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[www.hpcnet.com](http://www.hpcnet.com)

## Course Information Letter ---- DG201

# DIESEL FUNDAMENTALS

DG201

This course is of great benefit to operators, technicians, and engineers who are responsible for ensuring the availability of their diesel engines. The intent is to provide the participant with a broad knowledge base all aspects of a diesel engine. The course begins by providing a basic description, including: the engine construction, part identification, description of the Otto Cycle, use of different fuels, engine ratings, performance fundamentals, and the needed auxiliary systems. Operation and maintenance issues are included throughout the presentation. It is our experience that much of the damage done to diesel engine is because personnel do not fully understand fundamentals of operations and maintenance. This course is part of a solution to that problem.

**Major topics include:** Diesel Fundamentals • Fundamental Theory • Basic Construction • Classification • Fuels • Lubrication • Heat and Combustion • Governing • Auxiliary Systems • Starting Up • Operating Maintenance • Predictive Maintenance.

**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.

## COURSE DATES/LOCATION/FEE

For current dates / locations / prices, please see HPC's website, [www.hpcnet.com](http://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

## 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](mailto: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](mailto: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 Fundamentals.
2. A "Certificate of Completion" with 1.3 CEUs, authorized for issue by the International Associate of Continuing Education/Training.

## HPC INSTRUCTOR (S):



**Dan Anderson** is the primary instructor for this course. Dan started his career in the US Navy as a Boiler Technician. After his discharge Dan was a civilian instructor for the US Navy at Great Lakes Naval Training Center. While there Dan instructed Navy personnel in the four-phase steam cycle including balance of plant equipment. In 1990 Dan returned to Minnesota and received his Minnesota State Chief A Engineers license. After a few years in the position as Chief Boiler Engineer For Green Giant Co. and Maintenance Manager for Minnesota Energy, Dan went to work for Hutchinson Utilities Commission in Hutchinson, Minnesota. His position there was Operator 1. His operational responsibilities included GE LM 6000 Combined Cycle, GE Frame 5 Simple Cycle, and a GE Frame 3 Combined Cycle. He also had operations of 6 Diesel Engines for power production. Dan joined HPC Technical Services, June 2001. Dan currently holds a Chief A Engineers License for Minnesota, A Chief NIULPE Certificate, NIULPE Instructor and Examiners Certificate, Chief ASOPE Certificate, and is a Member of ASME.

**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.

**HPC TECHNICAL SERVICES**  
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Website: [www.hpcnet.com](http://www.hpcnet.com)

**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: \_\_\_\_\_