



Course Information Letter ---- DG301

DIESEL GENERATOR FUNDAMENTALS

DG301

This course is of great benefit to operators, technicians, and engineers who are responsible for ensuring the availability of their diesel-generators. The intent is to provide the participant with a broad knowledge base all aspects of a diesel-generator. The course begins by providing a basic description of the operation of a diesel engine. This basic description includes the engine construction, part identification, description of the Otto Cycle, use of different fuels, engine ratings, performance fundamentals, and the needed auxiliary systems. A similar discussion is completed on the AC generator as well: fundamental theory, components, and type so generators are discussed. Operation and maintenance issues are included throughout the presentation. It is our belief that much of the damage done to diesel-generator is because person does not understand the fundamentals.

Major topics include: Diesel Fundamentals • Fundamental Theory • Basic Construction • Classification • Fuels • Lubrication • Heat and Combustion • Governing • Auxiliary Systems • Starting Up • Operating Maintenance • Predictive Maintenance • AC Theory • Single/ Three Phase Power • Construction, Operating Characteristics Parallel Operation • Load Sharing • VARs/KW, Stability • Voltage Control and Excitation.

OBJECTIVES:

The overall objective of this course is to familiarize personnel with operation and maintenance of diesel equipment such that we make a positive impact upon O&M of this equipment.

Specifically, this training is to provide operators and/or technicians with the knowledge necessary to:

1. Demonstrate an understanding of the various applications of a diesel engine.
2. Describe the construction and function of those major components making up a diesel engine.
3. List the classifications of diesel engines.
4. Describe how a diesel engine is lubricated.
5. Describe the basic terms of heat and combustion.
6. List the types of oil and gaseous fuels used in a diesel engine.
7. Describe diesel engine ratings and performance.
8. Describe the exhaust system-scavenging and the benefits derived.
9. Describe the term supercharging and benefits derived from this process.
10. Describe the diesel engine fuel injecting system.
11. Using a block diagram, describe operation of diesel engines governors.
12. Describe the various diesel auxiliary support systems.
13. Describe basic operation and maintenance of a diesel engine.
14. Explain the operation of an AC Generator
15. Explain the fundamentals of an AC Generator
16. Discuss the two major types of AC Generators

COURSE DATES/LOCATION/FEE

For current dates / locations / prices, please see HPC's website, www.hpcnet.com.

COURSE OUTLINE:

1. **Distinguishing Features of Diesel Engines:** Recognizing a Diesel Engine, Diesels Differ from Each Other, Automotive Service, Farm Power Equipment, Mobile Service, Railroad Service, Marine Service, Stationary Service
2. **What a Diesel Engine Is:** Basic Parts, What Happens Inside the Engine, Four-Cycle Diesel Engine, Compression Ratio, Two-Cycle Diesel Engines, Advantages of Diesel Engines, Disadvantages of Diesel Engines, How Diesels Are Used, Why It Is Called a Diesel Engine
3. **Basic Construction of a Diesel Engine:** Parts Needed in a Diesel, How the Assembled Parts Look, How the Individual Parts Look
4. **Classification of Diesel Engines:** Diesel Engines/Classification by Type, Diesel Engine Classification by Use
5. **Stationary Parts—Frames, Cylinders, and Heads:** Engine Structure and Requirements, Cylinders and Liners, Cylinder Heads
6. **Major Moving Parts:** Pistons, Piston Rings, Connecting Rods, Wristpins, Crankshafts, Balancer Shafts and Vibration Damper, Bearings, Flywheels
7. **Lubricating the Diesel:** Lubricating Principles, Basic Requirements of a Lubricant, Diesel Engine Lubrication Systems, Properties of Lubricating Oils, Selection of Lubricating Oils
8. **Heat and Combustion:** What Heat Is, Heat Flow, Gas Pressure and Volume, Gas Laws, Basic Terms of Chemistry, Chemistry of Engine-Fuel Combustion, Heat Quantities from Combustion
9. **Oil and Gaseous Fuels:** What Oil Is, How Oil Is Refined, Properties of Diesel Fuels, Ignition, Dual-Fuel Engines Burn Gas and Oil, Gaseous Fuels
10. **Engine Power and Fuel Consumption:** Indicated Power, Brake Horsepower, Torque, Brake Mean Effective Pressure, Efficiency and Fuel Consumption, How Volumetric Efficiency Affects Engine Power, Effect of Compression Ratio on Thermal Efficiency, Where the Lost Heat Goes
11. **Engine Rating and Performance:** Engine Rating, Combustion and Cooling Limit Power Rating, Lubrication and Inertia Limit Speed Rating, Standard Ratings, Other Power Ratings, Fuel Consumption
12. **Intake and Exhaust Systems - Scavenging and Supercharging:** Intake and Exhaust Systems, Valve-Actuating Gear, Valve Timing, Air-Intake System, Inlet Manifolds, Scavenging, Supercharging
13. **Injecting Fuel:** Fuel Injection System, Multiple Plunger Injection System, Distribution Type Fuel Injection Pump, Unit Injectors, Injectors and Nozzles
14. **Burning the Fuel:** Diesel Combustion, Solid Fuel Injection System, Special Design Combustion Chambers
15. **Governing:** Governors, Speed Governors, Definition of Terms, Hydraulic Governor with Permanent Speed Droop, Isochronous Hydraulic Governor, Governor Modifications, How Governors Are Used
16. **High Compression Gas-Burning Engines:** High Compression Increases Burning Efficiency, Gas-Diesel Engines, Ignition and Combustion in Gas-Burning Engines, Dual-Fuel Engines, High-Compression Spark-Ignited Gas Engines, Uses of High-Compression Gas-Burning Engines
17. **Auxiliary Systems:** Lubricating System - Large Engines, Cooling System, Fuel-Supply System, Air-Intake System, Exhaust System, Starting System, Electric Ignition Systems for Gas Engines, Alarm and Shutdown Systems, Automatic Starting and Load-Control Systems
18. **Operation and Maintenance:** Operation, Operating Procedures, Performance Records, Operator As Trouble Shooter, Fundamental Problems
19. **AC Generators:** AC Theory, Single/Three Phase Power, Construction, Operating Characteristics, Parallel Operation, Load Sharing, VARs/kW, Stability, Voltage Control and Excitation

FREQUENTLY ASKED QUESTIONS

- Will HPC Technical Services bring this course to our location for our personnel only? YES, call or email Stephen Parker, stparker@hpcnet.com for a price quotation.
- Will HPC Technical Services customize the presentation at our site to suit our particular needs? Yes.
- Is HPC Technical Services' textbook available for purchase as a reference document? It will be available in the near future.
- What is the cost for HPC Technical Service to deliver this course at our location? Well, of course that can vary, but generally speaking, if you're planning on having 6+ attend, when considering your T&L, it is to your advantage to perform the course at your plant (office). You gain from the customization and price.
- Can HPC Technical Services provide "Technical Assistance" in the planning and implementation of our outages? Yes we can. Call or contact Harold Parker, hparker@hpcnet.com for our rate sheets and any further information required.

WHAT YOU WILL RECEIVE:

1. 1 copy of HPC Technical Services' textbook, Diesel Generator Fundamentals.
2. A "Certificate of Completion" with 2.3 CEUs, authorized for issue by the International Associate of Continuing Education/Training.

HPC INSTRUCTOR (S):

Bill Poisson. Mr. Poisson is a retiree of the US Navy where he served as an Electrician responsible for the operation and maintenance of onboard ship diesel generator sets. He also was based at the Orlando Technical Center for the Nuclear Groups where he instructed courses relevant to this topic. Mr. Poisson has been instructing courses for HPC since 1997, specializing in diesel generators and controls.



Tom McKinney. Mr. McKinney is an electrical engineer with over 25 years of experience in utility and industrial power systems. He earned his B.S.E.E. from the Virginia Military Institute. His experience includes the design, installation, and start-up of a wide variety power equipment, including turbine and diesel-generators, excitation systems, protective relaying, transformers and circuit breakers. Tom worked in the corporate engineering offices of American Electric Power supporting plant operation and maintenance needs. Most recently, before joining HPC Technical Services as a consultant, he worked for First Energy at the Bayshore Plant. Mr. McKinney has a unique ability to present technically complex subjects in an understandable and simple manner. Tom resides in Ohio.

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www.hpcnet.com

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REGISTRATION FORM

Company: _____

Plant: _____

Address: _____

City/State/Zip: _____

Telephone: _____ FAX: _____

Course Number/Title: _____

Course Dates: ____/____/____ Thru ____/____/____

Course Location: _____ Course Fee: _____

Please enroll the following individual(s) listed below:

Student #1: _____

Student #2: _____

Taking advantage of HPC's 3-4-2 Policy: Send 3, Pay for 2 when paying in advance.

Student #3: _____

Enrolled by: _____

Date: _____

METHOD OF PAYMENT

- Check to Follow: _____
- Check Enclosed #: _____
- MC/Visa/AMEX #: _____
Expiration Date: _____ CV Code: _____
- Purchase Order #: _____

HOW DID YOU LEARN OF THIS COURSE?

- Attended HPC courses in the past.
- Received a fax
- Received an email
- Web search
- Other: _____