

# FAULT ANALYSIS IN ELECTRICAL POWER SYSTEMS

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## **TRAINING TITLE**

### **FAULT ANALYSIS IN ELECTRICAL POWER SYSTEMS**

## **VENUE**

**Dubai, UAE**

## **DURATION**

**5 Days**

## **DATES**

**14 - 18 February 2021**

## **PRICE**

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

## **TRAINING INTRODUCTION**

The continuity of Electrical Power Supply is very important to the consumers especially for industrial sector, where curtail of electrical power supply is costly.

Electrical systems are subjected to several external & internal influences like weather conditions, lightning phenomenon, pollution, insulation failure, temperature rise, etc., these influences cause abnormal operational condition, which could lead to voltage and frequency variations and feeder trips, brown out or black out of electrical system, and sometimes, may lead to equipment damage or system failure.

Performance and characteristics of electrical system configurations are vital factor in reducing or increasing the effect of faults on the system as earthing system, switch gear, protective relays, active and reactive power generation, etc.

This course discusses electrical system faults and elements of the system that affect its behavior during the fault. The cause also will suggest measures to mitigate the problems that would arise.

Many utilities need this course which studies the influences of the above-mentioned events on the electrical networks and their effect on the continuity of electrical power supply and how mitigate these problems.

## **TRAINING OBJECTIVES**

**By the end of the course participants will be able to:**

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- Explain the models for generators during a fault and be able to use the models to calculate the fault current at any point in time for a fault applied to the terminal of a generator.
  - Perform design calculations for choosing a circuit breaker for a system experiencing a balanced three-phase fault at any location.
  - Describe the advantage of using symmetrical components to analyse unbalanced system operation
  - Convert between phase values and symmetrical component values.
  - Draw sequence networks for a given three-phase system for fault analysis.
  - Analyse unbalanced power systems using symmetrical components

### **TRAINING AUDIENCE**

This course is intended for Engineers & supervisors who work in transmission, distribution, maintenance, operation, control and analysis of Utilities & Industrial Electrical Networks.

### **TRAINING OUTLINE**

#### **Day One**

##### Introduction

- importance of continuity of electrical supply
- Power system components.
  - Causes of faults
  - Type of faults.

##### System Grounding

- Generation units
- Power transformers
- Transmission lines
- Distribution system
- Arrangement of grounding in power system

#### **Day Two**

Factors Effect the Fault Current Contribution & Continuity of Supply Relation between substation equipment connection and the fault contribution Transformers

- 
- Vector groups
  - Parallel transformers with different vector groups
  - Grounding transformers (zigzag t., 3wdg.t.,...)
  - Common & separate grounding resistance (high & low value) for number of parallel transformers.

### **Day Three**

#### **Fault Calculations**

- System configurations
- Per unit values.
- Symmetrical components
- Symmetrical & unsymmetrical fault calculations.
- Short circuit level.
- Effect of induction machines on short circuit level.
- Rupture capacity of circuit breaker.
- Methods, to reduce the short circuit level.
- Peak current limiters.
- Numerical examples.

### **Day Four**

- Over view of protection system
- Protection components:
  - o Current transformers,
  - o Voltage transformers,
  - o Relays and circuit breakers.
- Coordination between over current relays for a given system.

### **Day Five**

- Distance and differential relays

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- Transmission line protection
  - Transformer protection.
  - Generator protection.

### **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.

