Day 1 – Introduction to P,I & D action

- Introduction to Proportional, Integral and Derivative Action
- Practical implementation of PID Control Action
- Open loop response of PID controller

# Day 2 – PID Tuning rules & practice on simulated process

- PID Tuning rules
- PID Tuning practice using simulated processes
- Temperature Loop
- Cascade Loop

- Level Loop
- Pressure Loop
- Monitoring and Diagnostic of PID Controller
- Different form of PID Controller in DCS
- Non-Linear PID Control

# Day 3 – Advanced DCS configuration & complex tuning

- Cascade Control
- Ratio Control
- Pressure Compensated Temperature
- Signal Processing
- Feed forward Control

## **Control Valves Engineering**

# Training Module Code: CVEG

# Duration: 4 Days Objectives

This training workshop is essential to understand the essentials of Control Valves Engineering and acquire the basic selection and sizing tips. At the end of the sessions, participants will be able to:

- Understand the basic hydraulics and the relationship between the Cv, flow rate and pressure drop
- Select the best suiting valve for a given process
- Select the best suiting control valve for a given application
- Select the proper sizing, packing and accessories for a given flow and hydraulic configuration
- Deal with the essentials of digital product protocols and options for control valve communication

#### **Target Beneficiaries**

Mechanical, instrumentation and process engineers involved in sizing, selecting and applying process control valves.

#### **Prerequisites**

Basic hydraulic and instrumentation skills

#### Certification

Participant who attains at least 75% attendance will be awarded Certification of Attendance.

#### Day 1

- Basic hydraulics relationship between the Cv, flow rate and pressure drop
- · Recall on different types of valves
- Actuators and Positioners
- Fundamentals on valve control: Understanding the operation of control valve in a control loop

#### Day 2

- Control valves selection
- Actuator selection and sizing
- Liquid valve sizing
- Gas valve sizing

#### Day 3

- Severe service application: cavitation, flashing and chocked conditions, erosion, noise control, antisurge control,...
- Typical Control Loops using control valves
- Case Studies and application exercises

#### Day 4

- Communication protocols
- Loops and Process Control
- Maintenance

## Wireless Communication Technology - Basic Course

# Training Module Code: WFIB

#### Duration: 1 Day Objective

To understand basic knowledge of wireless technology and to be able to setup minimum wireless system smoothly.

#### **Participants**

Instrumentation and process control personnel involved in Engineering & Maintenance of Field Instruments

#### **Prerequisite**

Participants should preferably have some basic knowledge on process measurement.

#### Certification

Participant who attains at least 75% attendance will be awarded Certification of Attendance.

#### **Training Agenda**

1. ISA100.11a Wireless Standard

ISA100 wireless committee

Comparison with wireless HART

Key Feature of ISA100

- Channel hopping schemes
- IPv6, 6LowPAN
- Security Features
- Variety of ISA100 wireless venders etc.
- 2. Yokogawa wireless system features Device Portfolio

Long Communication Distance and multi-hop system

Remote antenna cable

Scalability

Full Redundant System

Security Measures

Sky mesh concept

Battery Life Time & Battery concept

3. Basic Setup of Yokogawa Wireless System (Hands-on training)

ISA100 wireless device roles

Preparation of software & hardware

**Device Provisioning** 

Access Point Setup

Wireless System Configuration

Wireless Network Confirmation

# Wireless Communication Technology - Advanced Course -

# Training Module Code: WFIA

# Duration: 2 Days Objective

To understand advanced knowledge of wireless technology and to be able to operate large scale wireless system.

#### **Participants**

Instrumentation and process control personnel involved in Engineering & Maintenance of Field Instruments and already awarded basic wireless course certification.

#### **Prerequisite**

Participants should preferably have some basic knowledge on process measurement and wireless system.

#### Certification

Participant who attains at least 75% attendance will be awarded Certification of Attendance.

#### **Training Agenda**

- Application references in Middle East Application introduction
- Advanced system setting for Large Scale Wireless System (Hands-on training)

Graphic Editor

Modbus Setting - Diagnostic, Device Status -

Multiple Subnet setting

Channel Blacklisting and noise interference

Full Redundant System

Latency minimization - Duocast -

Security Setting

OTA provisioning

System Design Sample for Large Scale Project

3. Maintenance procedure

Battery Maintenance

System Backup, Maintenance information & Firmware upgrade

4. Installation design guide line

Basic knowledge of radio communication

Wireless Device Layout and Topology (Sky Mesh Concept)

Consideration of Communication Distance

Fresnel zone

Height pattern effect

Weather condition effect

Examples of Installation Design without Site Survey

- Advanced product setup (Optional)
   Multi-Protocol Adapter setup (HART protocol)
- Advanced product setup (Optional)
   Multi-Functional Adapter (Al, Dl, DO, Pulse)
- 7. Advanced product setup (Optional) Vibration transmitter setup



### Introduction to Safety Systems training

# Training Module Code: FSEU

**Duration: 1 Day** 

**Objectives** 

To give the participants an understanding of the role played by Safety Systems for industrial production processes in preventing personal injury, environmental damage, damage to equipment and loss of production.

This course will cover the terminology used for Safety Systems, the international standards IEC 61508 and IEC 61511 which cover all safety life-cycle activities and also the safety solutions offered by the Yokogawa ProSafe Systems family.

#### **Target Beneficiaries**

Operators, Engineers, etc., interested in the various aspects of safety systems for industrial production processes

#### **Prerequisites**

None

#### Day 1

- Welcome and course introduction
- · Usage of safety systems
- Safety systems terminology
- International standards IEC 61508 and IEC 61511
- Introduction to Yokogawa ProSafe systems family
- Evaluation

## Functional Safety for End-users

# Training Module Code: FSEU

**Duration: 2 Days** 

**Objectives** 

The objective is to provide participants with elementary and necessary knowledge about functional safety based on international standards IEC 61508 and IEC 61511.

#### **Target Beneficiaries**

Architectural and/or basic designers, lead engineers, project engineers, system engineers, application engineers, site engineers and project managers involved in safety projects

#### **Prerequisites**

Participants should have an affinity with industrial safety

#### Examination

An open book assessment will be given at the end of the 2 days.

#### Certificate

Participant who attains at least 75% attendance will be awarded Certification of Attendance.

Participant who attains at least 80% at the final exam will be awarded a Yokogawa Competence Certificate, valid for 3 years.

#### Day 1

- General introduction
- Module 1: Introduction to Functional Safety
- Module 2: International safety standards IEC61508 and IEC 61511
- Module 3: HAZOP-SIF-SIL
- Module 4: Safety Engineering

#### Day 2

- Module 5: Functional Safety Management
- Module6: Failures and hardware fault tolerance
- Module 7: Common causes influences ad other failure types
- Module 8 Safety calculations

## Layer of Protection Analysis (LOPA) on Safety Systems

# Training Module Code: LOPA

**Duration: 2 Days** 

**Objectives** 

This course enables participant to learn to perform Layer of Protection Analysis (LOPA) & Safety Instrumented Systems (SIS). Layer of Protection Analysis (LOPA) is a methodology for hazard evaluation and risk assessment. It helps the analyst make consistent decisions on the adequacy of the existing or proposed layers of protection against an accident scenario. This decision-making process is ideally suited for coupling with a company's risk-decision criteria, such as those displayed in a risk matrix. LOPA is a recognized technique for selecting the appropriate safety integrity level (SIL) of your safety instrumented system (SIS) per the requirements of standards such

as ANSI/ISA-84.00.01, IEC 61508 and IEC 61511

#### **Target Beneficiaries**

- Process Safety personnel
- Process and Process Control engineers
- Operations and Maintenance personnel
- Personnel who may participate in LOPA reviews or Who may be affected by LOPA recommendations
- Participant should have basic understanding of Process Safety, Process Hazard Analysis techniques, and with strong engineering skills

#### **Prerequisites**

Participants should preferably have some basic knowledge on process control.

#### Day 1

- Overview of LOPA and SIL Assessment
- Process Hazard Analysis and Tolerable

Risk Target

- Consequence Evaluation
- Developing Scenarios
- Exercise
- Identifying Initiating Causes and Likelihood
- Identifying Independent Protection Layers
- Failure Rates and Reliability Data
- Risk Tolerance Criteria and Risk Reduction Measures

#### Day 2

- Introduction to Safety Instrumented Systems (SIS)
- Achieving Safety Integrity Level (SIL) Targets - Design Phase, Operations & Maintenance
- Exercise
- Case Study from a major site (refinery) for Operations & Maintenance
- Quiz

## **Functional Safety Certification for Operations**

# Training Module Code: TUVFST

# Duration: 2.5 Days Objectives

The objective is to provide operators, maintenance technicians all those who are involved in the maintenance and operation of safety instrumented systems with elementary and necessary knowledge about functional safety, based on the international standards IEC 61508 edition 2010 and / IEC 61511 edition 2016

#### **Target Beneficiaries**

This course is ideally suited for maintenance and instrument engineers or operators whom will be involved in testing, maintaining and decommission of Safety Instrumented Systems (cradle to grave).

#### **Prerequisites**

In accordance with TUV Rheinland Functional Safety Program: a minimum of 2 years experience in the field of functional Safety - A technical diploma or certificate or equivalent engineer level responsibilities status certified by the employer.

#### Methods of delivery

Interactive lecture. Exercises (both groups and individual exercises)

#### **Trainer:**

Safety Assurance and consultancy group of Yokogawa Europe.

**Trainer(s):** 6 to 12

#### Day 1

- Module 1: General Introduction
- Module 2: Standard IEC 61508 and 61511
- Module 3 Installation and commissioning
- Module 4:general aspects for all phases

#### Day 2

- Module 5: overall safety validation
- Module 6: Operational phase
- Module 7: Maintenance and repair
- Module 8: Proof Testing
- Module 9: Modifications
- Module 10: decommissioning and Disposal

## Day 3 – Examination EXAMINATION

At the end of the course, participants have to take an exam. The examinations contains two parts. Part. Part1 Consists of 40 Multiple Choice questions and part 2 consists of 10 open questions.

#### **Certification:**

The certification delivered upon succeeding in passing the examination is a Functional Safety Technician Certification officially delivered by TUV Rheinland - Germany.

## **Functional Safety Certification for Engineers**

# Training Module Code: TUVFSE

# Duration: 4 Days Objectives

The workshop will enable participants to: Understand and master the application, principles and requirements of IEC 61508 / IEC 61511

#### **Target Beneficiaries**

Instrument Engineers, Process Engineers & Supervisors, Maintenance & Operating Personnel, Safety System engineers.

#### **Prerequisites**

A minimum of 3 years experience in the field of functional Safety: Registration is subject to acceptation by TUV Rheinland.

## Day 1 – Introduction to Safety Engineering

- Introduction to safety engineering
- Application of the international standard IEC 61511 part 1: General requirement and management of Functional Safety
- Examples concerning management of Functional Safety

## Day 2 – Application of IEC 61511 standards

- Application of the international standard IEC 61511 part 2: Requirements E/E/PES
- Determination and evaluation of safety related parameter (practical examples)
- Application of international standard IEC 61511 part 3: software requirements
- Practical example concerning part3

## Day 3 – Application of IEC 61511 standard

- Requirements of tools for configuration and parameterization of Safety Systems
- Requirement of safety related bus system according to IEC 61511
- Summary of training questions and

#### Day 4 – Examination

#### **Certification:**

The certification delivered upon succeeding in passing the examination is a Functional Safety Engineer Certification officially delivered by TUV Rheinland - Germany.

### **Functional Safety of Machinery**

# Training Module Code: TUVFSM

# Duration: 5 Days Objective

The new standards regarding Functional Safety as well as the new European Machinery Directive demand that persons and organizations performing responsible (accountable) tasks during the life cycle phase of a machine have to acquire and prove their competencies in Machine Safety.

Within this training the requirements for the design as well as the proof of Functional Safety for Machinery applications are described and discussed in detail based on the relevant current standards.

The selection of protective devices for Machinery in order to achieve the required risk reduction is shown. Examples of safety functions are explained. The main requirements of ISO 13849 and IEC 62061 for the design of safety related parts of machine control systems are presented and application examples illustrating the quantitative assessment of safety functions are discussed.

#### **Participants**

Application engineers and system integrators with some experience in Functional Safety; also designers and safety specialists working in Machinery

applications.

Prerequisite and Certification

The following requirements must be fulfilled in order to get the FS Engineer (TÜV Rheinland) certificate in Machinery:

- Copy of degree (Bachelor's, Master's or other) in engineering or other technical area,
- 2. Participation in the complete training,
- 3. Passing of exam

#### **Working Material**

The standards ISO 13849 part 1 and part 2 and IEC 62061 are required working material for this training and need to be brought along by the participants.

#### Day 1

Introduction - TÜV Rheinland Functional SafetyTraining Program.

- · Guidelines and Standards
- Risk Analysis
- Introduction to ISO 13849
- · Safety Devices
- Guards, interlocking devices:
- Other safety devices:

#### Day 2

- · Safety functions of machines
- · Circuits, schematics, examples
- New standards regarding safety of machinery

#### Day 3

• ISO 13849

- Validation
- Validation acc. to ISO 13849-2.
- IEC 62061

#### Day 4

- Examples for proof of Functional Safety acc. to IEC 62061,
- Examples for proof of Functional Safety acc. to ISO 13849-1

Questions and answers, discussion

#### Day 5

#### Exam

Exam duration: 3 hours

The exam consists of 70 multiple choice questions and 12 open questions.

The standards EN ISO 13849 part 1 and 2 and EN 62061 are essential working material for the exam.

Additionally a calculator should be brought along for the quantitative assessment.



### **Process Control Principles**

# Training Module Code: PCP

# Duration: 5 Days Objectives

The workshop will enable participants to:

- Gain Analytical Knowledge & handling abilities of different units & processes through a dynamic process simulator
- Confirm the knowledge gained through Textbooks, Lectures & exercises by practically operating the various modules in the dynamic simulator
- Refresh control theory and practice standard methods to set control parameters & improve the controllability of various process controls i.e. Flow, Level, Pressure & Temperature
- Learn the principles behind Heat & Mass Balance & Heat Transfer
- Understand the basics of behavior of fluids i.e. Volumetric Flow Rate, Reynolds Number, Pressure Drop etc. using a Fluid Simulator
- Experience the unit operation of a
   Distillation Column & a Centrifugal
   Compressor which leads to the
   understanding of the concepts of Gas
   Compression, managing the critical
   characteristics such as surge control
   & operation of a water methanol
   distillation tower

#### **Target Beneficiaries**

Personnel from Instrumentation, Electrical, Electronics, Chemical, Process Engineering & Plant Operations departments

#### **Prerequisites**

- Background knowledge of Windows Operating System
- Knowledge of Basic Chemical Engineering

## Day 1 - Process Control Simulation

- Flow Control
- Liquid Level Control
- Pressure Control
- Temperature Control
- · Feed forward Control

## Day 2 – Equipment Control – Centrifugal Compressor

- Learn the basic operating method of Centrifugal Compressor by practical operation of the process simulator
- Reading the Performance Curve
- Understand the mechanisms behind surging and its avoidance

#### Day 3 – Distillation Column

- Learn the operation of a distillation tower by practical simulation
- Understand the type of control strategy behind the Distillation Tower

 Understand the influence of Reflux ratio on the Temperature & Heat Balance of the Tower

#### Day 4 – Heat Transfer, Material & Heat Balance

- Understanding the various parameters of a Heat Exchanger from the operating data
- Understand the relationship between the water amount & the overall Heat Transfer Coefficient
- Obtaining theoretical values of Material & Heat Balance from basic equations and testing verifying them
- Understanding the significance of Air Ratio Control
- Confirming the material balance of water around the steam generator

## Day 5 – Dynamics of Fluid Flow

- Study of the important parameters related to fluid flow viz. Volumetric Flow rate, Mean Flow rate, Reynolds Number, Pressure Drop etc.
- Practically determine the properties of water that will be affected by temperature
- Verify pressure drops due to friction & potential difference

### **Introduction to Advanced Process Control Techniques**

# Training Module Code: APC

#### Duration: 3 Days Objectives

The workshop will enable participants to:

- Understand the basic concepts of Advanced Process Control (APC) techniques
- Apply the theory to practice
- Identify the APC areas and quantify the deliverable benefits upon implementation
- Work in a Project involving all facets of APC

#### **Target Beneficiaries**

Process, Operations, Instrument, Control Engineers and Console Operators who are:

- Responsible for efficiently running the process units
- Responsible for maintaining process controls and ensure a stable control performance

• Responsible for translating the intended objectives in to performance

#### **Prerequisites**

Participants should preferably have some basic knowledge on process control.

# Day 1 - Introduction to APC Technology & Benefit estimation

Introduction to APC Terminology Process Dynamics PID Control Control Algorithms and Tuning Level Controls Cascade and Computer Controls

Introduction to Benefit Estimation Statistical Primer How benefits are achieved How to process data for benefit estimation Calculation approaches Real life examples Introduction to MPC

#### Day 2 - Working Principle

How it works in simple terms
Where should MVPC be used
Independent and Dependent Variables
Step test methods & Model identification
Project Implementation
Role of the consultant Vs. Client APC
APC Maintenance issues and QA

## Day 3 – Quality estimators & optimization

 Introduction to Optimization within MVPC

Introduction to Economics Variables (EV)

Importance to EV in achieving APC benefits

Introduction to Quality Estimators
Why use estimators?
 Keeping Estimators Healthy

YMA TRAINING CATALOG 2022-2023

# **Multivariable Control Techniques**

# Training Module Code: MVCT

Duration: 5 Days
Objectives

The workshop will enable participants to:

- Determine & express dynamic plant behavior in a multivariable sense
- Design & test MVC using SMOCPRO MVC
- Understand the details of the inferred measurements using the RQEPRO tool

# **Target Beneficiaries**

Process, Operations, Instrument, Control Engineers and Console Operators

# **Prerequisites**

Participants should be aware of Advanced Process Control Techniques

# Day 1 – Project Screening & MVC Formulation

- How benefits are achieved
- How to process data for benefit

Estimation

- Calculation approaches
- Project Screening
- Process Analysis
- Types of MVC
- Exercises

# Day 2 – ERC Concepts & Requirements

- Obtaining a Model for SMOC
- Introduction to Process Models
- Classification of Models
- Plant Testing Methods
- Model Identification
- Process of Identification
- Use of AIDA
- Examples
- Model Building
- Use of Model Builder
- Exercises

# Day 3 – Modeling Techniques (Process Models, Classification etc.)

• SMOC Features

- Unmeasured Disturbance Model
- Kalman Observer
- Optimization within SMOC Economic Variables (EV)
- Role of EV in achieving APC benefits
- Application Tips
- Exercises

# Day 4 – Introduction to Quality Estimators

- · Why use RQE?
- Off-line and On-line Configuration of Estimators
- Keeping Estimators Healthy

# Day 5 – Project Implementation

- Implementation Aspects
- MVC Strategies and Typical Application
- Implementation Guidelines
- Role of the Consultant Vs. Client
- APC Maintenance issues and QA

# Tuning concepts and "Tune VP" application

# Training Module Code: TVP

# Duration: 2 Days Objectives

The workshop will enable participants to:

- Understand the basic concepts of control loops, and tuning techniques.
- Apply the theory to practice
- Identify the areas and quantify the deliverable benefits upon implementation

Work in a Project involving facets of APC.

# **Target Beneficiaries**

Process, Operation, Maintenance, Control Engineers and Console Operators involved in:

• Plant operation efficiency and safety

improvement

- Plant operational procedure optimization
- Operational cost reduction
- Plant operation quality control
- Plant maintenance optimization

# **Prerequisites**

Participants should preferably have some basic knowledge on process control

### Certification

Participant who attains at least 75% attendance will be awarded Certification of Attendance.

## Day 1:

- Introduction to Terminology
- · Process Dynamics
- PID Control basics
- Yokogawa Control Algorithms
- Level Controls

- Overview of Tune VP Tools
- Cascade and Computer Controls
- Model -FOPTD, IPTD
- Loop Configuration.

### Day 2:

- Tune VP functioning principle
- Tune VP System Architecture
- IMC Method Of tuning
- Tune VP Demo
- Q&A
- Introduction to MVPC

# Tune VP: PID control, tuning and optimization

# **Training Module** Code: TVPA

# **Duration: 5 Days Objectives**

This course will be conducted for Five-days. The focus will be both on the theoretical and practical aspect of PID control and based layer control strategies, reinforced by exercises and hands on tuning practice on simulated process using CENTUM DCS.

At the end of the course, the participant

- Understand the theory behind the PID
- Familiarize with the PID Tuning Rules to be adopted to characterize the various types of Process Responses
- Tuning of Flow, Temperature, Pressure and Level Loops
- To analyze Process interactions and identify ways and means of overcoming them to provide improved base Laver Control.

# **Target Beneficiaries**

Control, Process and Instrument Engineers who are:

Responsible for tuning the control loops and ensure performance

Responsible for achieving higher levels of Process Performance

# **Prerequisites**

Participants should be familiar with:

- Process Control and Monitoring
- Instruments and their functions within a typical feedback/control loop
- Basic math and sciences

#### Certification

Participant who attains at least 75% attendance will be awarded Certification of Attendance.

# Day 1:

Introduction to Proportional, Integral and Derivative action.

Practical implementation of PID control

Open loop response of PID controller.

## Day 2:

PID tuning rules.

PID tuning practice using simulated processes,

- Temperature loop,
- Cascade loop,
- Level loop and
- Pressure loop.

### Day 3:

Monitoring and Diagnostic of PID controller.

Different form of PID controller in CENTUM DCS.

Non-linear PID Control.

### Day 4:

Advanced DCS configuration, and complex loop tuning.

- Cascade Control
- Ratio Control,
- Pressure compensated temperature,
- Signal processing.

# **Day 5:**

Advanced DCS configuration and complex loop tuning. Feed forward control.

Constraint control.

Temperature pass balancing.

# **Advanced Alarm Management System**

# Training Module Code: AAMS

**Duration: 5 Days** 

# **Objectives**

The workshop will enable participants to:

- Successfully eliminate the alarms by understanding of several analysis
- Optimize the alarms to improve the safety & reduce trips
- Understand Alarm Rationalization by learning effective procedures & strategies to prioritize & configure alarm settings
- · Assess a real world Project

# **Target Beneficiaries**

Personnel from Instrumentation, Control System Engineers, Chemical, Process Operations & Console Operators

# **Prerequisites**

An understanding of plant control systems working within the process control industry

# Day 1 – Purpose of Alarm Management

- Purpose of Alarm System One of the risk mitigation mechanisms
- Issues of poor Alarm Management

   Background of alarm problem,
   Potential to miss alarms due to alarm rates beyond human capability,
   Alarm suppression without control,

Improper Alarm settings/priority, lack of documentation on consequences or operator actions

- EEMUA Guidelines Key points on EEMUA Guidelines
- Alarm management lifecycle Introduction of ISA 18.02
- Benefits of effective Alarm
   Management Minimize the likelihood of missing alarms, suppression controlled by procedures, Apply consistent methods to determine the alarm settings/priority, document on consequences/ operator actions

# Day 2 – Applied Alarm Management

Alarm Management Solutions – Overview of existing Management Systems

- Alarm system performance analysis

   Introduction of alarm system
   benchmarking
- Application on Consolidated Alarm Management System (CAMS)
  - Alarms actions
  - Operations acknowledgement
  - Implementation, guidance
  - Testing of Alarms
  - Alarm response procedures
  - Alarm System Maintenance

# Day 3 Benefits of effective alarm management

- Alarms Identification
  - Methods for alarms identification

- Alarms prioritization
- Objectives analysis
- Set point determination
- Alarms classification
- Detailed Design
  - Alarms design principles
  - Special Alarms design considerations
  - Treatment of diagnostic alarms

# Day 4 – Alarm Rationalization

- Assess current alarms performance using alarms and event logs
- Identify nuisance alarms to be reduced
- Identify root causes of nuisance alarms and review DCS settings
- Evaluate possible solutions for root causes
- Use HAZOP studies to evaluate and design alarm system
- Evaluate and optimize operational state

# Day 5 – Alarms Reporting

- Practice on Alarm Master Database
- Alarms Reporting and Analysis
  - Alarms Documents and Reports
  - Security Reports
  - Publishing and Emailing reports automatically
  - Customized reports
  - Backup and Restore

# Introduction to Procedures Automation Using Exapilot

# Training Module Code: PAGE

**Duration: 3 Days** 

# Objective

This course is designed to provide a thorough introduction to the Yokogawa Exapilot Asset Guard package. It provides focus on how Exapilot can help automate plant operation efficiency in steady, unsteady, abnormal states, enhance DCS function, and guard plant operation assets & resources.

### **Participants**

Process, Operations, Maintenance, Control Engineers and Console Operators, from chemical, petrochemical, and other Process-related industries who are:

- Responsible for plant operation efficiency and safety improvement;
- Responsible for plant operational procedure optimization;
- Responsible for operational cost reduction;
- Responsible for plant operation quality control;
- Responsible for optimized plant maintenance.

## **Prerequisite**

Participants should preferably have plant experience and knowledge in operation and control.

# Day 1 – Introduction to EXAPILOT software

Introduction to Terminology

- Overview of ExaPilot
- Features of ExaPilot
- Functions of ExaPilot
- Suitable Operation's
- System ArchitectureApplication Structure
- Q & A

### Day 2 and 3: Practice

Builder function of ExaPilot

- •View Of Programming tool
- Builder Function
- Operation Function
- Case Studies
- •Q & A

# **Real Time Process Optimization (RPO)**

# Training Module Code: RPO

# Duration: 3 Days Max 12 Participants Objectives

This course is designed for allowing personnel operating and/or maintaining the Real Time Process Organizer to get started with this new system.

At the end of the sessions, the participants will:

- Understand the architecture of the platform
- Navigate within the different applications.

- Be capable of connecting a Plant Information System
- Be capable of performing basic maintenance and troubleshooting.

# Day 1

- Introduction to RPO
- Architecture of I-Field System
- RPO Launcher
- Common Users
- Common Users roles and permissions
- RPO Common
  - Plant Hierarchy
  - Equipment Hierarchy
  - Organization Hierarchy
  - Shift Settings

## Day 2

- Introduction to Production Instructor
- Operation Log
- Work Instructions
- Shift Handover
- Reports

- Introduction to Production Supervisor
- Configure Data Server
- · Configure KPI's
- LPI Alarms
- KPI Hierarchy
- KPI Dashboard
- Overview of WFC Builder
- Process Monitoring Operations
- Connection to PI Server
- Troubleshooting

# APPLIED PROCESS CONTROL

# **OTS Training for Operators – Customized course**

# Training Module Code: OTSOP

# **Duration: 10 Days**

# **Objectives**

At the end of the training program operators shall be fully aware of Process Startup and Shutdown in the OTS system for the plant model process. Awareness and analysis of Cause and Effect.

Process Upset and Scenario Handling using the Model in the OTS setup.

### **Important notes:**

- The process training shall follow the Process Operating Manual (POM) and reference of Design and commissioning manual ,vendor manual as provided by the Company
- Training material from Yokogawa shall cover the functional aspects in line with the operational Aspects of the complete plant available in the OTS model.
- Process theory / process specific details of the model shall be referred from the POM.
- The training manual will use simple steps prepared from the referred design documents for the understanding of the operators

# **Target Beneficiaries**

Panel Operator and Field Operator involved in the plant operations

### **Prerequisites**

Participants should have attended HMI Operation and Graphics Training

### Certification

Participant who attains at least 75% attendance will be awarded Certification of Attendance.

### Day 1

- Introduction.
- Overview of OmegaLand Direct DCS connection.
- · OmegaLand DCS emulation.
- · Loading OmegaLand.
- Stopping OmegaLand

## Day 2

- Introduction to Omega Land's model and functionalities.
- The FAT Completed (application and Graphics) will be used to load the training setup.
- Run simulation model and visualize the complete operation.
- Hands-on Exercise

# Day 3 and 4

- · Aspects of process startup.
- Load some Initial Conditions of startup and cold IC.
- Hands-on Exercise.

### Day 5

- Overview of Field operator Interface and sequences.
- Introduction to Omega Land's Field Operation (FO).
- Operation sequences for startup.
- Hands-on Exercise.
- Q & A.

# Day 6 and 7

- Overview of cause and effect.
- Use of Cause and Effect in the process and regular operations.
- Q & A

### Day 8

- Malfunctions and Process Upset for resorting steady state operation.
- · Scenario Handling.

#### Day 9

• Process interlocks and Operations.

- Process And Operational Key points coverage.
- Q & A.

# **Tank Inventory Management**

# Training Module Code: ETIM

# Duration: 3 Days Objectives

The objective is to provide participants with elementary and necessary information and understanding about tank gauging systems and Inventory Management.

It will introduce the Tank data calculations and detail the Tank Alarm Monitoring process.

# **Target Beneficiaries**

All personnel involved in Tank Inventory Management operation and maintenance

# **Prerequisites**

Participants should have an affinity with industrial safety

# Day 1

- General introduction on Tank Gauging System
- Different types of onshore tanks
- Tanks Instrumentation
  - Radar Level measurement
  - Radar Sensors and transmitters operation and maintenance
  - Temperature, Pressure and Density Measurement

# Day 2

- Inventory Calculation
- Tank data calculation
  - Tank Strapping table
  - Flow rate
  - Available volume / Ullage
  - Expected reach time to high/low
- Communication with DCS
- Tank Alarm Monitoring
  - Level
  - Temperature

# Endress+Hauser



People for Process Automation

- Pressure
- Leaks
- Static Electricity
- Pre-Alarms
- ..
- Reporting

- Installation
  - Best Practice
- Commissioning
  - Get the system up and running
- Hand dipping
  - Verifying the accuracy on a tank gauging system
- Electrical
  - · Hazardous area
  - Cabling
  - Restrictions

# **OPERATOR TRAINING SIMULATOR(OTS)**

# Operator Training Simulator (OTS) Engineering Training

# Training Module Code: OTS

# Duration: 4 Days Max 5 Participants Objectives

This training course is designed to train engineers to configure and to make changes in the "VMmaster Training Simulator" effectively in a training environment. At the end of this course, the trainees will be able to:

- Understand basics Omegaland Dynamic Simulation
- Configure units available in the VMmaster library
- Operate each station such as MDL-PC and VIEW-PC
- Operate all features of the "VMmaster" model station.

#### Day 1

- Introduction & definition of OTS
- Overview of Virtual Machine (VM)
- Definition of Material property
- Operation in Edit-mode
- Operation in Execute-mode
- Calculations in streams and Units
- Calculation of Pressure-Flow balance
- Model Integration
- · Hands on exercises

## Day 2

- Model building (selected process)
- Executing specific process
- Omegaland outline description
- Basic/option functional modules
- VM Space functions and mechanisms
- · Creation of simulators

#### Day 3

- Process component system
- Omegaland/DB configuration
- · Registrations in Omegaland/EXEC
- Reading stream and unit variables in Excel
- Writing in unit variables from Excel
- Customized physical property
- Calculation and data library

- · Getting started with APLIB
- Using Field Operation Library (FOD LIB)
- Using Interlock Block Diagram Library (IBD LIB)
- Using DCS LIB (Yokogawa Centum VP Emulation library)
- Using Malfunction Generator

# **Operator Training Simulator (OTS) Instructor Training**

# Training Module Code: OTSI

# Duration: 4 Days Max 5 Participants Objectives

The course is designed to train Instructors to use and maintain the "VMmaster" Training Simulator" effectively in a training environment. At the end of this course, the trainees will be able to:

- Start-up and Shut-down the simulator
- Operate each station such as ITK-PC, MDL-PC and VIEW-PC
- Operate all features of the "VMmaster" Instructor Station
- This course will help PLANT's
   Instructors to maintain an overall operator training program for the simulator, which covers a set of typical training exercises for modifications (process model, database, malfunction and graphics).

# Day 1

- Introduction and overview
- Loading OmegaLand
- Executing OmegaLand
- Stopping OmegaLand

- Hands-on Exercises
- Introduction to OmegaLand's snapshot function
- Save snap shot
- · Load snap shot
- Snap shot step back
- Q&A

### Day 2

- Introduction to OmegaLand's Initial Condition Loading function
- Save Initial Condition
- Load Initial Condition
- Hands-on Exercises
- Introduction to OmegaLand's Freeze/ Run function
- Freeze simulation
- Run simulation
- Hands-on Exercises
- Introduction to OmegaLand's Replay Evaluation Module
- Replaying
- Outputting logs
- Training record sheets
- Q&A

## Day 3

• Hands-on Exercise

- Introduction to OmegaLand's Malfunction
- Malfunction panel
- Executing Malfunction
- Stopping Malfunction
- Hands-on Exercises
- Introduction to OmegaLand's Instructor Variables
- Modifying Instructor Variables
- Execution
- Hands-on Exercises
- Q&A

# Day 4

- Introduction to OmegaLand's Field Operation (FO)
- Executing FO
- Stopping FO
- Hands-on Exercises
- Introduction to OmegaLand's Abnormal Scenario Handling
- Hands-on Exercises
- Introduction to OmegaLand's Abnormal Scenario Handling
- Executing Abnormal Scenario
- Stopping Abnormal Scenario
- Hands-on Exercise
- Q&A

# Operator Training Simulator (OTS) System Management Training

# Training Module Code: OTSM

# Duration: 3 Days Max 5 Participants Objectives

This course can help PLANT's engineers to maintain the proper configuration of operator training system and trouble shooting. The programme is specially designed for the maintenance members

of the company to have hands on exercise to maintain the OTS (hardware and components) and be confident on handling the system for maintenance and backups.

#### Day 1

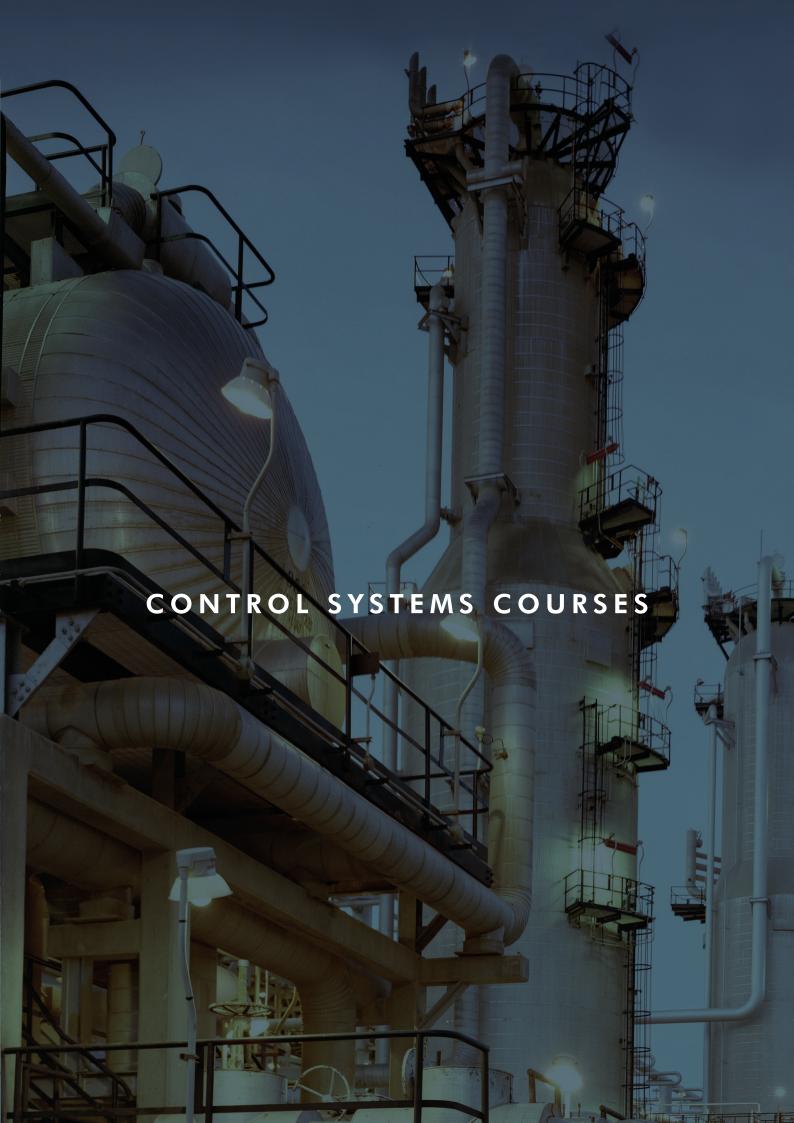
- Overview of OmegaLand
- OmegaLand System configuration
- Q&A

#### Day 2

- Hands on exercises
- Backup and Restore data

- · Hands on exercises
- Q&A

- System maintenance
- · Hands on exercises
- System configuration
- Trouble shooting
- Hands on exercises
- Q&A



# CONTROL SYSTEMS NETWORKING AND CYBER SECURITY

# **Plant Control Network Security**

# **Training Module** Code: PCNS

**Duration: 5 Days** 

# **Objectives**

The workshop will enable to: Qualify participants with the necessary skills to prevent unauthorized access to information related to their work and to protect computer systems from being attacked by harmful software, besides that it will provide them with the techniques in avoiding data loss.

# **Target Beneficiaries**

**Network Engineers** 

# **Prerequisites**

Knowledge on network management

# Day 1 - System Security Overview

- System Security Overview
- Firewall
- · Anti-virus software management

# Day 2 - Management of security essentials

- Operating System (OS) patch management
- Windows domains and accounts management

# Day 3 – Managing backup and recovery

- Backup and Restore management
- · Network management system.

# Day 4 – Importance of cyber security

- Cyber security overview
- · Necessity of control system security

# Day 5 – Vulnerability to computer viruses

- · Security, strategy & control
- Computer viruses and vulnerabilities

# Centum VP Networking (Vnet/IP)

# **Training Module** Code: VNETIP

# **Duration: 3 Days Objectives**

This course empowers participants to understand the concept of control network incorporating the general communication function to keep highly reliable stable real time communication. The participants will practice on configuring, setting up, maintaining and trouble shooting the network and the hardware involved:

- Acquire and apply the fundamentals on Control System Network Management
- Manage simple and multiple domains network
- Master Vnet/IP addressing
- Maintain and troubleshoot Control System Networks

### **Target Beneficiaries**

Engineers and Technicians involved in Process Control Network Management

#### **Prerequisites**

Participants should preferably be familiar with Process Control Systems and have basic knowledge on network management.

### Certification

Participant who attains at least 75% attendance will be awarded Certification of Attendance.

#### Day 1

- Introduction
- Vnet/IP overview
- System architecture
- System specification • Vnet/IP hardware
- Network Configuration
- Vnet/IP redundancy
- Vnet/IP Addressing

- DIP switches
- Hands on

#### Day 2

- Vnet/IP Addressing
- Physical IP (PIP)
- Virtual IP (PIP)
- Hands on
- Vnet/IP Troubleshooting
- Hands on

# Day 3

- Network Switches
- L2 & L3 Switch Functionalities
- Yokogawa Recommended switches
- Trouble shooting
- Security Hardening
- Hands on
- Q&A and wrap up

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# **Subsystems Integration**

# Training Module Code: SSI

**Duration: 4 Days** 

**Objective** 

Allow participants to: Integrate subsystems to Yokogawa control system and manage communication.

Manage sub system communication using industry standard communication protocols like MODBUS and OPC.

The participants will practice on connecting, configuring, setting up and trouble shooting the subsystems communication.

# **Participants**

Engineers and Technicians involved in Process Control Network Management

### **Prerequisite**

Participants should have attended the course "Centum VP Engineering".

#### Certification

Participant who attains at least 75% attendance will be awarded Certification of Attendance.

### Day 1 MODBUS

Overview of Modbus concept.

MODBUS Protocol Introduction & function codes

Subsystem communication.

Communication I/O Modules.

Communication Specifications of Modbus

Connection and engineering for MODBUS communication.

Subsystem Data Storing Format

Laboratory Work: Modbus DCS project part 1.

# Day 2 MODBUS (Continued)

Engineering and configuration.
Communication Packet Analysis.
Maintenance and trouble shooting.

Laboratory Work: Modbus DCS project part 2.

# Day 3: Unified Gateway Station (UGS)

Functional architecture
Functional details of UGS function blocks
OPC A&E event notifications
Communication functions

- Modbus
- OPC

Engineering and Configuration.

# **Day 4:**

Unified Gateway Station (UGS) Continued Engineering and Configuration Station redundancy:

- Principle of Redundant UGS
- Computer or Network Switch-over
- Redundant UGS operation
- Station switching

Maintenance and trouble shooting

# **OPC Communication Essentials**

# Training Module Code: OPC

**Duration: 2 Days** 

**Objectives** 

The workshop will enable participants to:

- Understand the concepts of OPC (OLE for Process Control)
- Understand the benefits of this communication method by comparing the Traditional connectivity methods to OPC

#### **Target Beneficiaries**

For engineers, developers and integrators who are integrating new systems, expanding current operations, replacing legacy equipment and looking for ways to improve data communication using OPC

#### **Prerequisites**

- Microsoft Windows and basic computer use
- An understanding of Process Automation requirements
- No previous OPC experience is expected

# Day 1 – Introduction to OPC its underlying technology

- Introduction to OPC and the underlying technology
- Specification Overview
- Configure OPC Server
- Configure OPC Client
- Exercises

# Day 2 –OPC Networking Essentials

- Networking essentials and how they apply to OPC communication
- DCOM settings and security
- DCOM Troubleshooting techniques
- Exercises



# **Exaquantum Technical Overview Seminar**

# Training Module Code: EQTS

# Duration: 1 Day Objective

This is a not a formal course but a presentation and demonstration of the features of Exaquantum. It describes the features and benefits of both Exaquantum server and the various client interfaces.

### **Participants**

Anyone who wishes to have an overview of the features of Exaquantum will benefit from this

# Prerequisite

None.

seminar

#### Certification

Participant who attains at least 75% attendance will be awarded Certification of Attendance.

### Day 1

Introduction to Exaquantum.
Features and Benefits.
Features and Benefits continued.
Addressing customer specific Issues.

# **Exaquantum System Administrator**

# Training Module Code: EQAD

**Duration: 4 Days** 

# **Objective**

This course covers all the tasks necessary to administer an Exaquantum System. The aim of the course is to demonstrate the post installation configuration of an Exaquantum System, perform all necessary steps to get the system up and running and then monitor it for performance etc.

# **Participants**

This course is essential for those people responsible for the Administration of an Exaquantum System.

# **Prerequisite**

A working knowledge of the Microsoft Windows Desktop environment.

### Certification

Participant who attains at least 75% attendance will be awarded Certification of Attendance.

## Day 1

Introduction to Exaquantum Administration.
System-Wide Configuration.

Laboratory Work:

Template Configuration.

Exercises and Multiple choice questions on the concepts covered.

#### Day 2

Tag Editor.

Tag Generation.

Laboratory Work:

Exercises and VMultiple choice questions on the concepts covered.

# Day 3

Role Based Name. Space Configuration. Miscellaneous. Administration Topics.

Laboratory Work:

Exercises and Multiple choice questions on the concepts covered.

### Day 4

Database Maintenance. First Line Troubleshooting.

Laboratory Work:

Exercises and Multiple choice questions on the concepts covered.

# **Exaquantum Data Access from Third Party package**

# Training Module Code: EQDA

**Duration: 1 Day** 

## **Objective**

Introduces the user to the Exaquantum tools to access data from third party clients like Microsoft Excel and Internet Explorer 6

#### **Participants**

Anyone in an organization who needs

access to data stored in Exaquantum would benefit from attending this course.

# **Prerequisite**

A working knowledge of the Microsoft Windows desktop environment.

#### Certification

Participant who attains at least 75% attendance will be awarded Certification of Attendance.

#### Day 1

Exaquantum Data Handling Overview. Overview of the Exaquantum / Explorer. Excel Add-In.

The Exaquantum OLE DB interface.

The Exaquantum Web Frame Work. Exercises and Multiple choice questions on the concepts covered.

# **Exaquantum User**

# Training Module Code: EQUS

**Duration: 2 Days** 

**Objective** 

This is an entry-level course designed to improve an overview of the Exaquantum system. In addition, hands-on training will be provided in the client access tools such as the Exaquantum/Explorer Excel Add-In and Exaquantum/Explorer itself...

# **Participants**

Anyone who:

Needs access to data stored in Exaquantum

Needs to understand where the Exaquantum/Explorer product could be used within their organization

Has a knowledge of other User Interface Generation applications and wishes to compare them with Exaquantum/ Explorer.

# **Prerequisite**

A user level knowledge of the Windows Desktop Environment.

# Certification

Participant who attains at least 75% attendance will be awarded Certification

of Attendance.

## Day 1

Demonstration of the feature of Exaquantum

 Describes the features and benefit of both Exaquantum server and various client interface

Introduction to Exaquantum Data Handling

- · How it handles information
- How it represents information
- Introduction to Exaquantum/Explorer Excel Add-in
- · Features of Add-In
- Use of the Set Data/Range Update dialogues
- Use of the Set Report Times dialogues
   The Exaguantum OLE DB interface
- · Discussion of what OLE DB is
- Which Exaquantum data is available to the user
- Sufficient info covered to generate a report

Exaquantum/Explorer Positioning and Benefits

- What is Exaguantum/Explorer
- What Exaguantum/Explorer is not

- Why should I use Exaquantum/Explorer
- What benefit would I gain from using it

### Day 2

Exaquantum/Explorer Terminology and User Interface

- What is an Explorer Document
- What is a Control
- What are Explorer Workbooks
- How do they differ from Microsoft Excel Workbook
- How and when would I use Explorer Workbooks
- What is the purpose of the various parts of the user interface
- What do you do in Run Mode and Design Mode
- What is the use of the Secure Workbook Folder
- What is navigation
- Trend Analysis
- Templates

Creating Documents and Configuring Controls

- Develop and configure one-off reports
- Covering textual, pictorial & graphical representation.

# **Exaquantum Explorer Overview**

# Training Module Code: EQEO

**Duration: 1 Day** 

Objective

Introduce the user to the Features and Benefits of Exaquantum / Explorer.

### **Participants**

Anyone in an organization who needs access to data stored in Exaquantum using Exaquantum / Explorer.

#### **Prerequisite**

A user level knowledge of the Windows Desktop Environment.

#### Certification

Participant who attains at least 75% attendance will be awarded Certification of Attendance.

#### Day 1

Exaquantum / Explorer Positioning and Benefits.

Exaquantum / Explorer Terminology and User Interface.

Preconfigured Examples and Templates.

Creating Documents and Configuring Controls.

Overview of Advanced Exaquantum / Explorer Features.

Exercises and Multiple choice questions on the concepts covered.

# **ExaOPC / Exaquantum Engineering & Maintenance**

# Training Module Code: ExaOPC/ExaQ

# Duration: 5 Days Objectives

The workshop will enable participants to acquire:

- Understanding the Exaquantum & OPC
- Enhance to using system support tools
- Increase the knowledge in backup/ restore/troubleshooting & Installation.

# **Target Beneficiaries**

Personnel who want to improve and develop their knowledge in Exaquantum & ExaOPC

# **Prerequisites**

None

# Days 1, 2 & 3 -

- Introduction to Exaquantum concepts
- Building the system configuration
- Using System Support tools
- Understanding Multi-Server Exaquantum
- Concept of Items, Tags, Function

#### **Blocks**

- Backup/ restore/troubleshooting
- Installation
- Using the Exaquantum Transformation Server
- Writing calculation

# Days 4 & 5 -

- Introduction to OPC technologies
- Understanding OPC Interfaces
- Understanding Yokogawa ExaOPC Software
- ExaOPC Tools and Troubleshooting
- · Monitoring user connections

# **Exaquantum Alarms Reporting and Analysis Package**

# Training Module Code: ARAP

# **Duration: 5 Days**

#### **Objective**

Exaquantum Advanced Alarm Management System assists users in determining the cause of incidents and trips by automatically collecting and storing all alarm & event messages and data points of interest from plant equipment such as control and safety systems.

The course provides an overview of the product as well as allowing students to configure a system that starts to collect Alarm and Event data and the creation of trip reports.

# **Participants**

This course is designed for those users who wish to get more familiar with the Exaquantum Advanced Alarms Management System.

### **Prerequisite**

It will be assumed that attendees are familiar with Exaquantum Administration to the level which would be obtained by attending the Exaquantum Administrators Course (EQAD).

#### Certification

Participant who attains at least 75% attendance will be awarded Certification of Attendance.

# Day 1: EXAQUANTUM OVERVIEW

Introduction to Exaquantum.

Features and Benefits.

Features and Benefits continued.

Addressing customer specific Issues.

# Day 2: EXAQUANTUM DATA HANDLING SYSTEM

Exaquantum Data Handling Overview.

Overview of the Exaquantum / Explorer.

Excel Add-In.

The Exaguantum OLE DB interface.

The Exaguantum Web Frame Work.

Exercises and Multiple choice questions on the concepts covered.

# Day 3 : SEQUENCE OF EVENTS RECORDER

Introduction and Overview

Installation

Trip and Tag Configuration

User Interface

Configuration of MS SQL Report Services Basic Troubleshooting

# Day 4: ALARMS REPORTING AND ANALYSIS

Introduction and Overview

Installation

Configuring ARA using the Configurator Application

CENTUM VP CAMS integration

**ARA Security** 

Reports

Publishing and Emailing Reports Automatically

ARA Data Storage and Update

Creating Custom Reports

Backup and Restore of ARA Data

# Day 5: ALARMS MASTER DATABASE

Installation requirements and prerequisites

Installation

Post installation configuration

AMD agents

Security

AMD web User Interface (UI)

Alarms and alarms configuration

Documents and reports

Import an export

Enforcements

Troubleshooting

# **Exaquantum Sequence of Events Recorder**

# Training Module Code: SER

**Duration: 1 Day** 

# **Objective**

Exaquantum/SER assists users in determining the cause of incidents and trips by automatically collecting and storing all alarm & event messages and data points of interest from plant equipment such as control and safety systems.

The course provides an overview of the product as well as allowing students to configure a system that starts to collect Alarm and Event data and the creation of trip reports.

## **Participants**

This course is designed for those users who wish to get more familiar with the Exaguantum/SER product.

### **Prerequisite**

It will be assumed that attendees are familiar with Exaquantum Administration to the level which would be obtained by attending the Exaquantum Administrators Course (EQAD).

#### Certification

Participant who attains at least 75% attendance will be awarded Certification of Attendance.

### Day 1

The course consists of the following sessions:

- Introduction and Overview
- Installation
- Trip and Tag Configuration
- User Interface
- Configuration of MS SQL Report Services
- Basic Troubleshooting

# **Exaquantum Alarm Reporting and Analysis**

# Training Module Code: ARA

# Duration: 1 Day Objective

Exaquantum/ARA (based upon EEMUA 191) is a valuable tool which helps managers to assess and monitor process and system alarm behaviour. The information provided helps diagnose many causes of operator overload and provides benchmarks for system improvement.

This course covers the installation, configuration, administration and use of the Exaquantum Alarm Reporting and Analysis package...

# **Participants**

This course is designed for those users who wish to get more familiar with the Exaquantum/ARA product.

### **Prerequisite**

This coures assumes that the user is familiar with Microsoft Windows and the basic Microsoft Windows terminology. It also assumes that the student is familiar with all the major features of Exaguantum.

Knowledge of SQL Server Management Studio would also be useful but is not essential..

#### Certification

Participant who attains at least 75% attendance will be awarded Certification of Attendance.

## Day 1

The course consists of the following sessions:

- Introduction and Overview
- Installation
- Configuring ARA using the Configurator Application
- CENTUM VP CAMS integration
- ARA Security
- Reports
- Publishing and Emailing Reports Automatically
- ARA Data Storage and Update
- Creating Custom Reports
- Backup and Restore of ARA Data

# **Exaquantum Alarm Master Database**

# Training Module Code: AMD

# **Duration: 1 Day**

# **Objective**

Exaquantum/AMD provides a centralized Alarm Master Database, holding the alarm configuration of connected process plants. It provides the ability to configure and maintain the alarm configuration details for multiple DCS and CAMS systems. Exaquantum/AMD strives to adhere to the principles as laid out in the EEMUA 191 and ISA 18.2 guidelines.

## **Participants**

This course is designed for those who wish to get more familiar with the Exaquantum/AMD product.

## **Prerequisite**

It will be assumed that attendees are familiar with Microsoft windows and the basic Microsoft windows terminology. It also assumes that the student is familiar with major features of Exaquantum with knowledge of SQL Server management essentials.

#### Certification

Participant who attains at least 75% attendance will be awarded Certification of Attendance.

## Day 1

- Installation requirements and prerequisites
- Installation
- · Post installation configuration
- AMD agents
- Security
- AMD web User Interface (UI)
- Alarms and alarms configuration
- · Documents and reports
- Import an export
- Enforcements
- Troubleshooting

# **PI Client Applications**

# Training Module Code: Pl

# Duration: 3 Days Objective

This course is designed to give participants the understanding of Client tools and handling the plant data.

#### **Participants**

Mainly DCS Operators, Plant Operation personnel and Engineers who are required to study the process history data of the Plant.

### **Prerequisite**

Participants should preferably have some basic knowledge on process measurement and control.

#### Certification

Participant who attains at least 75% attendance will be awarded Certification of Attendance.

#### 1. Overview

 What is PI? System architecture / data flow / PI Client Applications

#### 2. Fundamentals

 Dialogs boxes / Logging into PI / Tag search / Time formats / Processbook modes

#### 3. Processbook Trends

- Creating a trend / Using the trend / Customizing the trend

# 4. Other Processbook Elements

 Values / Bars / Text and shapes / Symbol Library / Bitmaps and graphics / XY Graph

### 5. Animation and Colour

- Modifying colours / Multistate indication / buttons

# 6. Introduction to Processbook Scripting

 ActiveX Objects / VB for applications / Automating processbook

### 7. Calculations and External

Data sets / Calculations in Processbook
 / Connecting to external data

# 8. Organizing Processbook Display

- Processbooks and displays / Filetypes
- Links and commands / external documents

# 9. Getting Around Datalink

 Datalink and Excel basics / functions / calculations and expressions /trends

#### 10. Single Value Functions

 Current & Archive Value / Tag Attributes

### 11. Table Functions

 Compressed Values Function / Sampled Data & Timed Data Function / Filter Expressions

# 12. Calculation Functions

 Calculated Data Function / Expression Calculations / Time Filtered Calculations / Advanced Calculations

## 13. Data Trend

 Creating a real-time trend / Using the trend / Customizing the trend / Trends using spreadsheet data



# **Introduction to Distributed Control Systems (DCS)**

# Training Module Code: DCSI

Duration: 2 Days
Objective

This course is designed to give participants the fundamental knowledge of Distributed Control System (DCS).

# **Participants**

For process instrumentation & control engineers, supervisors and technicians.

### **Prerequisite**

Participants should preferably have some basic knowledge on process measurements and control

#### Certification

Participant who attains at least 75% attendance will be awarded Certification of Attendance.

# Day 1

# Morning session:

Introduction to Control system concepts. History and evolution of DCS. Features & Advantages of DCS. DCS architecture and configuration. Introduction to DCS Communication.

#### Afternoon session:

Overview of Yokogawa CENTUM VP DCS.

CENTUM VP software and operation workshop.

# Day 2

# Morning session:

CENTUM VP Hardware overview. Control loop design. Control loop engineering.

### Afternoon session:

Loop connection design workshop in CENTUM VP system.

# **CENTUM VP Operation & Monitoring**

# Training Module Code: VPOF

**Duration: 5 Days** 

Objective

This course is designed to give participants the fundamental knowledge of operation and functions of the CENTUM VP system.

## **Participants**

Mainly CENTUM VP operators and plant operation personnel who are required to operate the CENTUM VP system.

#### **Prerequisite**

Participants should preferably have some basic knowledge on process measurement and control.

#### Certification

Participant who attains at least 75% attendance will be awarded Certification of Attendance.

### Day 1

**LESSON 1** System Architecture **LESSON 2** Display Layout of HIS and Navigation Activities

Laboratory Work for lesson 1 & 2..

## Day 2

**LESSON 3** 3 Centum VP – Operational Windows

Laboratory Work for Lesson 3:

#### Day 3

**LESSON 4** Operation Keyboard **LESSON 5** System Monitoring Window Displays and Reports

Laboratory Work for lesson 4 & 5

# Day 4

**LESSON 6** Sequence Control Displays **LESSON 7** Alarm and Message Windows

Laboratory Work for lesson 6 & 7

#### Dav 5

**LESSON 8** HIS Setup Appendixes Virtual Test Function and Supplemental Topics

Laboratory Work for all lessons.

# **CENTUM VP Fundamentals For Engineering**

# Training Module Code: VPEF

Duration: 3 Days Objective

This course is designed to give participants the fundamental knowledge of operation and functions of the CENTUM VP system in preparation of engineering works.

# **Participants**

Plant operation specialists, Engineers and Maintenance personnel who are required to operate the CENTUM VP system.

# **Prerequisite**

Engineers and Technicians involved in software generation or modification on CENTUM VP system.

# Certification

Participant who attains at least 75% attendance will be awarded Certification of Attendance.

# Day 1

**LESSON 1** System Architecture

**LESSON 2** Display Layout of HIS and Navigation Activities

**LESSON 3** Centum VP – Operational Windows

# Day 2

**LESSON 4** Operation Keyboard

**LESSON 5** System Monitoring Window Displays and Reports

**LESSON 6** Sequence Control Displays.

# Day 3

**LESSON 7** Alarm and Message Windows

**LESSON 8** HIS Setup

Appendixes Virtual Test Function and Supplemental Topics

# **CENTUM VP Engineering**

# Training Module Code: VPEG

**Duration: 5 Days** 

#### **Objective**

This course empowers participants to perform generation of CENTUM VP regulatory control functions, sequence control function, and Human Interface Station.

### **Participants**

Engineers and Technicians involved in software generation or modification on CENTUM VP system.

# **Prerequisite**

Participants should have attended the CENTUM VP Fundamentals for Engineering course.

# Certification

Participant who attains at least 75% attendance will be awarded Certification of Attendance.

#### Day 1

**LESSON 1** System Architecture **LESSON 2** System Configuration

Laboratory Work:

# Day 2

**FLESSON 3** HIS Builders **LESSON 4** FCS Configuration Builders

Laboratory Work:

# Day 3

**LESSON 4** FCS Configuration Builders **LESSON 5** Regulatory and Calculation Functions

Laboratory Work:

# Day 4

**LESSON 6** Sequence Control Programs Laboratory Work

#### Day 5

LESSON 7 Graphics LESSON 8 System Backup

Laboratory Work.

# **CENTUM VP AD Suite Engineering**

# Training Module Code: VPAD

Duration: 5 Days
Objective

This course empowers participants to perform generation of CENTUM VP regulatory control functions, sequence control function using AD SUITE and Human Interface Station

# **Participants**

Engineers and Technicians involved in software generation or modification on CENTUM VP system.

### **Prerequisite**

Participants should have attended the CENTUM VP Engineering.

#### Certification

Participant who attains at least 75% attendance will be awarded Certification of Attendance.

# Day 1

**LESSON 1** System Configuration **LESSON 2** IO List and IOM

Laboratory Work:

Hands on Lesson 1 and 2.

# Day 2

**LESSON 3** Module Configuration **LESSON 4** Switches and Message of FCS

Laboratory Work:

Hands on Lesson 3 and 4.

# Day 3

**LESSON 5** History and Change Management

**LESSON 6** Document Generation

Laboratory Work:

Hands on Lesson 5 and 6.

Day 4

LESSON 7 Downloading LESSON 8 Backup of ADMDB

Laboratory Work:

Hands on Lesson 7 and 8.

Day 5

**LESSON 9** Course Project

Laboratory Work:

Hands on Lesson 9.

# **CENTUM VP Maintenance**

# Training Module Code: VPMT

**Duration: 3 Days** 

Objective

This course is designed to provide participants with an overall understanding of CENTUM VP hardware, maintenance procedure, software installation, backup procedures and maintenance tools.

## **Participants**

Engineers and Technicians who are responsible for daily maintenance of CENTUM VP system.

#### **Prerequisite**

Participants should preferably be familiar with the CENTUM VP Fundamentals or Engineering.

#### Certification

Participant who attains at least 75% attendance will be awarded Certification of Attendance.

#### Day 1

**LESSON 1** System Architecture **LESSON 2** CENTUM VP System Setup **LESSON 3** Downloading

Laboratory Work:

Hands on Lesson 1,2 and 3.

#### Day 2

**LESSON 4** Maintenance Related HIS Buttons

**LESSON 5** Replacement of Common Modules

**LESSON 6** System Backup

Laboratory Work:

Hands on Lesson 4,5 and 6.

Day 3

**LESSON 7** Software Re-installation **LESSON 8** Lifecycle Agreement

Laboratory Work.

Hands on Lesson 7 and 8.

# **CENTUM VP Engineering & Maintenance**

# Training Module Code: VPEM

Duration: 5 Days
Objective

This course is designed to provide participants with an overall understanding of CENTUM VP hardware, maintenance procedure, backup procedures and maintenance tools. Course will empowers participants to perform generation of CENTUM VP regulatory control functions, sequence control function, and Human Interface Station.

# **Participants**

Engineers and Technicians involved in software generation or modification on CENTUM VP system.

# **Prerequisite**

Participants should have attended the CENTUM VP Fundamentals for engineering course.

## Certification

Participant who attains at least 75% attendance will be awarded Certification of Attendance.

# Day 1

**LESSON 1** System Architecture **LESSON 2** System Configuration **LESSON 3** HIS Builders

#### Laboratory Work:

Hands on Lesson 1,2 and 3.

# Day 2

**LESSON 4** FCS Configuration Builders **LESSON 5** Regulatory and Calculation Functions

#### Laboratory Work:

Hands on Lesson 4 and 5.

# Day 3

**LESSON 6** Sequence Control Programs

Laboratory Work:

Hands on Lesson 6.

### Day 4

**LESSON 7** Graphics **LESSON 8** System Backup

#### Laboratory Work:

Hands on Lesson 7 and 8.

### Day 5

**LESSON 9** Maintenance Related HIS Buttons

**LESSON 10** Replacement of Common Modules

#### Laboratory Work:

Hands on Lesson 9 and 10.

# **CENTUM VP Fundamentals of Operation & Maintenance**

# Training Module Code: VPFM

Duration: 5 Days
Objective

This course is designed to provide participants with an overall understanding of CENTUM VP Function, hardware, maintenance procedure, software installation, backup procedures and

maintenance tools.

# **Participants**

Engineers and Technicians who are responsible for daily maintenance of CENTUM VP system.

### **Prerequisite**

Participants should preferably have some basic knowledge on process measurement and control

# Certification

Participant who attains at least 75% attendance will be awarded Certification of Attendance.

### Day 1

CENTUM VP system overview and configuration. Description of hardware.

#### Laboratory Work:

Familiarization on CENTUM VP different components.

#### Day 2

Window Panel Operation

- User security.
- Basic tag features & security.
- Standard operation panel.

#### Laboratory Work:

Operation exercise on operation panels part 1.

Regulatory Control Functions. Sequence Control Function.

#### Laboratory Work:

Operation exercise on feedback and sequence. control operations

#### Day 3

CENTUM VP system configuration. HIS hardware & software. Daily checking of HIS hardware & software.

System maintenance function.

# Laboratory Work:

HIS Components check-up.
Replacement of HIS components.

#### Day 4

Installation fo Centum VP Laboratory Work: FCS Component Check-up. Replacement of FCS Components.

#### Day 5

Laboratory Work for Operators.

# CENTUM VP Graphic Builder

# Training Module Code: VPGR

**Duration: 3 Days** 

# **Objective**

This course empowers participants to perform graphic generation of CENTUM VP system and edit existing graphics.

# **Participants**

Engineers involved in software generation or modification on CENTUM VP system.

### **Prerequisite**

Participants should preferably have some basic knowledge on process measurement and control.

#### Certification

Participant who attains at least 75% attendance will be awarded Certification of Attendance.

# Day 1

**LESSON 1** Terminology **LESSON 2** Navigation

Laboratory Work: Centum VP Navigation

### Day 2

LESSON 3 Graphic Builder LESSON 4 Building a Graphic

#### Laboratory Work:

Graphic generation hands-on

# Day 3

**LESSON 5** Building a Graphic (continue)

**LESSON 6** Custom Faceplate

#### Laboratory Work:

Graphic generation hands-on

# CAMS (Consolidated Alarm Management System) Overview

# Training Module Code: CAMS

**Duration: 2 Days** 

#### **Objective**

This course is designed to provide participants with an overall understanding of the package for alarm rationalization CAMS (Consolidated Alarm Management System).

## **Participants**

Mainly CENTUM VP operators and plant operation personnel who are required to operate the CENTUM VP or CS3000 system.

## **Prerequisite**

Participants should preferably be familiar with the CENTUM VP or CS3000 Fundamentals.

### Certification

Participant who attains at least 75% attendance will be awarded Certification of Attendance.

## Day 1

Introduction.

CAMS Main Operation Functions
Alarm Action & Acknowledgment
Operation

#### Laboratory Work:

Familiarization on CAMS operations.

#### Day 2

CAMS Operation & Features Relationship between CAMS for HIS and HIS

Displaying Historical Data

#### Laboratory Work:

Familiarization on CAMS operations and features.

# CAMS (Consolidated Alarm Management System) Engineering

# Training Module Code: CAMSE

**Duration: 3 Days** 

## **Objective**

This course is designed to provide participants with an overall understanding of the package for alarm rationalization CAMS (Consolidated Alarm Management System) and provide engineering exercises on CAMS builder

### **Participants**

Mainly Process Control Engineers and plant operation personnel who are required to operate the CENTUM VP or CS3000 system.

# **Prerequisite**

Participants should preferably be familiar with the CENTUM VP or CS3000 Fundamentals.

#### Certification

Participant who attains at least 75% attendance will be awarded Certification of Attendance

# Day 1

Introduction.
CAMS Main Operation Functions
Alarm Action & Acknowledgment
Operation

## Laboratory Work:

Familiarization on CAMS operations.

### Day 2

CAMS Operation & Features Relationship between CAMS for HIS and HIS

Displaying Historical Data

#### Laboratory Work:

Familiarization on CAMS operations and features.

### Day 3

CAMS Engineering
Project Properties CAMS Options
-CAMS for HIS Alarm
-CAMS for HIS Alarm Group
-CAMS for HIS Shelf
-CAMS for HIS Message Monitor
Definition

CAMS Master Station Definition
Common Section Download &
Equalization
HIS Setup CAMS Tab
Laboratory Work:
Explore CAMS Builders and option items.
Download Common section definition
Apply CAMS Master Database Definition

# DCS System maintenance on Site training

# Training Module Code: SYMS

Duration: 3 Days
Objective

This course is designed to provide guidance and supervision on site for participants working on CENTUM VP system, If focus on practical training.

#### **Participants**

Technicians, engineers and maintenance personnel who are required to maintain YOKOGAWA system.

Minimum: Two Maximum: Four

#### **Prerequisite**

Participants should preferably have some basic knowledge on process measurement and control.

#### Certification

Participant who attains at least 75% attendance will be awarded Certification of Attendance.

# **Notes**

Based on the system type and sized the course contents and duration can be customized.

Collecting work permits if required is customer scope.

#### Day 1

Plant Architecture Familiarization Plant System Configuration System Hardware & Software Familiarization

Daily Checking Of Hardware & Software Replacement System Components Procedure

#### Day 2

System Maintenance Functions System Hardware Configuration Network Troubleshooting Loop Tracing And Troubleshooting Maintenance Data Management

# Day 3

Troubleshooting Data Gathering And Analysis History Log Analysis System Loading Backup And Restore Report Writing And Considerations

# **Centum VP Essentials with Batch Process**

# Training Module Code: VPBA

# Duration: 3 Days Objectives

After completion of this course, participants will have acquired fundamental knowledge about the operation and functions of the Centum VP system working with Batch process.

# **Target Beneficiaries**

Centum VP Operators, Plant Operation Specialists and Engineers.

### **Prerequisites**

Participants should have basic knowledge on process measurement and control.

# Day 1

System status overview
HIS Startup & Security
HIS tool bar and operator Keyboard
Window Hierarchy and navigator
Windows: Calling, size zoom, dynamics
an sets

Context meu, soft keys, function keys Instrument faceplates regulatory

# Day 2

Tuning panel, Trending Logic charts, sequence tables & control drawings Messages, SFC operation Alarm filters Process report Historical report Help messages

## Day 3

Operator guide messages
Output screen images
Plant hierarchy
Example of batch automation concepts
The recipe overview screen
Familiarization with automated recipe
Loading and operation of a control recipe
Assigning units

Monitoring active recipe operation steps Batch trending

# **Batch Programming**

# Training Module Code: BATCH

# Duration: 5 Days

**Objectives** 

After completion of this course, participants will be able to perform generation of a Centum VP Batch Project using the workstation.

# **Target Beneficiaries**

Engineers involved in software generation and/or modifications of the Centum VP Batch Systems.

## **Prerequisites**

Participants should have previously attended the Centum VP Essentials

of Operation (VPEF) and Centum VP Engineering (VPEG)

Batch Automation overview

### Day 1

Introduction of Batch Concepts ISA S88.01 Batch Control Standards Familiarization with example Batch Processes

Overview of Centum VP Batch Packages

# Day 2

Unit Supervision
Batch Engineering activities, defining a plant hierarchy
Management of shared resources, common blocks

#### Day 3

Batch Control Operations
Derivation of Batch operations from a

recipe

SFC sequences, operations and flashes Basics of SEBOL batch control language, operation SFC function blocks

#### Day 4

Process Management and recipe management

Process management, batch trains and paths, master recipes
Batch operation and monitoring screens

#### Day 5

Exception handling and batch report Exception handling logic Custom state transition matrix Batch report concepts and builder Access control concepts and builder Batch trend

# **CS3000 Fundamentals for Operation**

# Training Module Code: 3KOF

**Duration: 5 Days** 

## **Objective**

This course is designed to give participants the fundamental knowledge of operation and functions of the CENTUM CS3000 system.

# **Participants**

Mainly CENTUM CS3000 operators and plant operation personnel who are required to operate the CENTUM CS3000 system.

# **Prerequisite**

Participants should preferably have some basic knowledge on process measurements and control.

## Certification

Participant who attains at least 75% attendance will be awarded Certification of Attendance.

### Day 1

CENTUM CS3000 system overview and configuration.

Description of hardware.

#### Laboratory Work:

Familiarization on CENTUM CS3000 different components.

## Day 2

Window Panel.

Operation Part 1.

- User security.
- Basic tag features & security.
- Standard operation panel.

#### Laboratory Work:

Operation Exercise on operation panels part 1.

# Day 3

Regulatory.
Control Function.
Sequence Control Function.

#### Laboratory Work:

Operation Exercise on feedback and sequence control operations.

Operation exercise on operation panels part 2.

### Day 4

Window Panel.

Operation Part 2.

- System Status Display.
- Process / Historical Reports.

### Day 5

Laboratory Work for Operators.

# **CS3000 Fundamentals for Engineering**

# Training Module Code: 3KEF

**Duration: 3 Days** 

#### **Objective**

This course is designed to give participants the fundamental knowledge of operation and functions of the CENTUM CS3000 system.

### **Participants**

Plant operation specialists, Engineers and Maintenance personnel who are required to operate the CENTUM CS3000 system.

## **Prerequisite**

Participants should preferably have some basic knowledge on process measurements and control

#### Certification

Participant who attains at least 75% attendance will be awarded Certification of Attendance.

#### Day 1

CENTUM CS3000 system overview Description of hardware.

Window Panel Operation Part 1.

- User security.
- Basic tag features & security.
- Standard operation panel.

Laboratory Work:

Operation exercise on operation panels part 1.

#### Day 2

Regulatory sequence. Control functions.

Laboratory Work:

Operation exercise on feedback. Sequence control operations.

## Day 3

Window Panel.

Operation Part 2.

- System Status Display.
- Process / Historical Reports.



# **Fieldbus Orientation**

# Training Module Code: FBOR

# Duration: 2 Days Objective

This course is designed to provide participants with an overall understanding of Fieldbus concept, and familiarization of Fieldbus Engineering tools.

## **Participants**

Engineers and Technicians who are responsible for Fieldbus engineering configuration and modification of Fieldbus device parameters.

### **Prerequisite**

Participants should preferably be familiar with the CENTUM VP or CS3000 Fundamentals and Engineering.

#### Certification

Participant who attains at least 75% attendance will be awarded Certification of Attendance.

# Day 1

Overview Fieldbus concepts.
Fieldbus system hardware.
Fieldbus communication.
Overview of Fieldbus engineering tools.

#### Laboratory Work:

Fieldbus configuration for some devices.

### Day 2

Overview of device Management tools.

#### Laboratory Work:

Using device Management tool - Examples.

# Fieldbus Engineering

# Training Module Code: FBEG

# Duration: 5 Day Objective

This course is designed to provide participants with an overall understanding of Fieldbus concepts, software installation and Fieldbus Engineering Tool.

#### **Participants**

Engineers and Technicians who are responsible for Fieldbus Engineering configuration and modification of Fieldbus device parameters.

# **Prerequisite**

Participants should preferably be familiar with the CENTUM VP or CS3000 Fundamentals and Engineering and Field instruments knowledge

#### Certification

Participant who attains at least 75% attendance will be awarded Certification of Attendance.

#### Day 1

Overview Fieldbus concepts. Fieldbus system hardware. Fieldbus communication. Fieldbus function blocks. Device Management. Fieldbus wiring.

### Day 2

Segment design considerations. Fieldbus devices (example: EJA).

### Day 3

Fieldbus Engineering concepts.
CENTUM Fieldbus block engineering.

#### Laboratory Work:

Fieldbus devices engineering.

#### Day 4

Fieldbus device management tool.

- NI Tool.
- Yokogawa Device Management Tool.
- Other tools.

# Laboratory Work:

Fieldbus tools.

# Day 5

Fieldbus Startup procedures. Fieldbus device replacement procedure.

#### Laboratory Work:

Fieldbus device replacement procedure.

# Fieldbus Engineering & PRM

# Training Module Code: FPRM

# Duration: 5 Days Objective

This course is designed to provide participants with an overall understanding of Fieldbus & PRM concepts, Fieldbus Engineering Tools, PRM configuration & operation.

# **Participants**

Engineers and Technicians who are responsible for Fieldbus.
Engineering configuration and modification of Fieldbus device parameters.
Engineers and Technicians who are

Engineers and Technicians who are responsible for field device maintenance and modification of field device parameters.

### **Prerequisite**

Participants should preferably be familiar with the CENTUM VP or CS3000 Fundamentals and Engineering and Field instruments knowledge

#### Certification

Participant who attains at least 75% attendance will be awarded Certification of Attendance.

# Day 1

Overview Fieldbus concepts.
Fieldbus system hardware.
Fieldbus communication.
Fieldbus function blocks.
Device Management.
Fieldbus wiring.
Segment design considerations.

# Day 2

Fieldbus devices (example: EJA). Fieldbus Engineering concepts. CENTUM Fieldbus block engineering.

#### Day 3

Laboratory Work:

Fieldbus devices engineering. Fieldbus tools.

# Day 4

Plant Resource Manager Overview. PRM System configuration. PRM Function specification. PRM operation procedure. PRM Administration.

- User and Device security.
- Reference code.
- Inspection schedule.
- Inspection memo.
- Parts list.
- Link document.
- Calibration management.
- Self documentation

### Day 5

PRM database management. PRM Plugin application.

#### Laboratory Work:

Fieldbus device replacement procedure.

# **Plant Resource Manager**

# Training Module Code: PRMF

**Duration: 2 Days** 

# Objective

This course is designed to provide participants with an overall understanding of the concepts of Plant Resource Manager.

#### **Participants**

Engineers and Technicians who are responsible for field device maintenance and modification of field device parameters.

### **Prerequisite**

Participants should preferably be familiar with any of CENTUM VP, CS3000, STARDOM or ProSafe-RS and Foundation Fieldbus concepts.

#### Certification

Participant who attains at least 75% attendance will be awarded Certification of Attendance.

### Day 1

Plant Resource Manager Overview. PRM System configuration.

PRM Function specification. PRM operation procedure. PRM Administration part1.

• User and Device security.

# Laboratory Work:

Device parameters changes from PRM.

# Day 2

PRM Administration part2.

- Reference code.
- Inspection schedule.
- Inspection memo.
- Parts list.
- Link document.
- Calibration management.
- Self documentation.

PRM database management. PRM Plugin application.

#### Laboratory Work:

PRM Plugin application.

# FieldMate Orientation

# Training Module Code: FMOR

**Duration: 2 Days** 

# **Objective**

This course is designed to provide participants with overall knowledge that allow him to understand and operate the Fieldmate and use it in maintenance activities.

# **Participants**

For process instrumentation & control engineers, supervisors and technicians.

# **Prerequisite**

Participants should preferably be experienced in process industry with basic knowledge of process measurement and control.

## Certification

Participant who attains at least 75% attendance will be awarded Certification of Attendance.

# Day 1

FieldMate Overview & Features
FieldMate Registration
FieldMate PC Configuration
FOUNDATION fieldbus H1 Device
Interface
HART Device Interface
Installation of DD files
User Management Function

# Laboratory Work:

FieldMate Installation
Device Configuration/Connection
Exercises

# Day 2

Device Maintenance Information
Management
Segment Viewer and settings
Function Blocks settings for
FOUNDATION fieldbus
Device Adjustment/Setting Functions
Device Viewer & Operation Log

#### Laboratory Work:

Online adjustment & diagnosis



# Fundamentals of ESD (Emergency Shut Down) Systems

# Training Module Code: ESD

**Duration: 2 Days** 

# **Objectives**

Participants will be able to:

Gain fundamental knowledge of Emergency Shutdown Systems Understand the terms associated with safety systems and the need to comply with regulations

# **Target Beneficiaries**

Engineers, Supervisors & Technician from Process maintenance fields

### **Prerequisites**

Basic understanding of Oil & Gas Industry

# Day 1 – Safety System Essentials

- The fundamental concept of safety systems
- Characteristic of critical process systems
- Basic terminology associated with safety systems
- Identify the components of safety systems
- Safety Integrity Levels (SIL)
- Understand safety system architectures
- Safety System positioning

# Day 2 – Functional Safety Concepts

- Level of Protection Analysis (LOPA)
- Risk assessment & mitigation
- Types of safety failures
- Calculation of PFD(Probability of Failure on Demand)
- TUV/SIL classification
- Comparing of TMR/QMR and redundancy
- Comparing DCS and Safety System

# **ProSafe-RS Engineering**

# Training Module Code: RSEG

**Duration: 4 Days** 

#### **Objective**

This course empowers participants to perform generation of ProSafe-RS programs, functional block diagrams, ladder logic and CENTUM VP or CS3000 integration

### **Participants**

Engineers involved in design, software generation or modifications of ProSafe-RS system.

### **Prerequisite**

Participants should preferably be familiar with MS Windows environment and

basic knowledge of logic functions. CENTUM VP or CS3000 Fundamentals or Engineering knowledge is advantage

#### Certification

Participant who attains at least 75% attendance will be awarded Certification of Attendance.

#### Day 1

Introduction to Safety & Safety Integrity Levels "SIL".

ProSafe-RS hardware.

#### Laboratory Work:

SCS Manager (Workbench) software.

#### Day 2

Project creation.
design function blocks.
Simulation and debug.
Project Downloading.

#### Laboratory Work:

Creation of application logic Application development.

#### Day 3

Instances and typical.
User-defined function blocks.

### Laboratory Work:

Creation of function blocks.

#### Day 4

ProSafe-RS and CENTUM VP or CS3000 integration.

Inter-SCS communication.

#### Laboratory Work:

Exercise ESD and DCS integration.

# **ProSafe-RS Maintenance**

# Training Module Code: RSMT

# **Duration: 3 Days**

# **Objective**

This course is designed to provide participants with an overall understanding of ProSafe-RS hardware, maintenance procedures, software installation, backup procedures and Maintenance Support Tools.

# **Participants**

Engineers who are responsible for the daily maintenance of ProSafe-RS system.

# **Prerequisite**

Participants should preferably be familiar with MS Windows environment.

### Certification

Participant who attains at least 75% attendance will be awarded Certification of Attendance.

# Day 1

Introduction to Safety & Safety Integrity Levels "SIL".

Prosafe-RS hardware. SCS-FCS integration.

# Day 2

SCS Maintenance Support Tools.

#### Laboratory Work:

CPU module replacement. I/O module replacement.

### Day 3

Version Control Tool procedures. Database Validity Check Tool. Sequence Of Events Recorder.

#### Laboratory Work:

Security and Password Protection. SCS Reports.

# ProSafe-RS Engineering and Maintenance

# Training Module Code: RSEM

# **Duration: 5 Days**

## **Objective**

This course empowers participants to perform generation of ProSafe-RS programs, hardware and software maintenance and CENTUM VP or CS3000 integration.

#### **Participants**

Engineers involved in software generation or modification and daily maintenance of ProSafe-RS.

#### **Prerequisite**

Participants should preferably be familiar with MS Windows environment and basic knowledge of logic functions. CENTUM VP or CS3000 Fundamentals or Engineering knowledge is advantage.

#### Certification

Participant who attains at least 75% attendance will be awarded Certification of Attendance.

#### Day 1

Introduction to Safety & Safety Integrity Levels "SIL".

ProSafe-RS hardware. SCS Manager (Workbench).

### Day 2

Project creation. design function blocks. Simulation and debug. Project Downloading.

Laboratory Work: Creation of application logic. Application development.

#### Day 3

Instances and typical.
User-defined function blocks.

Laboratory Work: Creation of function blocks.

#### Day 4

ProSafe-RS and CENTUM VP or CS3000 integration.
Inter-SCS communication.

Laboratory Work: CPU module replacement. I/O module replacement.

## Day 5

Version Control Tool procedures. Database Validity Check Tool. Sequence of Events Recorder.

Laboratory Work: Security and Password Protection. SCS Reports.

# **ProSafe-RS Advanced Engineering**

# Training Module Code: PAEG

**Duration: 5 Days** 

## **Objective**

This course empowers participants to perform generation of ProSafe-RS programs, functional block diagrams, ladder logic and CENTUM VP or CS3000 integration.

# **Participants**

Engineers involved in design, software generation or modifications of ProSafe-RS system.

### **Prerequisite**

Participants should preferably be familiar with MS Windows environment and basic knowledge of logic functions. CENTUM VP or CS3000 Fundamentals and Engineering knowledge of Prosafe-RS is required.

#### Certification

Participant who attains at least 75%

attendance will be awarded Certification of Attendance.

### Day 1

ProSafe-RS Hardware SCS Process Data Flow and Scan Times. SCS Application Builders & Project Creation

#### Laboratory Work:

SCS Application Builders & Project Creation

## Day 2

SCS Test Function Procedures SCS Project Downloading Simulation and debug Ladder Logic Application Programming Functions/System Function Application Programming

#### Laboratory Work:

Creation of application logic Application development.

Ladder Logic Application Programming SCS Project Downloading.

# Day 3

Manual Operation Function Blocks

Application Programming. Structured Text Application Programming.

#### Laboratory Work:

Manual Operation & Structured Text Application Programming.

### Day 4

Inter-SCS Communication Application Programming SCS Link Transmission Application Programming ProSafe-RS and CENTUM VP or CS3000 integration.

#### Laboratory Work:

ESD and DCS integration. Inter SCS communication.

### Day 5

SCS Application Analysis Project Database management and master data recovery

#### Laboratory Work:

Application Analysis.

Application logic backup and master data recovery.

# ProSafe-RS Operation—Customized On Site training

# Training Module Code: RSOP

**Duration: 3 Days** 

## **Objective**

This course is designed to provide guidance and supervision on site for participants working on ProSafe-RS system, If focuses on practical training.

#### **Participants**

Engineers who are required to operate YOKOGAWA Safety Instrumented System.

#### **Prerequisite**

Participants should have some basic knowledge on process measurement and control, Safety Instrumented Systems and Functional Safety.

#### **Notes**

- Based on the system type and size the course contents and duration can be customized.
- 1 day familiarization with the site / ESD's and procedures in place will be necessary for the Instructor to acquire the required local knowledge before teaching the course.
- Collecting work permits, if required, is within customer scope.

# Day 1

Plant architecture familiarization
Plant system configuration
System hardware familiarization
System software familiarization
System overview windows related to
ProSafe-RS

## Day 2

Overview of safety functions in plant Overview of safety operation graphics Run test function and simulate project Debug and simulation

#### Day 3

Review standard operation procedures (SOP) for

- Startup override
- Operation override
- Maintenance override

Process alarm window for safety

Process report

Historical report

Operation of Sequence of Event Recorder (SOER)

# ProSafe SLS - HIPPS

# Training Module Code: SLS

**Duration: 3 Days** 

## **Objective**

This course enables participants to understand the principles of ProSafe-SLS, to operate and perform first-line maintenance on ProSafe-SLS systems. A predefined ProSafe-SLS High Integrity Pressure Protection system [HIPPS] training will be used to give participants an opportunity for hands-on experience and troubleshooting on a physical ProSafe-SLS system.

# **Participants**

Engineers involved in maintenance of ProSafe-SLS HIPPS System.

# **Prerequisite**

Participants should preferably have some basic knowledge on process measurement and control. It would

also be beneficial to have knowledge of electronics and Boolean logic.

# Certification

Participant who attains at least 75% attendance will be awarded Certification of Attendance.

### Day 1:

Course introduction.
ProSafe-SLS principle of operation.
ProSafe-SLS solid-state logic solver.
ProSafe-SLS hardware overview.
Explanation of a basic HIPPS in relation to ProSafe-SLS (2003, 2004)
Exercise: ProSafe-SLS hardware familiarization

# **Day 2:**

Concepts of ProSafe-SLS system configuration.

Exercise: Using the Harting extractor tool. Understanding ProSafe-SLS functional logic diagrams.

Reading and understanding the HIPPS Functional Logic Design (FLD)

Exercises: Building ProSafe-SLS Logic

and basic troubleshooting.

### **Day 3:**

ProSafe-COM hardware overview Concepts of ProSafe-COM SET software.

Exercise: ProSafe-COM SET step-by-

step guide.

Exercise: Set up communication between ProSafe-SLS Rack and Safety Station. Exercise: Modifying the TAG and CNF

Exercise: Creating your own tags and monitoring them via the ProSafe-SLS COM SET



## STARDOM & FAST/TOOLS Basic Engineering

## Training Module Code: STFTBE

## Duration: 5 Days Objective

This 5-day course is designed for Engineers and Operation and Maintenance Personnel to configure the application to meet the demand of the process operator

#### **Participants**

For engineers involved in software generation or modification of the Stardom system

- For Operations and Maintenance Personnel who will configure and/or maintain the FAST/TOOLS operational environment
- Participants must be familiar with IEC61131-3 programming or have attended the IEC61131 programming training course
- With Fundamentals knowledge of computers and a working knowledge of MS- Windows

#### **Prerequisite**

Participants should preferably be familiar with MS Windows environment and some basic knowledge on process measurements and control.

#### Certification

Participant who attains at least 75% attendance will be awarded Certification of Attendance.

#### Day 1

Introduction to Stardom

- System Configuration
- Hardware Configuration
- Licenses
- FCX Introduction
- FCX Configuration
- Resource Configurator
- I/O Configuration
- Logic Designer Overview
- Program Organization
- Laboratory Work: Using the Resource Configurator, Creating a project and creating a control application

#### Day 2

Data and Variables

- IEC61131 Programming
- IEC61131 (cont.) Creating a control application
- PAS POU Function Blocks
- Connections
- Function Block Detail
- Debugging Tools
- Laboratory Work: Creating a control application and NPAS POU exercise

#### Day 3

FAST/TOOLS Introduction

- User Interface
- Exercise: Adding new users
- Stations

- What are stations?
- Exercise: Requesting/changing station information
- Process variables
- Exercise: Definition of Installation/Units and Items/Sub-items.

#### Day 4

The Human Machine Interface

- Exercise: Creation of symbols
- Exercise: Creation of mimics (with process variables)
- Exercise: Menu definition.

#### Day 5

**Alarms** 

- The Alarm Mechanism
- Exercise: Configuration of an alarm environment
- Historical information
- Exercise: The method of collecting and storing

### **STARDOM Engineering**

## Training Module Code: STEG

#### **Duration: 4 Days**

#### **Objective**

This course empowers participants to perform system configuration of STARDOM and use of programming tools and YOKOGAWA function blocks available in the STARDOM controller.

#### **Participants**

Engineers or Technicians involved in design, software generation or modifications of STARDOM system.

#### **Prerequisite**

Participants should preferably be familiar with MS Windows environment and some basic knowledge on process measurements and control.

#### Certification

Participant who attains at least 75% attendance will be awarded Certification of Attendance.

#### Day 1

Introduction to STARDOM system configuration
Hardware configuration and Licenses FCX introduction
FCX configuration
Resource Configurator

#### Laboratory Work:

Creating a Project Using the Recourse Configurator

#### Day 2

I/O Configuration.
Logic Designer overview.
Program organization.
Project creation.
Generation of control application.

#### Laboratory Work:

Creating a project in Logic Designer. Downloading the logic in STARDOM controller.

#### Day 3

Data and variables.
Introduction to IEC 61131 programming.

- Structured text.
- FBD.
- Ladder Diagrams.
- PAS POU function blocks.

#### Laboratory Work:

Creating an IEC 61131 program. PAS POU.

Function blocks details. Inter-FCX communication.

#### Day 4

Debug tools. STARDOM maintenance. using web browser. Upgrading firmware.

#### Laboratory Work:

Changing STARDOM controller IP address.

Using debug tools. Function blocks.

### **STARDOM Maintenance**

## Training Module Code: STMT

**Duration: 1 Days** 

#### **Objective**

This course enables participants to learn to use the Maintenance browser page, use maintenance tools and perform backup, revision upgrade and step to perform before a battery change operation.

#### **Participants**

Engineers or Technicians involved in routine maintenance of the STARDOM system

#### **Prerequisite**

Participants must be familiar with the STARDOM system.

#### Certification

Participant who attains at least 75% attendance will be awarded Certification of Attendance.

#### Day 1

Basic of Maintenance page. Change System date/ time. Change communication parameters. Retain data save. Maintenance tools.

#### Laboratory Work:

Backup tools. Restoration tools. Firm ware revision upgrade. Battery change operation.

## **FAST/TOOLS Engineering Revision 10**

## Training Module Code: FTEG

**Duration: 5 Days** 

#### **Objective**

System Managers are able to configure the application to meet the demand of the process operator. This lecture-based course combined with lab exercises provides the opportunity for hands-on experience to configure FAST/TOOLS. After completion of this module the student is able to develop a SCADA application according the Yokogawa recommended standard and Interpret and understand the available FAST/TOOLS manuals / documentation.

#### **Participants**

The course is meant for System Managers who will configure and/or maintain the FAST/TOOLS operational environment.

#### **Prerequisite**

Participants will require fundamental knowledge of computers and working knowledge of MS-Windows.

#### Certification

Participant who attains at least 75% attendance will be awarded Certification of Attendance.

#### Day 1

Welcome and Course Introduction.
Introduction to FAST/TOOLS.
How to use the documentation
I/O Processing.
Connecting equipment (MODBUS based)

Connecting equipment (MODBUS based Definition of items / Use of Item status Exercises

#### Day 2

First-out groups / Alarm collections / acknowledgement types
Alarm selection areas / areas of interest / Alarm-Display relations / Alarm notification
Exercises

Introduction and interface of PROCESS/ FAST

#### Day 3

Introduction Object Oriented Programming.

**Exercises** 

Introduction and interface of REPORT/FAST

Introduction to Report Query Language (RQL)

**Exercises** 

#### Day 4

Report Query Language (RQL) Continue...

Create and modify reports. Storing and retrieving Historical Information.

Implementing user Authorization. Logging user actions: Audit Trail Database engineering by means of quickload tool.

Creating graphics - Basics

#### Day 5

Backup / restore procedures Creating graphics - Advanced Evaluation



# Introduction to Process Analyzer & Sample Handling Systems

## Training Module Code: PASHS

**Duration: 2 Days** 

#### **Objectives**

The workshop will enable participants to:

Gain understanding of process analyzers and sample handling systems

Understand the theory of the various types of analyzers and their measuring principles and operation, Sample Handling System design and the function of components, sample phase consideration and their effects on measurement, and the preventive maintenance program for analyzers

#### **Target Beneficiaries**

Plant Operation & Maintenance personnel who are responsible for ensuring the continuous and stable analyzer performance

#### **Prerequisites**

Participants should preferably have fundamental knowledge on process measurement and control

## Day 1 – Role & Application of Process Analyzers

- Role of Process Analyzers Process Control
   Process Monitoring
   Product Quality Control
- Application of Process Analyzers Petroleum Refinery Petrochemical Complex Natural Gas Plant

**Environmental Monitoring** 

 Sampling System Configuration Sample Take-Off
 Pre-Conditioning System
 Sample Transport
 Sample Conditioning System

## Day 2 – Maintenance & Troubleshooting

- Basic Chemistry
   Elements and Compounds
   Sample Media Phase
- Analyzers
   Various Types of Analyzers
   Gas or Liquid Measurement
   Continuous & Batch Analyses
- Maintenance & Services
   Planned Maintenance Program
   Trouble-Shooting Guidelines

### **Essentials of Analyzers & Gas Chromatographs**

## Training Module Code: ANZGC

## Duration: 2 Days Objectives

The workshop will enable participants to:

Understand the different types of Analyzers & Gas Chromatographs Understand their applications & their measuring principles, Operation & Maintenance

#### **Target Beneficiaries**

Maintenance, engineers and technicians involved in engineering and maintaining Gas and Liquid analyzers and Gas Chromatographs

#### **Prerequisites**

Participants should preferably have fundamental knowledge on process measurement and control

#### Day 1 – Introduction to Analyzers (Principles & Operations)

- Role of Process Analyzers Process Control
   Process Monitoring
   Product Quality Control
- Application of Process Analyzers
   Petroleum Refinery
   Petrochemical Complex
   Natural Gas Plant
   Environmental Monitoring

#### Day 2 – Online Gas Chromatographs (Introduction, Terminology, Components & Functions)

- Gas Chromatograph Appreciation
- Gas Chromatography terminology
- Introduction to different function blocks of Process Gas Chromatography Analyzer.
- Main components and their functions:
- Oven, Column, Detectors, Switching Valves and processor.
- Operation of Gas Chromatograph
- Injection, Separation, Detection and Calculation
- Sample Handling System
- Vaporizer, filter, fast loop, switching valves & vents.
- Start up and Shutdown procedures
- Basic Maintenance practices
- Trouble-shooting techniques
- Demonstration of PGC

### GC8000 Operation and Maintenance

## Training Module Code: GCOM

**Duration: 3 Days** 

#### **Objective**

This course is designed to provide participants with overall understanding of GC 8000 hardware, maintenance procedure, Analyzer Server Engineering Terminal software installation, backup procedure and troubleshooting.

#### **Participants**

Plant instrument Engineers and Maintenance Technicians involved in operation and maintenance of gas chromatograph.

#### **Prerequisite**

Participants should preferably have some knowledge on process instrumentation. However, prior exposure to GC1000

Mark-II, GC 8000 or any other gas chromatograph/analyzer will be an advantage.

#### Certification

Participant who attains at least 75% attendance will be awarded Certification of Attendance.

#### Day 1

Overview & principle of Gas Chromatograph

- Basic Chromatography and Detection Principles
- GC8000 Introduction & specification
- GC8000 Specifications

GC8000 hardware identification & functions

- Protection System
- Electronics System
- Pressure/Flow Control
- Oven System

#### Day 2

Overview of KGC datasheet KGC datasheet explanation

- Analyzer specification
- Method setup
- Stream setup
- Peak specification and setup
- Analog/Digital setup
- IP address setup

Ethernet LCD

GC table review

#### Day 3

GC 8000 operation

- GC startup
- HMI operation
- Flow check
- Hands on calibration
- Hands on validation
- GC Shut down

ASET setup and comunication

GC8000 maintenance

# GC8000 Operation and Maintenance & Network Management

## Training Module Code: GCOMN

**Duration: 4 Days** 

#### Objective

This course is designed to provide participants with overall understanding of GC 8000 hardware, operation & maintenance procedure, PC Analyzer Server, Analyzer Server Engineering Terminal, GC Virtual Technician software installation & operation, backup procedure and GC network architecture.

#### **Participants**

Plant instrument Engineers and Maintenance Technicians involved in operation and maintenance of gas chromatograph.

#### **Prerequisite**

Participants should preferably have knowledge on process instrumentation. However, prior exposure to GC1000 Mark-II and GC 8000 or any other gas chromatograph/analyzer will be required.

#### Certification

Participant who attains at least 75% attendance will be awarded Certification of Attendance.

#### Day 1

Overview & principle of Gas Chromatograph

GC8000 Introduction specification & configuration

GC8000 hardware identification & functions

- Protection & Electronics System
- Pressure/Flow Control
- Oven & column System

#### Day 2

Overview of KGC datasheet KGC datasheet explanation

- Analyzer specification
- Method, stream, peak and Analog/ Digital setup
- IP address setup

#### **HMI Operation:**

Ethernet LCD - KGC datasheet review

#### Day 3

Take it and fix it - Practical

• Uninstall and install electronic cards

- · Replace rotary valve seat
- Check and test the detector GC operation Practical
- Startup procedure
- Manual operation and hardware test procedure
- Flow check procedure
- Calibration procedure
- GC shutdown procedure GC8000 maintenance procedure

#### Day 4

Introduction of Analyzer Bus System Analyzer server and Network setup procedure

Software and networking component setup

- Installation and operation
  - PC analyzer server
  - Analyzer server Engineering terminal
  - Ethernet LCD operation
  - Virtal technician
- Analyzer server gateway
- Introduction to Stardom and ASGW
- Hardware setup and configuration
- AGSW mapping

# GC8000 Operation and Maintenance with Network & Sample Conditioning System (SCS)

## Training Module Code: GCAON

## Duration:5 Days Objective

This course is designed to provide participants with overall understanding of GC 8000 hardware, operation & maintenance procedure, PC Analyzer Server, Analyzer Server Engineering Terminal, GC Virtual Technician software installation & operation, backup procedure and GC network architecture.

#### **Participants**

Plant instrument Engineers and Maintenance Technicians involved in operation and maintenance of gas chromatograph.

#### **Prerequisite**

Participants should preferably have knowledge on process instrumentation. However, prior exposure to GC1000 Mark-II and GC 8000 or any other gas chromatograph/analyzer will be required.

#### Certification

Participant who attains at least 75%

attendance will be awarded Certification of Attendance.

#### Day 1

Overview & principle of Gas Chromatograph

GC8000 Introduction specification & configuration

GC8000 hardware identification & functions

- Protection & Electronics System
- Pressure/Flow Control
- Oven & column System

#### Day 2

Overview of KGC datasheet KGC datasheet explanation

- Analyzer specification
- Method, stream, peak and Analog/ Digital setup
- IP address setup HMI Operation:

Ethernet LCD - KGC datasheet review

#### Day 3

Hands on - Practical

- Uninstall and install electronic cards
- Replace rotary valve seat
- Check and test the detector GC operation Practical
- Startup procedure

- Manual operation and hardware test procedure
- Flow check procedure
- Calibration procedure
- GC shutdown procedure GC8000 maintenance procedure

#### Day 4

Introduction of Analyzer Bus System Analyzer server and Network setup procedure

Software and networking component setup

- Installation and operation
- Analyzer server gateway

#### Day 5

Modbus mapping and testing Sample Conditioning System

- Sample conditioning system configuration
- Block and bleed valve setup
- Athmospheric balancing
- · Heat trace setup
- Carrier gas consumption Troubleshooting GC8000 troubleshooting Network troubleshooting Case study

## Liquid Analyzers Operation and Maintenance

## Training Module Code: LAOM

## Duration: 2 Days Objective

This course is designed to provide participants with overall understanding of liquid analyzer hardware, Installation, operation & maintenance

#### **Participants**

Plant instrument Engineers and Maintenance Technicians involved in operation and maintenance of liquid analyzers.

#### **Prerequisite**

Participants should preferably have knowledge on process instrumentation. However, prior exposure to any other liquid analyzers will be advantage.

#### Certification

Participant who attains at least 75% attendance will be awarded Certification of Attendance.

#### Day 1

PH analyzer

Analyzer overview

PH measurement principle

PH Sensor and holder

Sensor wiring

Analyzer operation

Sensor diagnostics & Liquid earth

PH sensor calibration & maintenance

Specific Conductivity & Inductive Conductivity

SC Measurement principle and cell constant

ISC measurement principle

conductivity sensors and electrode holders

#### Day 2

SC & ISC (continue)

SC & ISC sensor wiring

SC & ISC analyzer operation & maintenance

Dissolved Oxygen Analyzer:

Dissolved oxygen theory

Analyzer specification

Air and water calibration

DO analyzer sensor and holder

DO analyzer operation & maintenance

## TDLS 200/220 Operation and Maintenance

## Training Module Code: TDOM

**Duration: 2 Days** 

**Objective** 

This course is designed to provide participants with overall understanding of TDLS 200/220 hardware, Installation, operation & maintenance

#### **Participants**

Plant instrument Engineers and Maintenance Technicians involved in operation and maintenance of TDLS analyzers.

#### **Prerequisite**

Participants should preferably have knowledge on process instrumentation. However, prior exposure to TDLS 200/220 or any other TDLS analyzers will be advantage.

#### Certification

Participant who attains at least 75% attendance will be awarded Certification of Attendance.

#### Day 1

TDLS Basic theory

TDLS 200/220 specification

TDLS hardware and its function

Overview of the electronics and field connections

Process interface systems

Practical demonstration (Hands on)
- Viewing of zero and target gas spectrum

- Transmission and alignment

#### Day 2

(Practical)

Analyzer startup, shutdown & alignment procedure

Operation and maintenance procedure

Calibration and Validation

Laser module & detector module replacement

Export Data and file review

Alarms - Warnings and Faults

Spectrum, transmission and data review

## IR 400 Operation and Maintenance

## Training Module Code: IROM

**Duration: 2 Days** 

#### **Objective**

This course is designed to provide participants with overall understanding of IR 400 Analyzer hardware, Installation, operation & maintenance

#### **Participants**

Plant instrument Engineers and Maintenance Technicians involved in operation and maintenance of IR 400 analyzers.

#### **Prerequisite**

Participants should preferably have knowledge on process instrumentation. However, prior exposure to IR 400 or any other IR analyzers will be advantage.

#### Certification

Participant who attains at least 75% attendance will be awarded Certification of Attendance.

#### Day 1

Principle of NDIR analyzer

Introduction and overview of IR400 analyzer

Components of IR analyzer and its function

#### Day 2

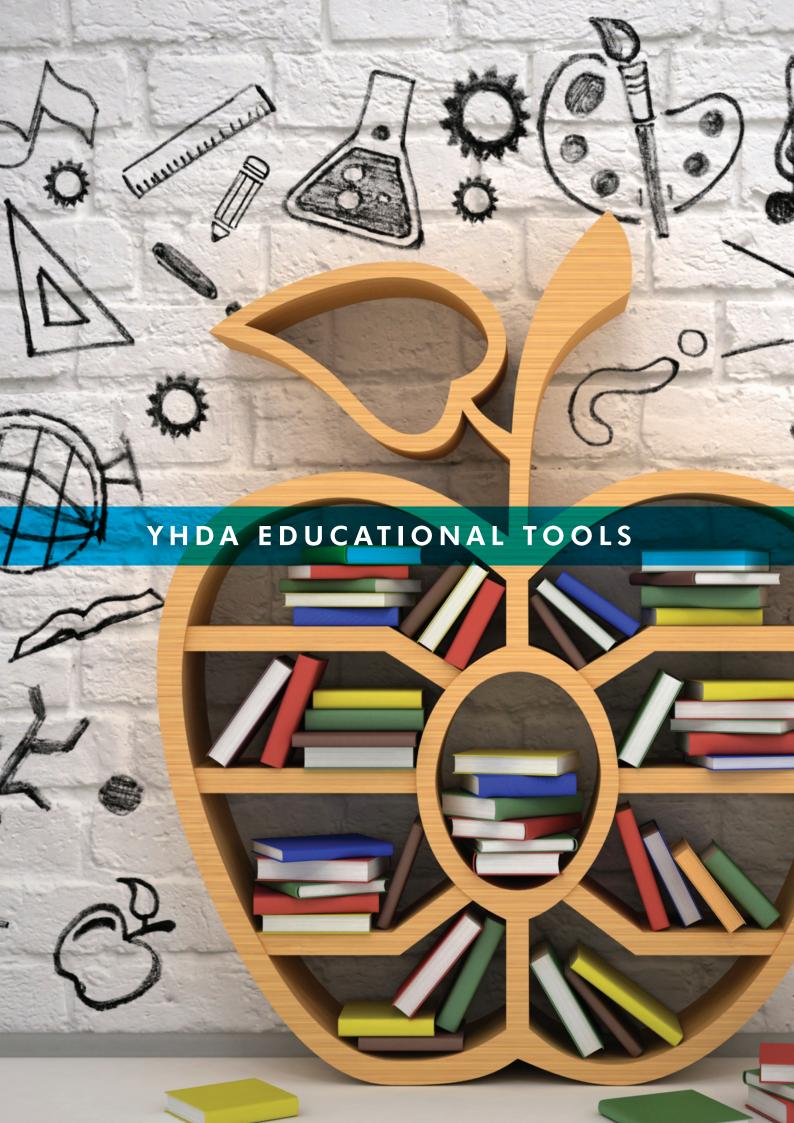
Practical demonstration on analyzer operation

Manual calibration

Auto calibration

Hardware check points

Preventive maintenance



### **E-Learning Support**

# The E-Learning incomparable Strengths:

**Increased Productivity:** E-Learning is not bound by geography or time, enabling the employees to have greater flexibility to complete their training at their own schedules, across multiple work sites.

Reduce time in achieving learning goals: Employees don't waste time taken out with travel and classroom breaks, learn at their own pace and focus only on the content and learning objectives.

Meeting audit and compliance goals: E-Learning uses a Learning Management System to organize and provides an audit trails, providing full control of consistent, accurate and comprehensive learning data.

**Lower Training costs:** Deliver around 50% savings compared to traditional training, along with reduced travel and materials costs.

**Training large workforces:** Projects no longer need to be constrained by the time it used to take to deliver learning to large work force across multiple sites. E-Learning has a much faster delivery time than traditional learning and does away with the physical limitations of building classroom and recruiting trainers

#### Consistent approach to learning:

E-Learning courses provide greater consistency in the delivery of learning, which ensures that the training goals are met across multiple geographies and cultures.

**Up-to-date and relevant:** Course content can be easily maintained and updated to ensure that the learners rapidly receive the latest knowledge and training to comply any changes in legislation.

#### Flexible delivery and deployment:

Available 24/7, 365 days a year with real time access to learners across the business, even in remote locations.

**Scalability:** E-Learning courses are effective for both individuals and multisite, large population work groups

**Environmentally friendly:** E-Learning uses less energy and produces less CO2 emissions per student compared to



conventional face to face courses

Freedom to fail: Nobody likes to fail in a classroom full of people and in some cultures this is a real obstacles to learning. E-Learning lets you fail without fear and courses can be repeated and taken again.

**Personalized learning:** Your teams will learn at their own individual pace. Retention levels will also be higher as your learners will progress through the courses at a pace which suits their own individual needs rather than those of the group.

- Centum VP Virtual Operator Trainer
- Generic E-Learning Modules
  - Instrumentation and Process Control
  - Safe System of Work Range
  - Safety Awareness range
  - Environmental Range
  - Process Operation and technology Range: Oil & Gas
  - Process Operation and Technology Range: Chemical
  - Integrity Management Rage
  - Mechanical engineering Range
  - Oil & Gas Industry Familiarization Range
- International Minimum Industry Safety Training - IMIST

### **Agenda**

### Centum VP Virtual Operator Trainer

# How to practice/Train on DCS without affecting Live System?

- ◆ Virtual Operator Trainer
- Two Access Possibilities:
  - Private Cloud Server at site
  - From any individual workstation
  - At Training Center & with Instructor
  - In a dedicated room close to Central Control Room
  - Public Cloud Web Services.
  - From any computer or smart phone, anywhere with web access.
- Centum VP & ProSafe-RS Virtual Engineering Trainers (VET)
  - Unsupervised practice & simulation on Engineering



CENTUM VP Virtual Operator Trail

CENTUM VP Virtual Operator Trainer for new and experienced operators, delivered around the world 24/7 on-demand through the cloud. Trainees receive instruction and practice on their own private, fully-functioning instance of CENTUM VP Human Interface Station (HIS).



CENTUM VP Virtual Operator

 Web-based training on CENTUM VP HIS navigation, basics and standard graphics, trends, system alarms and system overview, process alarms, and operator reports



- Interactive practice exercises in
- Skill and knowledge assessments
- Reporting and results tracking via Learning Management System (LMS)
- Completion certificate



Self-paced CENTUM VP Virtual Operator Trainer is ideal for:

- Initial training of new operators
- Conversion of existing operators from different DCS
- Refresher training for experienced
- Practice and improvement of CENTUM VP knowledge and skills



Custom Virtual Operator training using client specific process screens, graphics, and standard operating procedures, and designed to meet client's training objectives and requirements, is available upon request

## Self paced Training ideal

- Initial Training of New Operators
- Conversion of Experienced Operators from different DCS
- Refresher Training for Experienced Operators
- Practice and improvement of Centum VP knowledge and skills



Grants the operator with a fully functional Centum VP Human Interface Station (HIS)t

Covers all features & Functionalities of Centum VP

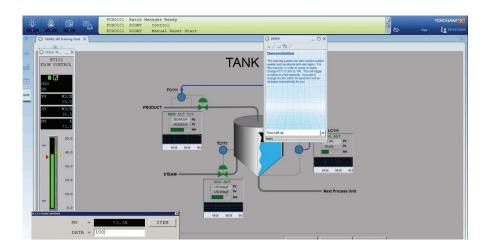
#### **♦ Centum VP VOT delivers:**

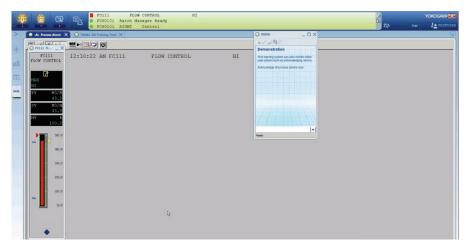
- TWeb Based or Private Cloud accessible training on:
  - HIS navigation
  - Basic and standard graphics,
  - Trends
  - System Alarms





- ◆ Interactive Practice Exercises
  - Practice on Standard Operating Procedures(Static scenarios)
  - Monitors the user and reacts to the actions in HIS, proposing corrections if necessary





- ◆ Tracking, Reporting and Results registered in a Learning Management System (LMS)
- ◆ Skills and Knowledge Assessment → certificates





The integrated Learning Management System enables the delivery of a certificate upon completion of the whole training



### **Centum VP Virtual Operator Trainer**

**Training Module Code: VOT** 

Duration: 12 to 18 hours

#### Objectives / outcomes

Upon completing the course, the learner will be able to exhibit the ability to:

- Identify and define the function of each system component
- Open standard display panels
- Control process equipment
- Acknowledge and respond to alarm messages

#### Intended audience

 All persons tasked with process operations using the Centum VP System

#### Knowledge requirements

- Basic file / folder manipulation in MS Windows environment
- Basic downloading and running operations in a MS Windows environment.

#### **Prerequisites**

None

#### Materials

- Private Cloud: Material available on Company Server
- Public Cloud: Course material will be available for download upon completed registration

#### Requirements to be awarded certification:

Complete all quiz questions with a score of at least 70% or above.

#### **Course Description**

The objective of the Virtual Operator Trainer (VOT) is to show the user the overall capabilities of the Centum VP system.

Utilizing Cloud technology. you will run a virtual machine with a Centum VP training project on your desktop.

Downloadable course materials will guide you through the training process. Knowledge retention will be verified throughout through periodic quizzes.

Course progress will be monitored through our Learning Management Software, allowing supervisors to receive updates on course completion.

This training is not intended to replace the normal training environment. It is intended to help the student gain additional Centum VP product knowledge prior to instructor led training or completing OJT.

#### Items covered:

There is testing throughout the Virtual Operator Trainer (VOT). Quiz questions must be completed satisfactorily in order to move on to the next training topic.

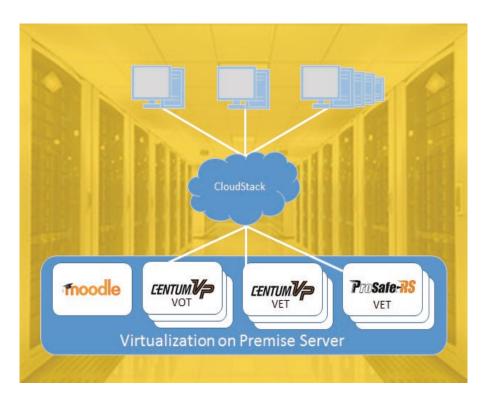
The Virtual Operator Trainer will cover the following topics:

- Centum VP System Overview and Terminology
- Process Operation Screens
- Faceplates Overview
- System and Process Alarm Screens
- Graphic Window Interactions
- System Status Display
- Process Reports
- Historical Report
- Control Programs Overview
- E-Learning is not bound by Geography or Time: flexibility in accessibility
- Training at own pace: No time wasted in travelling, coffee breaks...
- Meeting audit and compliance goals: Any access/practice is recorded in the LMS
- Freedom to fail / higher retention level

### More

## Centum VP Virtual Engineering Trainer & ProSafe-RS Virtual Engineering Trainer / Simulator

- Centum VP Virtual Engineering Trainer
- ProSafe-RS Virtual Engineering Trainer (VET)



- An actual Centum VP / ProSafe-RS system with engineering, maintenance, debugging, logic simulation and test function capabilities
- Unsupervised learning environment
- Create new RS and SCS projects
- Create variables
- Create programs
- Add I/O modules and wiring variables
- Integration of ProSafe-RS with CENTUM VP
- Run integrity and cross reference analyzers
- Import/export engineering data
- Engineering data is automatically saved upon logging out
- One virtual disk per user

### **Educational Kits and Skids**

The Yokogawa Human Development Academy (YHDA) developed the Automated Training Simulator (ATS), a Field Instrumentation training Simulator associated to a DCS/SIS to incorporate the fundamental principles of instrumentation and process control.

The ATS was Co-Innovated in collaboration with all of our partners, Major National Oil and Chemical Companies in Middle East and Africa, as well as Colleges, Universities and Technical Training Institutes. Benefiting of more than a Century of experience, it was specifically adapted to deliver courses certified by the Society of Automation, Instrumentation, Measurement and Control (SAIMC).

The ATS aims at giving "hands on" training to all personnel involved in instrumentation and process Control, from technician to engineer level.

In the current context of Industrial Revolution 4.0, Yokogawa "Synaptic Business Automation" approach was key for creating sustainable value on this Simulator through:

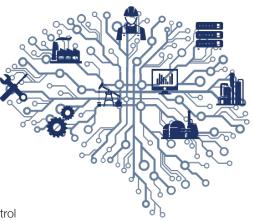
Co-innovation with customers and partners

Synaptical synthesis of all available information and experience

Optimum utilization of expertise and proven solutions

The facility is equipped to comply with the electronic section of the latest Control & Instrumentation Trade Test incorporating measuring Principles of Pressure, Temperature, Flow, Level, Liquid Analysis, Cascade Control, Control Valves and DCS and FCS System with HIM.

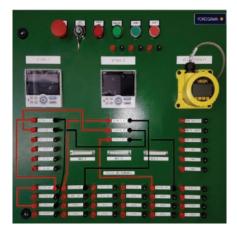
The simulator can be used to teach principle of operation, calibration (local and remote) and fault finding. It requires only water, compressed air (5 Bar) and power to operate, making it practical for on-site training or classroom use. Plug & Play, it is built on a steel frame with casters for maximum mobility, with dimensions allowing it to fit through a standard doorway.



The associated educational material includes Videos and lab workbook presenting a range of realistic exercises and practical cases, for the users to learn and experiment without the expense and risks of on-the-job training. The tutorial exercises have been elaborated and fine-tuned over the years jointly with the end-users: They are adapted to external operators and technicians as well as to Control Room personnel.

The principles incorporated are:

- Flow (Magnetic flow meter & Vortex flow meter).
- Level (Radar Transmitter & DP Bubbler).
- Temperature (Thermocouple with hockey puck transmitters and RTD with YTA610 Temperature Transmitter).
- Pressure (Differential).
- Liquid Analysis (pH & Conductivity).
- Pump Control (Start, Stop & Trip) utilizing a Yokogawa DCS
- Cascade Control Utilizing the UT55A's with local connectiondiagram.



Additional to the local Controllers, the Plant Simulator can also be controlled by a Distributed Control System (DCS) remotely.

- The Plant Simulator can be connected to a Yokogawa Field Control Station (FCS) and monitored by a Human Interface Station (HIS)
- Additional licensing is included so that the HIS doubles up as an Engineering station for the programming of the DCS/SIS with all the required software
- The Yokogawa DCS-SCS Training Simulator is designed to give you the flexibility of testing loops using our engineering and SCS blocks without having to uselive equipment:

Hands on experience in a safe working environment









### Control

- Cascade Loop
- Single Loop
- Local / PLC



### Analytical

- рН
- Conductivity



Flow

Electromagnetic



Level

- Ultrasonic
- dP Bubbler
- Tuning Fork



Temperature

- Thermocouple
- RTD
- Heated Tank



Pressure

- Differential Pressure
- Gauge Pressure



#### **Portable**

 Fully Portable Stackable cases on wheels

#### **Robust Case**

Robust Aluminum case with removable front and back covers

#### Engineering

- Engineering
- PID Tuning
- ESD programmingTesting without
- I esting without stopping a real plant

### Faultfinding

- Faultfinding
- IOP, OOP, ANS+, ANS-
- Network troubleshooting

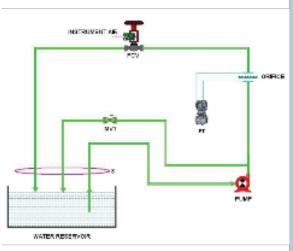
### Commissioning Tool

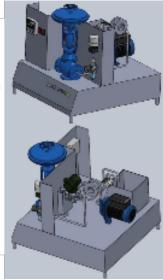
- Combine with a YokoSim
   or PiaB for real time plant commissioning
- HIS Dual Screens
- Includes HIS with dual screens
- All relevant Centum VP licenses

Some alternative solutions have been developed, with smaller size elements, allowing to demonstrate each and every single modules individually and on a classroom table or workshop bench.

- The different proposed modules are:
- Flow Control Trainer Kit
- Level Control Trainer Kit
- Pressure Control Trainer Kit
- Temperature Control Trainer Kit
- Cascade Control Trainer Kit
- Study of I/P Converter & P/I Converter
- Control Valve Characteristics

Optionally these simulators can be connected with Control System such as DCS, PLC or any other SCADA.



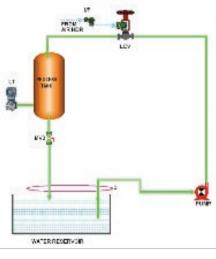


#### Flow Control Experiments:

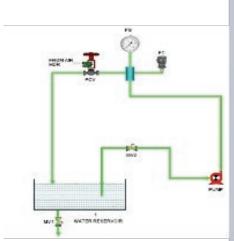
- Study of Valve Flow Measurement
- Study of Control Valve Operation
- Study of DP Transmitter Calibration
- Study of Controller PID Tuning
- Study of Modbus Communication

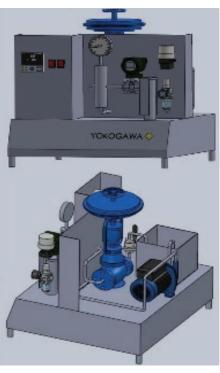
#### **Level Controls Experiments:**

- Study of Level Measurement
- Study of Control Valve Operation
- Study of Level Transmitter Calibration
- Study of Controller PID Tuning
- Study of Modbus Communication
- Study of ON/Off Controller
- Study of Closed Loop method







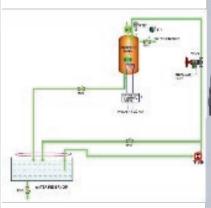


#### **Pressure Control Experiments:**

- Study of Pressure Measurement
- Study of Control Valve Operation
- Study of Pressure Transmitter Calibration
- Study of Controller PID Tuning
- Study of Modbus Communication
- Study of ON/Off Controller
- Study of Closed Loop method

#### **Temperature Control Experiments:**

- Study of Temperature measurement
- Study of Temperature Transmitter Calibration
- Study of Controller PID Tuning
- Study of Modbus Communication
- Study of ON/Off Controller
- Study of Closed Loop method





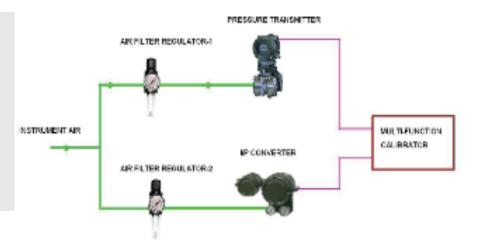


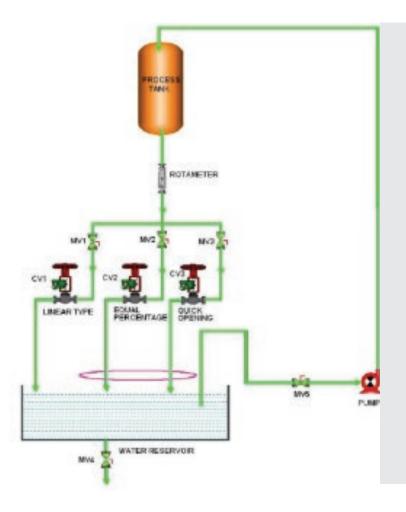
#### **Cascade Control Experiments:**

- Study of Cascade Control Measurement
- Study of Flow, Level and Cascade Control Loop
- Study of Control Valve Operation
- Study of DP Transmitter Calibration
- Study of Controller PID Tuning
- Study of Modbus Communication
- Study of ON/Off Controller
- Study of Closed Loop method

#### I/P & P/I Converters Experiments:

- I/P Converter Working Principle & Calibration
- P/I Converter Working Principle & Calibration
- Digital Calibrator Working & operation





#### **Control Valves Experiments:**

- Study of Valve Flow Characteristics
- Study of Valve Positioner
- Study of inherent Characteristics
- Study of Hysteresis of Control Valve



### **Training Simulators**

In our industrial world where risks are obvious, the professional associations have defined and imposed clear rules and procedures, particularly in training, by introducing and enhancing the utilization of simulator training as an essential training component, in order to create some reflex reactions and eliminate potential dangerous initiatives.

Abnormal Situation Management Consortium statistics estimate that more than one third of the financial losses in the US Chemical Industry are due to human error and insufficient knowledge.

International Atomic Engineering Section report in 2004 also states that: "Safety analysis and operational experience consistently indicate that human error is the greatest contributor to the risk of a severe accident in a nuclear power plant".

And in Civil aviation, it is said that Human error is the biggest obstacle to 100% flight safety.

Wrong actions performed by operators remain a major risk and it has been shown that, most of the non compliant behaviors can be explained by:

- Deficient procedures
- Complicated or ill-defined procedures
- Operators experiences that lead them to believe that their own way of operating the plant is safer, more economical or more efficient that stared in the procedure.

OTS will allow increasing the level of understanding of the operators and revisiting the procedures, for instance by dividing them into several steps.

### Globally, the risk of human error gets reduced by extensive use of OTS.

In this view, the primary objectives of OTS are:

- To provide the plant operational staff with practical experience on how to operate complex plant process systems in various situations. These include:
  - Normal operations at different throughputs and feeds
  - Plant malfunctions and upsets
  - · Normal startups and shutdowns of

the process units

- Emergency shutdowns
- Recovery form various malfunctions and upsets
- To assess the performance level of the trainees

Operator Training System (OTS) provides a virtual plant on computer, allowing plant operators to train in plant operations ahead of plant start-up and throughout plant lifecycle. OTS enables the plant operators to gain experience in an off-line, non-intrusive environment without any damage on the actual plant, for both inexperienced and experienced plant operators.

### OmegaLand OTS & MIRROR PLANT



With more than 200 systems in Oil and Gas, Refining, Petrochemical, Chemical and Power industries distributed worldwide, **OmegaLand high fidelity OTS** is one of the leading OTS solution in such industries.

The OmegaLand high fidelity OTS reproduces actual plant behaviors, accurately giving the ability to provide realistic operations training. The identical DCS, SIS, and graphical user interface gives the ability to provide realistic operation training environment. High fidelity plant models built for OTSs are

able to be leveraged to other purposes throughout the plant lifecycle.

MIRROR PLANT is a solution based on OmegaLand technology and is able to leverage OTS models for the operation phase. As MIRROR PLANT constantly synchronizes with the plant control system, it is able to predict plant internal states and plant responses, contributing to optimized plant operations.

#### **OTS** Benefits

- Training on a virtual plant which has the identical look and feel, reproducing realistic plant behaviors with identical DCS and SIS operational environments
- Gaining plant start-up, shut-down and normal plant operations
- Acquiring how to respond against equipment malfunctions and other emergency situations (early recognition, avoidance, and corrective action)
- Capturing and transferring plant operation knowledge among plant operators
- Increasing process knowledge and confidence in operators (experienced and inexperienced) for better plant operations
- Ability to leverage OTS assets over the plant lifecycle, from the design phase to the operation phase. The OTS assets can contribute to reduce design time and cost, evaluate and improve control strategy, and improve productivity and efficiency



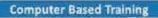
#### **Advanced Solutions:**

**OTS Enterprise** Solution provides standard emulated PCS functions through the WEB or over the COMPANY network where applicable.

#### Objective:

- Training for Company wide users.
- Training is conducted via the corporate intranet
- Trainees self e-learning training course

- Network based Instructorless and trainee self training/evaluation
- Network based remote interactive training
- Concurrent multi-user multi-simulation training
- Utilizing intranet with a SCORM conformant link to the Company's Corporate Learning Management System (LMS)





A trainee can learn a process unit by him/herself using scenarios.

At own desk or at each control room



Mentored training

Trainees
lesson ar over their

Trainees can prepare their lesson and also look back over their lesson with a mentor.

At each control room



#### Instructor-Led Training

Trainee can perform an application uniquely and also several trainees can perform it together.



At a training center

#### Instructor-Led Online Training

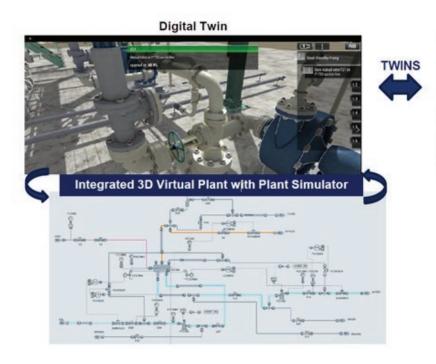


Instructor can monitor trainee's learning progress and send messages remotely.



At own desk or at each control room

#### The Digital Twin:



Real/Physical Plant

**The Digital Twin** replicates the plant with a high level of fidelity.

#### It offers:

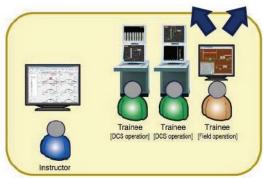
- Realistic 3D virtual environment.
- Realistic and accurate plant process simulation (Through Omegaland OTS or KBC Petro-Sim)
- Training and Test mode

With its capacity of storing employee's training records, it is the perfect tool to train, assess and qualify the technical plant personnel.

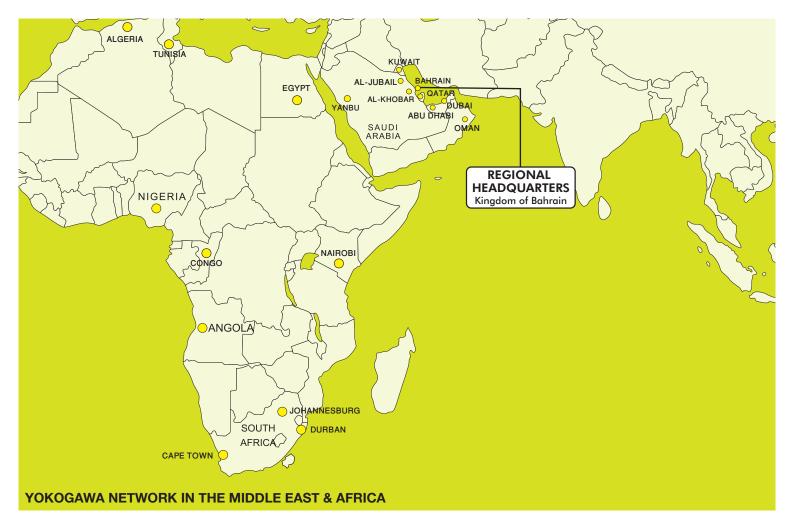












#### **BAHRAIN**

Yokogawa Middle East & Africa B.S.C. (c) P.O. Box 10070, Manama Building 577, Road 2516, Busaiteen 225, Muharraq, Kingdom of Bahrain Tel: +973 17358100, Fax: +973 17336100 Email: info@yokogawa.com

Yokogawa Engineering Bahrain (S.P.C) Building 1318, Road 1516, Block 115 AlHidd, BIIP, Kingdom of Bahrain Tel: +973 17707800, Fax: +973 17701870 E-mail: enquiry.yeb@yokogawa.com

#### **SAUDI ARABIA**

Yokogawa Saudi Arabia Company- Dhahran Ibn Rushd Street, Dhahran Techno Valley, Dhahran P.O. Box 3368, Al-Khobar 31952 Kingdom of Saudi Arabia Tel: +966 (13) 331-9600, Fax: +966 (13) 330-1444 Email: yokogawa.dhahran@yokogawa.com

Yokogawa Services Saudi Arabia -Jubail P.O.Box 10318, Jubail 31961 Jubail Industrial City, Industrial Support Area No. 1, Road No. 114 Kingdom of Saudi Arabia Tel: +966 (13) 3429600 Fax: +966 (13) 3407222 Email: yokogawa.jubail@yokogawa.com

Yokogawa Services Saudi Arabia -Yanbu Branch Office Al-Wady Street, Radwa 8, Block 6 Ali Shar Building, First Floor, Royal Commission, Yanbu Industrial City, P.O. Box 30377 Kingdom of Saudi Arabia Tel: +966 (14) 3928882 / 3928883 Fax: +966 (14) 3928881 Email: yokogawa.yanbu@yokogawa.com

#### **UNITED ARAB EMIRATES**

Yokogawa UAE Industry – Sole Proprietorship L.L.C ICAD -1, WH-24J5 - B4- 44,45,46-1, P.O.Box 112873 Mussafah, Abu Dhabi, UAE Tel: +971 (2) 5101888, Fax: +971 (2) 5507455 Email: yokogawa.abudhabi@yokogawa.com

Yokogawa Engineering Middle East & Africa FZE-Dubai P.O.Box 18112, Jebel Ali Free Zone, Bldg No. LIU FZS1-BH03, Free South Zone Dubai, UAE Tel: +971 (4) 8049100, Fax: +971 (4) 8860844 Email: enquiry.yeu@yokogawa.com

#### QATAR

Yokogawa Middle East & Africa B.S.C. (c)
Al Matar Commercial Center, 1st Floor, Office Nos. 106
& 107, Building No: 63, Zone No: 45, Al Matar Street
(Airport Road), P.O. Box 24281, Doha, Qatar
Tel: +974 44452444, Fax: +974 44313717
Email: yokogawa.qatar@yokogawa.com

#### OMAN

Yokogawa Oman Limited L.L.C. Building 232, Plot No 785, Complex 252 Ghala Heights District, P.O. Box 2667 Muscat, Sultanate of Oman Tel: +968 2423 0400 Fax: +968 2423 0401 Email: yokogawa.oman@yokogawa.com

#### KUWAIT

Yokogawa Middle East & Africa B.S.C. (c) Shuaiba Industrial Area-East Road #100, Block #8, Kuwait, Tel: +965 22 28 9888, Mobile: +965 94 91 1105, Fax: +965 23 26 0424 Email: yokogawa.kuwait@yokogawa.com

#### **EGYPT**

Yokogawa Middle East & Africa B.S.C. (c) 16A St. No. 300 New Maadi, Cairo, Egypt Tel: +202 27055222 Mobile: +201 001446944, Fax: +202 27055444

Email: yokogawa.egypt@yokogawa.com

#### **SOUTH AFRICA**

Yokogawa South Africa (Pty) Ltd.
Yokogawa Anglophone African Region (Pty) Ltd.
Block C. Cresta, Junction, Corner Bayers Naude

Block C, Cresta Junction, Corner Beyers Naude Drive and Judges Avenue Cresta, Johannesburg PostNet Suite #222, Private Bag X1, Northcliff, 2115, South Africa

Tel: +27 11 831 6300 / +27 11 057 8100

Fax: +27 86 411 8144 Email: info@yokogawa.com

#### **NIGERIA**

Yokogawa Nigeria Limited

Km 16, Ikorodu Expressway, Ojota Lagos, Nigeria

Tel: +234(0)17009900/+234-(0) 13423447

Email: info@yokogawa.com

#### ANGOLA

Yokogawa Africa Holding B.V. "Sucursal de Angola"

Expressa Way Km 6, Towards Benfica-Cacuaco Shop #2-Phase 2 Benfica, Belas Luanda, República de Angola Tel: +244 222 039 668

Tel: +244 222 039 668 Fax: +244 222 039 679

Email: information@yokogawa.com

#### French Speaking Africa:

Tel: 973 17 358100 Fax: 973 17 336100 Mobile: +213 778 185 202 / +33 672 78 6128 Email: Info.Maghreb@bh.yokogawa.com / congoarea@yokogawa.com

#### Eastern Africa:

Kenya Landline: +254 20 5234 602 Kenya Mobile: +254 721 449 633 Email: herat.shah@.yokogawa.com

For customer feedback and complaints, please contact: qltymgr@yokogawa.com

