Training Title

ADVANCED GC PROCESS

Training Duration

5 days

Training Venue and Dates

Advanced GC Process	*5*	*03-07 February, 2025*	*$5,500*	*Dubai, UAE*

Trainings will be conducted in any of the 4 or 5 star hotels.

Training Fees

- ***5.500 US$ per participant for Public Training includes Materials/Handouts, tea/coffee breaks, refreshments & Lunch.***

Training Certificate

Prolific Consultants FZE Certificate of Course Completion will be issued to all attendees.

COURSE OVERVIEW

COURSE INTRODUCTION:

The control of processes in today's oil, gas and chemicals industries requires accurate knowledge of process conditions and this in turn means accurate measurement of those conditions. Without measurement there can be no control and no information as to the state of the process.

A greater understanding of the measuring equipment and the instruments can improve the performance of the operator and this in turn will improve plant performance. Better knowledge of how equipment is selected and how it is constructed and how it works also helps an operator to identify the cause of problems and prevent there

Recurrence, Hence, the economic benefits of properly trained and informed operators can be readily quantified.
The course is designed to provide an overview of industrial measurement and control which includes process measurement (Flow, Level, Pressure and Temperature), transmitter, controller, process control (basic control theory, closed loop, Process dynamic, time constant, process gain, PID Control , practical logic and control system hardware, (UPS, DCS, PLC, and SCADA), alarm and trip system.

The course covers the major components and subsystems of a gas chromatographic system and its accessories, including inlets, columns and detectors. It presents operating principles, set-up procedures, and failure modes for each along with practical examples

The course will cover also the use of best practices in troubleshooting and diagnose of equipment operation problem.

COURSE OBJECTIVES

By the end of the course, participants who are almost all operatorI and OperatorII in production operations, should become able to:

- *Explain theory behind measurement and control skills*
- *Describe the common control loop: elements, types of signals, response time, etc*
- *Discuss logic in DCS operation, alarm and shutdown signals*
- *Diagnose equipment operations problems*
- *Use best practices in troubleshooting 'By the end of the course, participants*
- *who are almost all operatorI and OperatorII, are expected to be able to:*
- *Explains GC control philosophy*
- **Explain theory behind measurement and control skills*
- *Describe the common control loop: elements, types of signals, response time, etc*
- *Discuss logic in DCS operation, alarm and shutdown signals*
- *Discuss key elements of an emergency response action plan*
- *The impact of modern instrumentation*
- *Signal Category, Standard Ranges, Linearity*
- *The major technologies used in the measurement of temperature, pressure, level and flow etc.*
- *theory behind measurement and control skills*
- *the common control loop: elements, types of signals, response time, etc*
- *logic in DCS operation, alarm and shutdown signals*
- *PLC, UPS and SCADA*
- *Diagnose equipment operations problems*
- *GC control philosophy, Principle of chromatography, Calibration and signal processing*
- *The key elements of an emergency response action plan*
- *Identify different types of industrial analytical measuring instruments*
- *Troubleshoot and identify problems with instrumentation systems and equipment*
- *The fundamentals of process control*
- *The effects of proportional, integral and derivative control*
- *The process loops and how this can be applied to optimize process control.*
- *To give an understanding of the principles and practice of the following elements:*
- *Flow Measurement*
- *level Measurement,*
- *Pressure Measurement*
- *Temperature Measurement,*
- *Control Valves*
- *To allow the delegate to become familiar and confident with a range of measurement techniques*

- *To understand the concepts of Process Control and acquire the knowledge relating to the characteristics and properties of a process variable being measured*
- *To disseminate and share experience and knowledge with other delegates through open session discussions hence broadening the*
- *knowledge base of all*
- *To become familiar and knowledgeable with PID control and develop the*
- *ability to 'tune' a process control system using PID control*
- *To have the confidence and knowledge to apply the above techniques*
- *and principles to solve an unfamiliar and bespoke measurement situation in the workplace*

TRAINING METHODOLOGY:

A highly interactive combination of lectures and discussion sessions will be managed to maximize the amount and quality of information and knowledge transfer. The sessions will start by raising the most relevant questions, and motivate everybody find the right answers. You will also be encouraged to raise your own questions and to share in the development of the right answers using your own analysis and experiences. Tests of multiple-choice type will be made available on daily basis to examine the effectiveness of delivering the course.
Very useful Course Materials will be given.

SUITABLE FOR:

- *Operator I*
- *Operator II*

COURSE OUTLINE

INTRODUCTION TO INSTRUMENTATION AND CONTROL SYSTEM

- *Measured and controlled variables*
- *Performance terms and specifications*
- *Measurement terminology*
- *P&ID symbols*

FLOW MEASUREMENT

- *Basic fluid properties*
- *Reynolds number*
- *Flow measurement and rangeability*
- *Flow measuring sensors types*
- *Differential pressure flowmeters*
- *Mechanical flowmeters*
- *Electronic flowmeters*
- *Mass flow-meters, Coriolis.*

LEVEL MEASUREMENT

- ***Basic principles***
- ***Float systems***
- ***Displacement systems***
- ***Conductive level detection***
- ***Ultrasonic level measurement***
- ***Radar gauging***

PRESSURE MEASUREMENT

- ***Basic principles***
- ***Bourdon tubes***
- ***Diaphragm elements***
- ***Electrical displacement sensors***

TEMPERATURE MEASUREMENT

- ***Basic principles***
- ***Thermocouples***
- ***Resistance thermometry***
- ***Thermistors***
- ***Radiation thermometry***

FUNDAMENTALS OF PROCESS CONTROL

- ***ON/OFF control***
- ***Proportional control***
- ***Proportional offset***
- ***Integral action***
- ***Integral windup***
- ***Stability***
- ***Derivative action***
- ***PID control***
- ***Control algorithms***
- ***Load disturbances and offset***

FUNDAMENTALS OF TUNING

- ***Basic principles***
- ***Open loop reaction curve method (Ziegler-Nichols)***
- ***Default and typical settings***
- ***Closed loop continuous cycling method (Ziegler-Nichols)***

DAY 2

BASIC VALVE THEORY

- ***Valve types***
- ***Control valve characterization***

- *Defining the valve flow coefficient, Cv*
- *Inherent characteristics*
- *Valve testing and diagnostics*

DCS, PLC & SCADA

- *Introduction*
- *System architecture*
- *Major component*
- *Controllers*
- *I/O System*
- *Master Unit*
- *Remote Terminal Unit (RTU)*
- *Communication*
- *System hardware and software*
- *Human Machine Interface (HMI)*
- *Operator console*
- *Types of display, Trends, Alarms and overview.*
- *System integration*
- *Troubleshooting from operation prospective.*

GAS CHROMATOGRAPH

INTRODUCTION
BASIC CHROMATOGRAPHIC INSTRUMENTATION
COMPONENTS OF A PROCESS GAS CHROMATOGRAPH

- *Analyzer*
- *Oven*
- *Valves*
  - ❖ *Rotary Valve*
  - ❖ *Sliding Plate*
  - ❖ *Diaphragm*
- *Columns*
  - ❖ *Packed Columns*
  - ❖ *WCOT (Capillary) Columns*

COLUMN AND VALVE CONFIGURATIONS

- *Hardware*
  - ❖ *Sample Injection*
  - ❖ *Backflush*
  - ❖ *Heart-cutting*

DETECTORS

- *Thermal Conductivity Detector*
- *Flame Ionization Detector*

- *Flame Photometric Detector*
- *Pulsed Flame Photometric Detector*
- *Orifice-Capillary Detector*
- *Photoionization Detector*
- *Electron Capture Detector*
- *Discharge Ionization Detectors*

CARRIER GAS FLOW CONTROL

- *PROGRAMMER-CONTROLLER*
- *Programmer*
- *Peak Processor*
- *Data Acquisition*
  - ❖ *Input–Output*
- *Communication*
- *Operator Interface*
- *Alarms and Diagnostics*
- *Quantitative*

SAMPLE HANDLING

- *Sample Probe*
- *Sample Transport*
- *Sample Conditioning*
- *Multistream Analysis*
- *Sample Disposal*

INSTALLATION AND MAINTENANCE

DAY 3

WASTEWATER TREATMENT CONTROLS

Introduction

- *General Considerations*
- *Industrialwastewater treatment*

Chemical Oxidation

- *Cyanide Destruction Process*
  - ❖ *Batch Cyanide Control*
  - ❖ *Continuous Cyanide Control*
  - ❖ *Chlorinator, Sulfonator, and other Controls*
  - ❖ *Cyanide Destruction by Ozonation*

CHEMICAL REDUCTION

- *Reduction of Hexavalent Chromium*
- *Other Reduction Processes*

NEUTRALIZATION CONTROLS

- ***Equalization Tanks***
  - ***Valve Rangeability Required***
  - ***Sequenced Valves***
  - ***Reaction Rates and Tank Sizing***
- ***Single Reagent Control***
- ***Two Reagent Control Systems***
- ***Ratio Control***
- ***Cascade Control***
- ***Feedforward Control***

Flared Gas Recovery System

- ***Introduction***
- ***Schematic of Flare Gas Recovery System***

Case Studies, Discussions, Last Day Review & Assessments will be carried out.

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