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**Advanced**

# Process Control & Loop Tuning

(Incorporating common instrumentation, control valves and loop tuning)

**13 – 16 April 2014 | Al-Khobar, Saudi Arabia**

## Trainer Profile

**Dr. Rodney Jacobs** is a Senior Engineer with over 27 years of experience with various types of Electrical Instrumentation. He has been a world class trainer for over 15 years. In his vast training experience, he has provided training programs in United States of America, Canada, England, Wales, Scotland, Ireland, the United Arab Emirates, Bahrain, Qatar, Malaysia, Vietnam, Australia, New Zealand etc in areas such as:

- Installation, Calibration and Maintenance of Electronic Equipment
- Practical SCADA and Telemetry
- PLCs and SCADA Systems
- Analytical Instrumentation
- Advanced Process Control
- Practical PLCs for Automation
- Practical Data Communications
- Troubleshooting of Data Acquisition and SCADA Systems

His Clients include a number of top Petrochemical and Oil & Gas companies within the Middle East and African Region. He is also a senior member with some of the most reputed technical organizations such as: Institute for Professional Engineering Technologies, South Africa's Institute of Measurement and Control, Engineering Council of South African (ECSA) and so on.

## Introduction

The course is concerned with getting a better understanding of, and enhancing your knowledge on a complete process, and the general instrumentation associated with that process. This includes the major areas of measurement, including level, pressure, temperature and flow. The workshop also considers control valves commonly used in industry, and delves into communication strategies as well as future directions (such as fieldbus and Hart) that are coming to the fore.

Process control is a multi-pronged approach. One needs to fully understand the primary measuring devices, and how they interact with the final control elements. But it goes a lot further than this. You also need a well-tuned controller, to ensure that the process variables (PVs) you measure are able to control your plant in an effective and efficient manner.

The workshop has been designed for anyone who comes into contact with control systems, and who would either like to enhance their knowledge, or brush up on basic skills that have become rusty over the years. The course will focus on applications and practical examples raised by the delegates, and will be specific to the Oil and Gas, as well as Petrochemical industries. Preferences will be given to process examples raised by the delegates, themselves, as long as the delegates are able to provide background information on specific processes and areas of focus.

**Booking line:** Tel: + 91 9738813015 | Fax: + 91 80 4900 5099

**email:** john.sebastian@fleminggulf.com | www.fleminggulf.com



## Training Objectives

Delegates will gain an appreciation of the following:

- How processes work
- Types of processes
- Instrumentation basics
- Pressure measurement
- Level measurement
- Temperature measurement
- Flow measurement
- Control valves
- Hart and Fieldbus strategies
- Serial data communication
- Control philosophy and terminology
- Open loop tuning methods
- Closed loop tuning methods
- Tuning methods that are NOT formulae dependant
- Feedback, feed forward and Cascade control
- Making the most out of controller features that are offered

## Training Methodology

This course has been designed to have a roughly 50-50 split between theoretical and practical sessions. Modern training techniques are utilised, and delegates are encouraged to use this opportunity to learn as much as possible, in an environment conducive to the sharing of knowledge. The material is of such a nature, that discussions flow freely, and questions are encouraged, at any time. Every major section of the work is followed by a practical session, which may be found to be useful in the working environment.

Delegates will be provided with a 21-day time-limited copy of a simulation package, which can be used to hone skills acquired during the workshop. A full package will NOT be included in the course, as the simulation package will not be of benefit in the working place afterwards, due to the nature and uniqueness of all processes. However, should delegates still want to purchase their own packages, they can do this on their own, and information will be shared of how to go about this. At the end of each day, an additional wrap-up session is included, to ensure full understanding of all course material covered. All theoretical exercises will be tailor-made to ensure that they tie in, with the line of work of the majority of the delegates present, or based on participant consensus.



## Who Should Attend?

**Managers, Instrumentation and Process Engineers, Technicians and any other staff members that are responsible for control systems. In particular, those that are involved in the selection, setting up and tuning of equipment of this nature. The workshop is also suitable for engineering disciplines that come into contact with control systems, but that merely need to be familiar with the methodologies, in order to communicate on an equal footing with control personnel.**

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# Seminar Outline

DELEGATES ARE ENCOURAGED TO BRING LAPTOP COMPUTERS

Computer software will be available to delegates. The loop-tuning software will be limited for a 21-day free use period, after which it will expire. It will be suitable ONLY for training purposes, as every process is unique, and needs to be dealt with individually. Valve sizing software will also be supplied. However, this software will not have an expiry date associated with it.

## Program Outline

### DAY 1

- Understanding instrumentation principles, and the various definitions and processes that come into play

**Practical session #1** – Mathematically manipulating mA, voltage, and percentage values that will be encountered in control processes.

- Understanding the different types of processes you may encounter

**Practical session #2** – SP or PV Tracking

- Pressure measurements (and the clarification of atmospheric, gauge and absolute pressure)

**Practical session #3** – Calculating an assortment of pressures, as well as using conversion tables

- Understanding feedback or closed loop control

**Practical session #4** – Calculating the Gain of a Process

- Level measurements

**Practical session #5** – Calculating the values required for measuring levels inside a tank open to atmosphere, as well as wet-leg and dry-leg DP cell calculations

**END OF DAY DISCUSSION**

### DAY 2

- Temperature measurements

**Practical session #6** – Making use of thermocouple and RTD tables, and calculating rough RTD values, out in the field

- Flow Measurement

**Practical session #7** – An assortment of flow calculations, ranging from Reynolds numbers, to open channel measurements

- PROPORTIONAL BAND PERCENTAGE / GAIN control fundamentals

**Practical session #8** – Implementing the gain or proportional band actions of a controller

- INTEGRAL / RESET control fundamentals

**Practical session #9** – Understanding the Integral or reset action of a controller

- DERIVATIVE / RATE control fundamentals

**Practical session #10** – Understanding the derivative or rate action of a controller

- Considering the PID combinations that can be used, and when to implement which strategy

**Practical session #11** – Selecting the PID right strategy, for different processes

- Control valves

**Practical session #12** – Sizing a control valve, using valve-sizing software

**END OF DAY DISCUSSION**

### DAY 3

- The essence of SELF-REGULATING and INTEGRATING processes

**Practical session #13** – Understanding the difference between equal percentage and linear inherent strategies, and how this affects the installed characteristics of a valve

- Open loop tuning strategies

**Practical session #14** – Implementing the Ziegler-Nichols open loop tuning method

- Closed Loop tuning strategies

**Practical session #15** – Implementing the Ziegler-Nichols open loop tuning method

- TRIAL and ERROR tuning strategies, and when and how to implement them

**Practical session #16** – Implementing an OPEN LOOP tuning method, without having to revert to formulae, methodologies and procedures

- Serial data communication

**Practical session #17** – Implementing a CLOSED LOOP tuning method, without having to revert to formulae, methodologies and procedures

- Valve problems to consider, when dealing with control loops

**Practical session #18** – Understanding Dealing with a sticky control valve, and the effects it can have on your process. Leading on from this, getting the benefit of a valve positioner

**END OF DAY DISCUSSION**

### DAY 4

- Hart, Fieldbus and future technologies

**Practical session #19** – Calculating cable lengths, for a fieldbus application

- Effectively understanding DEAD TIME, and knowing how to deal with this effectively

**Practical session #20** – How to tune a process that has short to medium (i.e. marginal to moderate) dead-time characteristics, using just PI settings

- Understanding CASCADE loops, and deciding when to implement them

**Practical session #21** – Working with a cascade loop

- Understanding FEED FORWARD loops, and the advantages and disadvantages of implementing them

**Practical session #22** – Dealing with noise and aliasing errors

**END OF DAY DISCUSSION**

**Final theoretical and practical assessment, testing delegates on theoretical knowledge acquired over the four days.**



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The course is for  
**LIMITED SEATS**  
\* BOOK YOUR SEAT  
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## Training Fee

☐ **USD 3500**  
*per delegate*

19 USD administration charge will be applied  
Payment is required within 5 working days

## Registration Details

Please write in CAPITAL LETTERS

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Conference fee does not include travel costs, hotel accommodation, transfers or insurance.

Any disputes arising under or in connection with this registration form shall be settled before the competent Court in United Arab Emirates.

### Hotel Accommodation:

Overnight accommodation is not included in the registration fee. A reduced rate will be available at the conference hotel. Booking form will be confirmed, but not later then one month prior to the event.