CONCEPT

Diesel Generator Maintenance and Testing: Engine Systems, Paralleling, ATS and Load-Bank Tests



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Introduction:

Diesel generator maintenance decides whether a set will start, accept load and run whenever mains power fails, yet many standby units sit idle for months with contaminated fuel, light-load carbon build-up and transfer switches nobody has exercised under load. This Core Concept course gives technicians and engineers a practical method to operate, maintain and test diesel generator sets, from the engine's fuel, air, cooling, lubrication and starting systems to the alternator, governor, paralleling controls and automatic transfer switch. Participants build a Genset Reliability and Load Test Programme for a unit at their own site.

Course Objectives:

- Identify the engine, alternator and control components of an installed diesel generator set and confirm its standby, prime or continuous rating against the connected load
- Inspect and service the fuel injection, air intake, turbocharger, cooling, lubrication and starting systems to the manufacturer's schedule
- Operate generator sets in parallel by synchronising them and setting governor droop and voltage control so that kW and kVAr are shared between units
- Test automatic transfer switch sequences and carry out commissioning and periodic load-bank tests with correct acceptance records
- Diagnose failure to start, black smoke, overheating, low oil pressure and hunting faults using alarm logs, readings and a structured fault-finding sequence
- Compile a preventive maintenance schedule, fuel management routine and load test programme that keeps standby units ready to run

Target Audience:

- Mechanical and electrical technicians responsible for routine servicing and first-line fault finding on diesel generator sets
- Plant and utility engineers responsible for the availability of emergency, standby and prime power units
- Facilities and building services staff responsible for standby power at hospitals, data centres, airports and commercial sites
- Shift operators responsible for starting, loading, paralleling and shutting down generator sets
- Maintenance planners responsible for genset service intervals, spares and test records

Course Outline:

Day 1: Diesel Generator Set Anatomy, Ratings and Duty

- Genset Package Layout: Engine, Alternator, Base Frame, Canopy, Control Panel and Circuit Breaker
- Four-Stroke Compression Ignition Cycle and Engine Nameplate Data
- Standby, Prime and Continuous Ratings Under ISO 8528 and ISO 3046 Definitions
- Load Survey Worksheet: kW, kVA, Motor Starting Surge and Non-Linear Loads
- Installed Genset Baseline Survey: Running Hours, Service History and Alarm Records

Day 2: Engine Systems: Fuel, Air, Cooling, Lubrication and Starting

- Fuel Injection Systems: Common Rail, Unit Injector and Mechanical Pump Arrangements
- Air Intake, Turbocharger and Charge Air Cooler Inspection Points
- Jacket Water Cooling Circuit, Radiator, Thermostat and Coolant Condition Checks
- Engine Lubrication Circuit, Oil and Filter Change Intervals and Oil Sampling Point
- Electric and Air Starting Systems, Jacket Water Heater and Cold-Start Aids

Day 3: Alternator, Governor, Paralleling and Transfer Switching

- Brushless Alternator Construction and AVR Interaction with Engine Speed Governor
- Isochronous and Droop Speed Governing During Load Acceptance
- Synchronising Checks and Paralleling Panel Sequence for Multiple Generator Sets
- kW and kVAr Load Sharing Between Parallel Units
- Automatic Transfer Switch Operation: Open Transition and Closed Transition Sequences

Day 4: Load-Bank Testing, Fuel Management and Fault Diagnosis

- Commissioning Test Sequence and Resistive and Reactive Load-Bank Test Procedure
- Wet Stacking at Light Load: Symptoms, Prevention and Corrective Loaded Runs
- Diesel Fuel Storage, Water and Microbial Contamination Checks and Fuel Polishing
- Generator Protection Functions at Overview: Overcurrent, Reverse Power and Engine Shutdowns
- Fault-Finding Chart: Failure to Start, Black Smoke, Overheating, Low Oil Pressure and Hunting

Day 5: Genset Inspection Walkthrough and Reliability Programme

- Guided Inspection Walkthrough of a Case Standby Generator Room and Fuel Day Tank
- Exhaust Emissions and Noise Control Measures at Overview: Silencer, Enclosure and Aftertreatment
- Preventive Maintenance Schedule by Daily, Weekly, Monthly and Annual Task Lists
- Test Record Review from a Case Load-Bank Run and Transfer Switch Exercise
- Genset Reliability and Load Test Programme Drafting and Peer Review

Skills You Will Gain:

- Genset Rating Verification
- Diesel Engine System Servicing
- Governor Droop Setting
- Generator Paralleling Practice
- Transfer Switch Testing
- Load-Bank Test Execution
- Fuel Contamination Control
- Genset Fault Diagnosis

Why Attend This Course:

- Return with a Genset Reliability and Load Test Programme written for a diesel generator set at your own site
- Catch contaminated fuel, light-load carbon build-up and weak starting systems before a mains failure exposes them
- Run load-bank and transfer switch tests with a clear sequence and acceptance record that auditors and managers can follow
- Compare generator practice with peers from utilities, oil and gas, hospitals, data centres and industrial plants

Conclusion:

A standby generator is only dependable when its engine systems are serviced, its fuel is kept clean and it is proven under real load. The one week move from genset anatomy and ratings, through fuel, air, cooling, lubrication and starting systems, to the alternator, governor, paralleling and transfer switching, then to load-bank testing, fuel management and fault diagnosis. The final day applies these methods in an inspection walkthrough and closes with a Genset Reliability and Load Test Programme ready for site use.