



**MAESTRO**  
CONSULTANTS

# **POWER SYSTEM GENERATION & DISTRIBUTION**

## **COURSE OUTLINE 2020**

Contact Us On :

Tel : +971 7 2042072 |

Email: [training@maestrouae.net](mailto:training@maestrouae.net)

Website: [www.maestrouae.net](http://www.maestrouae.net)

## **TRAINING TITLE**

POWER SYSTEM GENERATION & DISTRIBUTION

## **VENUE**

Dubai, UAE

## **DURATION**

5 Days

## **DATES**

11 - 15 October 2020

## **PRICE**

US\$4,000 per attendee including training material/handouts, morning/afternoon coffee breaks and Lunch buffet daily.

## **TRAINING INTRODUCTION**

This program is aimed to provide deep knowledge & experience on the applications of power system generation & distribution in the field of oil & gas industries. Whereas, a practical based knowledge of electrical generation and equipment could be applied on different case studies and gives a rule of thumb relevant to deal with the Electrical Equipment

## **TRAINING OBJECTIVES**

Delegates will gain a detailed appreciation of learnt from this training to interactive with the power plant equipment & network to identify, evaluate & put the suitable remedies for faults & troubles to get a stable operation and good plan for equipment maintenance. Concerning the following

- Different types of generator's prime movers focus on gas turbines & Diesel engine Main components, operations, control, protection and load control, starting & stopping sequence
- Generator theory, main components, types, Excitation system , AVR, Regulation , synchronizing of generators and parallel operations ,load sharing –shedding system , generator protections , fault finding and trouble shootings typical exercises & Maintenance for generator and its associated Auxiliaries system – operators duties in control room

- Power transformers ; Operational principles ,Design guidelines and different types, Maintenance and commissioning procedures ,Troubleshooting checklists and failure analysis techniques &Testing procedures
- Electric power distribution systems; Types of distribution systems. Overview of main components & interconnection of power systems; Standby & emergency (black start generators) power generators - control circuit & protection, automatic changeover, loading & unloading

## **TRAINING AUDIENCE**

This course is aimed at all Personnel involved in power plants operation & maintenance. The program is based on multi-disciplinary approach, which includes all personnel from Operators, Technicians , Supervisors, New graduated to Senior Engineers

## **COURSE OUTLINE**

### **Day 1**

- **Gas turbines & types of prime movers**
  - Main components & operations of single shaft gas turbines
  - Main components & operations of Two shaft gas turbines
  - Main components & operations of Diesel Engine
  - Starting & stopping sequences
  - Protection & load control
- **Principles of AC generators**
  - General; AC generator theory & principles.
  - Typical Generator main components , Construction , insulation & cooling Methods
  - Behavior under fault
  - Capability curve.
  - Neutral Earthing Resistor
  - Insulated Bearings
- **Generator Excitation And Voltage Control**
  - General
  - Conventional excitation
  - Static Excitation

- Brushless Excitation (General Case)
- Behavior Under Short Circuit
- Brushless Excitation (Without Pilot Exciter)
- Brushless Excitation (With Pilot Exciter)
- The diode bridge
- Regulation response time
- Automatic voltage regulators (AVR)
- AVR set-point
- **GENERATOR INTERNAL IMPEDANCE AND REGULATION**
  - General
  - D.C. Generator
  - A.C. Generator
  - Regulation
  - Practical Application
  - Synchronous Reactance
  - Percentage Reactance

## **Day 2**

- **GENERATOR SPEED CONTROL**
  - General
  - Mechanical governors
  - Modern mechanical governors
  - Electronic governors
  - Typical single shaft gas turbine governor
  - Single shaft over speed protection
  - Typical two shaft gas turbine governor
  - Two shaft auto and manual speed control
  - Two shaft over speed protection
  - Load sharing
  - Typical fault finding and troubleshooting technique
  - Case study & practical Exercise
- **DIESEL GENERATOR SETS**
  - General
  - Basic services
  - Availability of basic services generator
  - Basic services generator utilities

- **Generator protection**

- Standard protection
- Special generator protection
- Protection diagrams
- Case studies and workshop discussion

- **Generator Maintenance and troubleshooting**

- Preventive Maintenance of Generator
- Preventive Maintenance of generator's Auxiliaries
- Trouble shooting and fault finding typical practical case study

### **Day 3**

- **Control Persons Main duties in power station control room**

- An Electrical Person operating from a control room specially equipped with system control facilities.
- Responsibilities Of Authorized Persons

- **Transformer ; Introduction, General Principles and Classification**

- General Classification of Transformers: Transformer Construction, Core-Type, Shell-Type, Dry-type Transformers, Oil-filled Transformers, Cooling Techniques
- Transformer Windings, Interconnection of Windings, Advantages and Disadvantages of Principal Connections. Tertiary Windings, Autotransformers
- Parallel Operation of Transformers, Loadings of Transformers in Parallel, Paralleling Requirements, Polarity
- Standards for Transformers, Types and Requirements
- Transformer Tapings and Connections
- Ability to withstand Short Circuit, Sound Level
- Case studies and workshop discussion

- **Transformer Constructional Details**

- Transformer Oil, Characteristics, Oil Oxidation, Breakdown Voltage, Water Content, Acidity, Oil Testing, Field Oil Testing, Dissolved Gas Analysis, Treatment and Filtering of Oil
- Effect of Oil Expansion, Breathing Action, Buchholz Relay, Explosion Vents
- Instrument Transformers
- Case studies and Workshop Discussion

## **Day 4**

- **Transformer Operation and Maintenance**

- Distribution Voltage Adjustment, Off-Load Tap Changing, On-Load Tap Changing
- Switching of high voltage underground cables supplying Distribution Transformers
- Earthing and Over-Current Protection of Distribution Transformers
- Transformer Maintenance: Oil preservation , Deterioration of oil, Breathers, Condition Monitoring, Faults in Transformers, Tappings and Windings
- Advanced Transformer Maintenance
- Guidelines on how to care for your Distribution Transformer
- Case studies and Workshop Discussion

- **Transformer Testing**

- Transformer Routine Tests
- Transformer oil test
- Transformer gas test
- Measurement of winding resistance
- Measurement of voltage ratio
- Measurement of impedance voltage short-circuit impedance and load loss
- Measurement of No-load loss and current
- Insulation resistance
- Analysis of the tests result
- Open session for questions, answers and case studies

## **Day 5**

- **Electric power distribution systems**

- Types of distribution systems.
- Overview of main components & interconnection of power systems
- Standby & emergency (black start generators) power generators - control circuit & protection, automatic changeover, loading & unloading
- Open session for questions, answers and case studies

## **TRAINING CERTIFICATE**

**MAESTRO CONSULTANTS** Certificate of Completion for delegates who attend and complete the training course

## **METHODOLOGY**

Our courses are highly interactive, typically taking a case study approach that we have found to be an effective method of fostering discussions and transferring knowledge. Participants will learn by active participation during the program through the use of individual exercises, questionnaires, team exercises, training videos and discussions of “real life” issues in their organizations. The material has been designed to enable delegates to apply all of the material with immediate effect back in the workplace.

