

# DESIGN OPERATION, MAINTENANCE AND INSPECTION OF STATIC EQUIPMENT

## MCE069

### COURSE DESCRIPTION

This course covers the behaviour of static equipment and discusses appropriate fault detection and diagnostic criteria and schemes for various applications. Emphasis will be placed on the application of vibration-based methods of machine condition monitoring and fault diagnostics, particularly data acquisition and analysis techniques.

### COURSE GOAL

To enhance the participants' knowledge, skills, and attitudes necessary to properly operate and support the static equipment in a way based on the good acquaintance. With the modern technologies applied in this field. Trouble-shooting & forecasting break downs are inclusive.

### COURSE OBJECTIVES

By the end of this course, participant will be able to:

- Provide a clear understanding of Static Equipment installed workplace.
- Describe the operating principle of these types of equipment.
- Give main applications of each type and highlight the main selection criteria.
- List the common maintenance practices, and reliability criteria.

### WHO SHOULD ATTEND

- Engineers, Supervisors, Technical Staff from Many Departments: Process, Maintenance, Operation, Mechanical, Inspection, HSE, Instrumentation, Electrical...
- Foreman Mechanical Maintenance
- Foreman Instrument Maintenance

### COURSE DURATION

5 Working Days

### COURSE OUTLINES

#### 1. Piping - Flanges

- Different types of piping equipment: pipes, flanges & gaskets, valves, steam traps, bellows, safety valves, rupture discs...

- Piping codes and standards. Piping classes. Criteria for selection and installation. Use and Technology.
- Pressure resistance: PN, series, impact of temperature. Symbols and equipment representation on PID's. Insulation.
- Main risks in case of failure, common problems. Corrective and preventive maintenance.

## 2. Vessels & Storage Tanks

- Vessels: technology of separator drums; technology and internals of distillation columns & reactors.
- Storage Tanks: Different types (atmospheric, Pressurized, cryogenic...).
- Design, technology. Main safety and operating equipment. Reliability criteria.

## 3. Metallurgy of Ferrous & Non-Ferrous Material Used In Process Industries

- Overview of materials & steel structure. Effect of alloying elements.
- Structure of steels and alloys. Behavior during operating conditions. Behavior to the pressure and depression of the equipment.
- Calculation conditions. Various types of corrosion mechanisms. Prevention: material selection, design, coatings...

## 4. Thermal Equipment

- TEMA standard heat exchangers. Thermal performance: fluid flow distribution, geometrical characteristics and technological constraints.
- Other types of heat exchanger: tubular or plate type, air coolers and condensers.
- Different types of furnaces and their characteristics.
- Boiler technology. Operating conditions.
- Construction of heat exchange areas and refractory materials.
- Air and flue gas circulation: natural and forced draft.
- Burner technology: fuel and air supply and mixture. Low NOx and ultra-low NOx burners technology.

## 5. Instrumentation

- Sensors, transmitters, control valves. Instrument tags and symbolization on P&ID drawings. ISA standard.
- Distributed Control System: Architecture, characteristics and functionalities. Systems operation: control, graphics, alarming, trends, etc.
- Safety Instrumented Systems. Applications & exercises.

- Process identification. Control strategies: split-range, cascade, feed forward, multi-variable. Tuning of a PID controller.
- Non-linearity of process; controller operating point. Application: loop tuning demo on a process dynamic simulator.

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