
FUNDAMENTALS OF OPERATION AND TROUBLESHOOTING OF EMERGENCY/STANDBY POWER GENERATION USING DIESEL GENERATORS



WHAT YOU WILL LEARN:

- To select and apply Diesel engines for emergency power requirements in your work place
- To choose appropriate ratings and fuel options
- To select and apply alternators, their excitation and protection systems
- To plan for auxiliary systems of the engine as a part of the package
- To formulate procedures for testing and commissioning of Diesel engine generators
- To be able to guide your team to operate and maintain Diesel engine generators

WHO SHOULD ATTEND:

- Plant electrical/mechanical engineers
- Design engineers
- Project engineers
- Testing and commissioning engineers and technicians
- Maintenance technicians (engine/electrical)



Technology Training that Works

The Workshop

Industries require stable, reliable power supply. Sometimes this becomes difficult due to remote location of the industry or weak grid supply. Essential loads need to be provided with power supply from in-plant generators either to supplement the grid supply or as an emergency source for critical loads which can tolerate very little or no interruptions. Diesel engine generators are useful in these circumstances because of their simplicity, ease of maintenance and ability to run with different types of fuels. They can be started easily without external supply assistance, available in a variety of ratings and can be operated in parallel with other generators or with the supply grid if needed.

This training describes the principles of engines and generators starting with the fundamentals, discusses the options available and the constructional details of engines, the electrical alternators and auxiliary equipment in an easy to understand manner. The testing and commissioning of Diesel engine generators and their operation and maintenance aspects are also discussed.

An optional third day is also offered (refer to the separate outline given in this document) for those who wish to achieve a more in-depth knowledge of the engine-based power plants, operation of more than one engine generator in parallel and also synchronised to the utility grid.

Pre-requisites

- A fundamental knowledge of mechanical or electrical engineering
- Some experience in operation and maintenance of general machinery
- Planning plant installations

On-Site Training

- ✓ **SAVE** over 50% by having an IDC workshop presented at your premises.
- ✓ Customise the training to **YOUR** workplace.
- ✓ Have the training delivered when and where you need it.

Contact us for a **FREE** proposal.

The Program

DAY ONE

REFRESHER ON THE BASIC ELECTRICAL THEORY

- A brief history of electricity
- The static and dynamic forms of electricity-the difference
- Electrical circuits
- Voltage, current, resistance and Ohm's law
- DC and AC circuits-how they differ
- Ac amplitude-time curve-Why is it called a sine wave?
- Phasors -Introduction
- Reactance and impedance and Ohm's law for ac circuits: Calculation examples
- Concept of power factor (displacement power factor)
- Circuit theory and applicable laws for solving problems of power flow in AC and DC circuits
- DC and AC sources

FORMS OF ENERGY AND CONVERSION-WHY ELECTRICITY IS A CONVENIENT ENERGY CARRIER

- Potential and kinetic energy as the main classification of energy forms
- Energy types based on the source such as fuel, chemical, nuclear and mechanical
- What is meant by energy carrier?
- Why is electricity the most preferred energy carrier?
- Points of comparison
- Law of energy conservation and laws of thermodynamics-Applications to power generation

ENGINES FOR POWER GENERATION-LIQUID AND GASEOUS FUELS

- A brief historical perspective
- External combustion cycles (Otto, Diesel)
- External combustion engines-Spark and compression ignition types
- Industrial generating sets based on compression ignition cycle
- Fuels used: liquid and gas engines

DIESEL TECHNOLOGY AND CLASSIFICATIONS

- Basic Engine processes
- Dual Fuel Engines
- Speed Classifications
- Service Classifications

BASIC ENGINE DESIGN AND RATINGS

- Design characteristics and formulas
- Turbo charger
- Ambient conditions
- ISO ratings
- Performance and Efficiency
- Efficiency enhancements
- Engine speed
- Fuel combustion methods

FUEL OILS USED AND FUEL HANDLING SYSTEM

- Crude oil
- HSD, LDO and Heavy fuels
- Economics of fuel selection
- Pressure and temperature characteristics
- Viscosity characteristics
- Specific heat and temperature
- Viscosity conversion
- Specific fuel consumption
- Fuel filters and heaters
- Fuel nozzles and igniters
- Emission control
- Storage requirements
- Typical fuel system layouts and components

DAY TWO

LUBE OIL SYSTEM

- Lube oil specification
- Lube oil consumption in diesel engines
- Typical Lube oil system layouts
- Viscosity and temperature
- Lube oil filters and heaters

BASICS OF AC SYNCHRONOUS GENERATORS AND ESSENTIAL COMPONENTS

- The basic electrical generator
- Components of the alternator
- Stator winding in alternators
- Rotor (field) windings
- Damper windings
- Slip rings
- Sources for supplying field current to rotor
 - Rotary exciters
 - Static exciters
 - Brushless excitation
- Cooling components and methods of cooling

PROTECTION OF AC SYNCHRONOUS GENERATORS

- Failure modes of ac generator
- Stator winding protection-short circuits
- Stator winding protection-earth faults
- Differential (circulating current type) protection for windings
- Rotor winding protection-Single and double earth fault
- Negative sequence current protection
- Excitation failure and pole slip/out-of-step protection
- Over voltage protection of generators

DIESEL GENERATING SETS

- Coupling Requirements
- Skid mounting
- Layout requirements
- Standard Control panels
- Interconnections

OTHER COMPONENTS

- Starting methods
- Starting characteristics
- Battery sizing
- Step load requirements
- Standby requirements
- Auto start and auto transfer schemes
- Auto Transfer switches

TESTING AND COMMISSIONING

- Factory tests
- Pre-commissioning checks
- Pre-commissioning tests
- Performance monitoring
- Fuel and lube oil consumption checks
- Electrical system tests

OPERATION AND MAINTENANCE OF DIESEL GENERATING PLANTS

- Safety requirements
- Operation monitoring based on applications
- Philosophy of maintenance
- Maintenance techniques
- Maintenance planning and scheduling
- Spares and inventory management
- Maintenance tools
- Inspection
- Engine overhaul and repair
- Training
- Health monitoring
- Troubleshooting

SUMMARY, OPEN FORUM AND CLOSING