Training Title

PREVENTIVE, PREDICTIVE & CORRECTIVE MAINTENANCE OF FIELD INSTRUMENTS

Training Duration

5 days

Training Venue and Dates

REF IC075	Preventive, Predictive & Corrective Maintenance of Field Instruments	05	21 – 25 Apr. 2025	$5,500	Dubai, UAE

In any of the 4 or 5-star hotels. The exact venue will be informed once finalized.

Training Fees

- **$5,500 per participant for Public Training. Fees Includes Course Materials/ Handouts, Tea/Coffee, refreshments & Lunch**

Training Certificate

Define Management Consultancy & Training Certificate of course completion will be issued to all attendees.

TRAINING OVERVIEW

TRAINING DESCRIPTION

Corrective, Preventive, Predictive and operational maintenance must be performed by qualified and experienced I&C maintenance personnel, because of the complexity of existing control systems that utilize many fields of expertise, several maintenance backgrounds are required to maintain, troubleshoot and calibrate pneumatic, electrical, electronic and computerized instruments and systems. The systems approach, which looks at the whole picture to gain an understanding of the process, is the special attribute of I& C maintenance personnel.

Good maintenance saves money. With the equipment working properly, the process quality and production will be high. When equipment fails, production normally stops, and many production personnel cannot do their jobs. With good maintenance management, spare parts are available quickly to reduce the mean time to repair (MTTR).

When the equipment is repaired quickly, the mean time between failures (MTBF) is extended. The proper frequencies of preventive maintenance should provide less downtime and the down time that occurs can be scheduled. We can become pro-active instead of reactive.

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TRAINING OBJECTIVES

At the end of this course, participants will be able to:

- **Employ proper safety practices during installation, calibration, and maintenance procedures**
- **Describe the difference between maintenance and troubleshooting**
- **Apply Different types of maintenance.**
- **Select and operate test equipment to measure electrical properties and calibrate instruments**
- **Calibrate electronic transmitters and controllers**
- **Install electronic instruments using manufacturer's guidelines and ISA's recommended practices and procedures**
- **Use piping and instrumentation diagrams (P&IDs) and wiring, schematic, and installation detail drawings to install, calibrate, maintain and verify proper operation of instruments.**
- **Describe different types of flowmeter operating principles, installation, calibration and maintenance.**
- **Discuss electrical connections and grounding.**
- **Discuss maintenance engineering.**
- **Describe the operation of various pneumatic devices including bellows, diaphragm, Bourdon tube, flapper/nozzle mechanism, and pressure transmitters**
- **Describe the specific tools used for pneumatic maintenance in a contemporary plant environment**
- **Calibrate a differential pressure (D/P) transmitter for a dip tub application**
- **Discuss the function of a control valve and actuator in a typical loop**
- **Develop a systematic approach to troubleshooting**
- **Verify, locate, and identify performance problems and the causes of the problems**
- **Identify the common causes of sensor, transmitter, controller, and final control element problems**
- **Troubleshoot control systems and documentation control**
- **Compare general troubleshooting procedures for conventional, FIELDBUS, and HARTTM control systems**

WHO SHOULD ATTEND

This course focuses on maintenance, calibration and troubleshooting of different instrumentation devices and systems for Engineers and Technicians.

- **Control and instrumentation**
- **Control system**
- **Electrical installations**
- **Field technical support**
- **Maintenance**
- **Instrumentation Maintenance Technicians**
- **Electrical Engineers and Technicians**
- **Plant Operations Engineers, Supervisors and Operators**
- **Maintenance Supervisors**

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TRAINING METHODOLOGY

The latest educational methods and strategies will be employed. The course is designed to maximize delegate benefit from the outset. Questions are encouraged throughout; this provides opportunities for participants to discuss with the presenter and others specific problems and appropriate solutions. All delegates take a detailed and comprehensive copy of the material presented; therefore, minimal note taking is encouraged to ensure maximum delegate participation and attention. Practical hands-on training ensures knowledge retention.

At the end of the session there will be a question-and-answer session to allow participants enough time to seek answers to grey areas and to seek clarifications to any misconceptions or problems they may have regarding the subject concerned to the course. There will also be some indoor experiential activities to enhance learning.

- **30% Lectures**
- **30% Workshops and work presentation**
- **20% Group Work& Practical Exercises**
- **20% Videos& General Discussions**

COURSE DURATION:

The course duration will be 10 days.

COURSE CONTENTS

Module (01) Introduction

1.1. Overview
1.2. History of Instrumentation and control Maintenance
1.3. Need for Instrumentation and Control Maintenance and Engineering

Module (02) Fundamental Principles

2.1. Overview
2.2. Electronic Field Instrumentation
2.3. Why Maintain
2.4. Maintenance versus Troubleshooting
2.5. Calibration and Reasons to Calibrate
2.6. Troubleshooting
2.7. Basic Troubleshooting Technique
2.8. Designed with maintenance in mind

Module (03) Diagram, Symbols and Specifications

3.1. Overview
3.2. P & ID
3.3. Instrument Loop Diagram
3.4. Logic Diagram
3.5. Specifications

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- 3.6. Instrument Symbols

Module (04) Maintenance Personnel

- 4.1. Overview
- 4.2. Multi-Disciplined
- 4.3. Continuous Training
- 4.4. Training of Maintenance Workers
- 4.5. Multi craft / Multiskilled, Multi-Discipline
- 4.6. Knowledge Factors
- 4.7. Skills
- 4.8. Job Titles and Descriptions

Module (05) Maintenance Management and Engineering

- 5.1. Overview
- 5.2. The Need for Maintenance Management
- 5.3. Maintenance Philosophy
- 5.4. Maintenance Management Organization
- 5.5. Basic Requirement for Maintenance Department
- 5.6. Planning and Scheduling.
- 5.7. Work Order System.
- 5.8. MTTF, MTTR and Availability
- 5.9. Preparing Functional Specifications
- 5.10. Computerized Maintenance Management Systems (CMMS)
- 5.11. Office/Shop Layout
- 5.12. Centralized/Decentralized Shops

Module (06) Pressure and Flow Instruments

- 6.1. Overview
- 6.2. Pressure Transmitters
- 6.3. Differential Pressure Technology
- 6.4. Level Transmitters
- 6.5. Flow Transmitters
- 6.6. Magnetic Flowmeters
- 6.7. Mass Flowmeters
- 6.8. Turbine Flowmeters
- 6.9. Positive Displacement Flowmeters
- 6.10. Ultrasonic Flowmeters

Module (07) Maintenance Engineering

- 7.1. Overview
- 7.2. Engineering Assistance
- 7.3. Maintenance involvement in new Project
- 7.4. Successful Maintenance
- 7.5. The High Maintenance System

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7.6. Documentation Control
7.7. Alternative Methods of Maintenance
7.8. Service / Contract Maintenance
7.9. In house Maintenance versus Contract Maintenance
7.10. New Systems Installation Checkout
7.11. Preventive Maintenance
7.12. Predictive Maintenance
7.13. Power, Grounding and Isolation Requirements
7.14. Instrument Air Requirements
7.15. Heating, Ventilating, Cooling and Air Conditioning System

Module (08) Temperature Devices

8.1. Overview
8.2. Thermocouples
8.3. RTDs
8.4. Thermistors
8.5. Infrared Temperature Transducer
8.6. Optical Fiber Thermometry
8.7. Thermometers

Module (09) Panel and Transmitting Instruments

9.1. Overview
9.2. Panel and Behind Panel Instruments
9.3. Panel Meters
9.4. Discrete Switches
9.5. Transducers
9.6. Smart Transmitters

Module (10) Analytical Instruments

10.1. Overview
10.2. Field Analytical Instrument Systems
10.3. Field Analytical Instruments
10.4. Organizations
10.5. Maintenance Approaches
10.6. Service Factor
10.7. Maintenance Workload
10.8. Spare Parts
10.9. Vendor Support
10.10. Installation Issues

Module (11) Primary Element and Final Control Devices

11.1. Overview
11.2. Temperature

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- 11.3. Primary Elements
- 11.4. Primary Element Locations
- 11.5. Control Valves
- 11.6. Troubleshooting Guide

Module (12) Pneumatic Instruments

- 12.1. Overview
- 12.2. Instrument Air Requirements
- 12.3. Pneumatic Field Instruments

Module (13) Calibration

- 13.1. Overview
- 13.2. Field Calibration
- 13.3. Calibration in Hazardous Locations
- 13.4. In Shop Calibration

Module (14) Tuning

- 14.1. Overview
- 14.2. Loop Classification by Control Function
- 14.3. Control Algorithms
- 14.4. Loop Tuning
- 14.5. Flow Loops

Module (15) Distributed Control Systems

- 15.1. Overview
- 15.2. DCS Maintenance
- 15.3. Maintenance Goals and Objectives
- 15.4. Programmable Logic Controllers (PLCs)

Module (16) Software and Network Maintenance

- 16.1. Overview
- 16.2. Computer Operating Environment
- 16.3. 21st Century Maintenance Technology

Module (17) Safety

- 17.1. Overview
- 17.2. Electrical Hazards
- 17.3. Hazardous Area
- 17.4. Contamination
- 17.5. Pressure and Vacuums
- 17.6. High Voltage
- 17.7. Moving and Rotating Machines
- 17.8. Gases and Chemicals
- 17.9. Heights and Confined Spaces

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17.10. Process Considerations
17.11. Communications
17.12. Standards and Recommended Practice

Module (18) Fiber Optics

18.1. Overview
18.2. Construction
18.3. Classification
18.4. Sensing Modes
18.5. Advantages
18.6. Disadvantages
18.7. Applications
18.8. Input/output Modules
18.9. Sensors

NOTE:
Pre & Post Tests will be conducted
Case Studies, Group Exercises, Group Discussions, Last Day Review & Assessments will be carried out.

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