ANALYZE CONTROL SYSTEM FUNCTIONS, COORDINATE REMEDIAL ACTIONS

ICE117
Instrumentation & Control Engineering

TRAINIT ACADEMY

COURSE TITLE

ANALYZE CONTROL SYSTEM FUNCTIONS, COORDINATE REMEDIAL ACTIONS

COURSE DATE/ VENUE

12th-16th May 25'

London, UK

COURSE REFERENCE

ICE117

COURSE DURATION

05 Days

DISCIPLINE

Instrumentations & Control Engineering

COURSE INTRODUCTION

This course covers all the essentials of process control and tools to optimize the operation of your plant and process, and regards the process, from the primary measuring device, through the controller, right down to the final control element as a chain with important links. Controllers need to be carefully matched to the process to work optimally; this matching procedure is called tuning. Controllers that are not correctly configured and tuned will not perform optimally and will not reduce variability in the process as they should.

It is aimed at engineers and technicians & controllers who wish to have a clear, practical understanding of the essentials of instrumentation and final control elements typically found in common loops. It incorporates loop tuning, as well as how to optimize the operation of their particular plant or process. Mathematical theory has been kept to a minimum with the emphasis throughout on practical applications and useful information.

But it does not stop there. Advanced Process Control (APC) is an essential part of the modern plant.

Small differences in process parameters can have large effects on profitability; get it right and profits continue to grow; get it wrong and there are major losses. Many applications of APC have pay back times well below one year. APC does require a detailed knowledge of the plant to design a working system and continual follow up along the life of the plant to ensure it is working optimally. Cascade Control, Feed forward control, control with long dead times, IMC and MPC are all considered, with respect to different applications. At the end of this course you will have the skills to troubleshoot / tune / deal with / understand a wide variety of process loops.

A control system for an engine comprises a fault determination module and a remedial action control module. The fault determination module generates a fault signal after detecting an infrastructure fault. The remedial action control module directs a throttle valve of the engine to a default position after receiving the fault signal, determines when the throttle valve is moving to the default position, and directs engine shutdown when the throttle valve is not moving to the default position.

COURSE OBJECTIVE

Upon successful completion of this course, the delegates will be able to:

- ✓ Implement an instrument and wiring number system
- ✓ Identify Pressure sources and the basic terms of pressure measurement
- ✓ Discuss about Level measurement and the basics associated with it
- ✓ Discuss about Temperature measurement and the various associated transducers
- ✓ Recognize Flow measurement techniques
- ✓ Identify Control valve principles and common valve types
- ✓ Discuss about New technologies such as smart instrumentation and fieldbus
- ✓ Integrate a complete system (considering instrumentation and total errors) as well as selection criteria, commissioning and testing
- ✓ Explain the use of PLCs in industrial applications

- ✓ Discuss about Overview of HMI, SCADA and DCS systems
- ✓ Specify PLC hardware and installation criteria
- ✓ Describe PLC software structure, Ladder Logic, Function Block System (FBS), Instruction List (IL) as per IEC 1131.
- ✓ Write medium level PLC programs
- ✓ Troubleshoot a typical PLC system
- ✓ Specify DCS hardware components
- ✓ Explain DCS functions and features
- ✓ Explain how DCS configured
- ✓ Discuss the fundamentals of SCADA systems
- ✓ Discuss about the key industrial communication networks and protocols
- ✓ Apply SCADA System security

COURSE AUDIENCE

This course focuses on analysing, functions, calibration and troubleshooting of different systems for Engineers and Technicians.

- Instrumentation Maintenance Technicians
- Electrical Engineers and Technicians
- Plant Operations Engineers, Supervisors and Operators
- Maintenance Supervisors

COURSE CONTENT

Chapter 1

Introduction to Instrumentation & Control System

- This gives an overview of measurement terms and concepts. A review is given of process and instrumentation diagram symbols and places instrumentation and valves in the context of a complete control system.

Chapter 2

Flow Measurement

- Initially the basic principles of flow measurement are discussed and then each technique is examined. This ranges from differential pressure flowmeters to mass flow meters. The installation aspects are also reviewed.

Chapter 3

Level Measurement

- The principles of level measurement are reviewed and the various techniques examined ranging from simple sight glasses to density measurement. Installation considerations are again discussed.

Chapter 4

Temperature Measurement

- The principles of temperature measurement are discussed and the various transducers examined ranging from thermocouples to non-contact pyrometers. Installation and impact on the overall loop are also briefly discussed.

Chapter 5

Pressure Measurement

- This section commences with a review of the basic terms of pressure measurement and moves onto pressure sources. The various pressure transducers and elements are discussed with reference to installation considerations.

Chapter 6

Control Valves

- The principles of control valves are initially reviewed. Various types of valves ranging from sliding stem valves to rotary valves are also discussed. Control valve selection and sizing, characteristics and trim are also examined. The important issues of cavitation and noise are reviewed. Installation considerations are noted. In addition to safety Relief valves, types, valve components, operations and testing.

Chapter 7

Process control - Basic Control philosophy

- This gives an overview and describes process control terms and definition, process dynamic characteristics in terms of time constant and transportation time lags, process gain and stability, control system classifications and actions. Functions of automatic control and its elements, feedback & feed forward control and cascade control.

Chapter 8

Fundamental of process control

- This explains the different control modes, on-off control, Proportional (p), Integral (I), Integral windup, Derivative (D) and PID CONTROL, PID Algorithms, Ideal, series and parallel algorithms, load disturbances, process control loops (single, multi-variables, cascade, feed-forward, batch and ratio control.

Chapter 9

Process control loop examples

- Examples for single control loop, feedback loop, multivariable loop, feedforward, both manual and automatic, a combination of feedforward plus feedback , Ratio control as well as cascade control loop were given

Chapter 10

Tuning PID Controller

- Objectives of tuning, methods of tuning, Reaction curve method (Ziegler–Nichols), The procedure to obtain an open loop reaction curve Recording the PV, open loop tuning method , Ziegler–Nichols PI control algorithm, Ziegler–Nichols PID control algorithm, Examples of Ziegler–Nichols P, I and D open loop control algorithms, Continuous cycling method (Ziegler–Nichols) and self-tuning controller.

COURSE CERTIFICATE

TRAINIT ACADEMY will award an internationally recognized certificate(s) for each delegate on completion of training.

COURSE FEES

£5,500per Delegate. This rate includes participant's manual, Hand-Outs, buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

COURSE METHODOLOGY

The training course will be highly participatory and the course leader will present, guide and facilitate learning, using a range of methods including formal presentation, discussions, sector-specific case studies and exercises. Above all, the course leader will make extensive use of real-life case examples in which he has been personally involved. 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.

- 30% Lectures
- 30% Workshops and work presentation
- 20% Case studies & Practical Exercises
- 10% Role Play
- 10% Videos, Software or Simulators (as applicable) & General Discussions