

# Protective Control Relay Systems and Automation

## INTRODUCTION

- This training course is designed to provide participants with the skills to understand how protection systems work, what type of protection is required for specific equipment and how it is applied in medium to large power generation and distribution systems, particularly in the oil & gas, mining and minerals processing and heavy industries.
- This Protective Control Relay Systems and Automation training course will also enable the participants to understand how modern protection and control relays are utilised as part of power system and substation automation.

This training course is interactive and encourages delegates to participate through questions and answers, along with opportunities to discuss with the presenter specific issues which may result in appropriate solutions.

Participants will learn:

- How Protection Systems work in Major Power Systems
- The Types of Faults that can occur
- How to read and analyze Power System Protection and Control Diagrams
- The Basics of Fault Calculations and The Software used to determine them
- How to Analyze Faults using data Collected by Protection and Control Relays
- Selectivity and Sensitivity in Protection and Control Relays
- Intelligent Electronic Devices (IEDs) In Modern Power Systems
- What Power System and Substation Automation is
- How Protection and Control Relays and IEDs are integral to these functions

## **PROGRAMME OBJECTIVES**

The Protective Control Relay Systems and Automation training course aims to enable participants to achieve the following objectives:

- Understand the purpose of Protection Systems and their basic application
- Understand typical Electrical Faults and their effects on the system
- Learn the basics of Electrical Fault Calculations
- Understand the differences in relay technology, including IEDs
- Identify which type of Protection is required for different applications
- Understand the main requirements of Substation and System Automation
- Learn how IEDs are selected and their role in Power Systems Automation
- Techniques for Testing, Commissioning and Maintaining Protection Relays

## **PRE-REQUISITE**

- All attendees on the Protective Control Relay Systems and Automation training course should have some experience or knowledge of Power Generation, Distribution and Motor Control in a process or manufacturing plant environment.

## **WHO SHOULD ATTEND?**

- If you work in the Electrical and Control disciplines of the Oil and Gas, Minerals Processing, Mining and Heavy Industries, this training programme will provide you with a detailed understanding of the critical role that modern Protection and Control Relays play in the safe operation, monitoring and control of electrical equipment used in the facilities for these industries.

This training course is specifically tailored to suit the following personnel:

- Project Managers and Engineers
- Lead and Senior Design and Support Engineers
- Electrical Engineers and Designers – Design and Maintenance Operations
- Electrical Superintendents – Maintenance Operations
- Maintenance Technicians

## **TRAINING METHODOLOGY**

- This training course combine presentations with interactive practical exercises, supported by video materials, activities and case studies. Delegates will be encouraged to participate actively in relating their particular protection requirements at their workplace.
- There will be adequate time given for group discussion during and at the end of each session, including detailed case studies and anecdotes on based on the subject matter and the facilitator's own experience in the field.

## PROGRAMME SUMMARY

- This training course covers a wide range of topics relating to protective control relay systems and automation, from basic principles to the complex application of such systems in large plants and facilities, including testing and maintenance. This Protective Control Relay Systems and Automation training course is designed to be beneficial for beginners and experienced personnel alike.

## PROGRAM OUTLINE

### Power Systems and Faults

- Power System Overview
- Power System Major Components
- Generators
- Circuit Breakers
- Transformers
- Cables
- Switchboards and Motor Control Centres
- Motors
- Faults and Fault Currents
- Fault Calculations and Methods
- Measuring Transducers: Current and Voltage Transformers

### Protection and Control Relays Part 1

- Definitions and Terminology
- PD activities
- Standard Symbols of Protective Relay Schemes
- Basic Requirements
- Function of Protective Relay Systems
- Elements of Protective Relay Systems, including Legacy Systems
- Types of Protection.
- Multifunction Relays and Intelligent Electronic Devices (IEDs)

### Protection and Control Relays Part 2

- Relay System Coordination
- Relay Selection
- Relay Setup and Adjustment
- Factory Tests
- Commissioning, including Testing Selectivity and Co-Ordination
- Testing relays during Commissioning and Maintenance
- Software Upgrades for Intelligent Electronic Devices (IEDs)

## Automation of Power Systems and Substations

- Definition and Overview
- History of Automation in Power Systems
- Hardware Requirements
- Application of Devices and Systems
- Communication between Devices and Systems
- Commissioning and Testing of Automation Systems

## Smart or Intelligent Systems

- Smart Grids
- Smart Meters
- Renewable Energy
- Practical Applications
- System Security