

# Operation and Maintenance of Heavy Duty Diesel Engines (HDD)

## Operation and Maintenance of Industrial Diesel Engines

### Introduction

The added benefits that heavy duty diesel engines (HDDs) can provide to engineers and technicians working in power plants, the petroleum industry, fleet management, and maintenance will be highlighted in this five-day interactive, applications-driven Course N Carry Operation and Maintenance of Heavy Duty Diesel Engines (HDD) training seminar. It will demonstrate how to use these engines in a cost-effective, environmentally responsible, and safe manner.

The application of related recommended operation and maintenance practices advised by the most reputable manufacturers and by the relevant standards will be emphasised in this Course N Carry Maintenance Engineering training seminar. It will also cover proper HD Diesel engine selection for particular jobs as well as the retrieval and interpretation of data from HD Diesel engine manuals.

### Featured in this Course N Carry training lecture are:

- Talks about the advantages and uses of heavy-duty diesel HDD engines
- The significance of proper HDD operation and maintenance for increased dependability
- An in-depth explanation of HDD systems and their distinctive capabilities
- Concentrating on HDD electronic control for cost-effective and environmentally responsible operation

### Objectives

#### Following this Course N Carry training program, attendees will be qualified to:

- Describe the fundamentals of how diesel engines work.
- What distinguishes heavy-duty diesel engines from regular diesel engines?
- Explain the process of combustion in diesel engines.
- Describe the purpose of diesel engine air charging.
- Enumerate and describe the fundamentals of how diesel engine air charging systems work.
- List the several kinds of fuel injection systems that are used in HDD and describe their working principles.
- Describe the configuration and parts of the several fuel injection systems that are utilised in HDD.

- Describe the methods for controlling the amount and timing of injected fuel.
- Name a few advantages of Diesel Electronic Control (DEC).
- List all of the HDD emission control systems and describe their basic principles of functioning.
- Describe the steps and prerequisites for HDD maintenance.
- List the fundamental routine maintenance procedures for HDDs.
- Enumerate and describe the common HDD problems.

## Training Methodology

In order to maximise knowledge, comprehension, and retention of the material provided, this Course N Carry Maintenance Engineering training session on Heavy Duty Diesel Engine (HDD) Operation and Maintenance will make use of a range of tried-and-true adult learning strategies. There will be a lot of interaction and participation during the daily training seminar sessions. Along with the presentation of movies that highlight the latest advancements in HDD technology, proper maintenance, control, and operation, as well as troubleshooting techniques for frequent issues, there are in-depth talks included. It is highly recommended that delegates bring data from their own work domain to evaluate; this makes the information more relevant.

## Organizational impacts

**A corporation hopes to obtain the following benefits from sending its staff to this specific Course N Carry training course:**

- Optimising the use of tools, equipment, and supplies by delegates while preserving organisation HDD powerplants
- Enhanced performance and integrity of operational HDD engines
- Reducing equipment malfunctions due to increased capacity for risk assessments on HDD engines
- Facilitate improved pipe system element replacement and new element specification.
- Including a skill set for delegates that enhances the activities and reputation of the organisation.
- Improving the delegate's capacity to respond appropriately in dangerous scenarios involving HDD engines.
- Improved track record for safety

## Personal Impact

**An employee of the organisation who attends this specific Course N Carry training program anticipates adding the following to his foundational knowledge and real-world experience:**

- An improved understanding of the maintenance and instrumentation of HDD engines for incident prevention
- Enhanced capacity for HDD engine troubleshooting.

- Increased self-assurance while dealing with risky safety situations relating to HDD engines
- Increased self-assurance and capacity to choose the right HDD engines, which will improve dependability and elevate one's profile with senior management
- He will have a greater understanding of the latest technological advancements connected to his work and experience a great deal of personal fulfilment.
- Increased productivity on a daily basis due to a greater comprehension of the technology and ideas behind the systems used in HDD engines
- Increasing his capacity for self-learning

## Who should attend?

**Professionals of all stripes can benefit from this Course N Carry training program, but the following will be very helpful:**

- Engineers and technicians for fleet maintenance of automobiles
- Supervisors of fleet maintenance
- Engineers for automotive maintenance
- Technicians for automotive maintenance
- Engineers and technicians working on diesel power generating plants

## Course Outline

### Day 1

#### Overview of High-Pressure Diesel (HDD) Engines

- HDD Engine definition: Rating - Load factor - Duration of operation
- HDD Engine Terms Glossary
- Global Guidelines for HDD Engine
- HDD engine construction features and materials HDD engine internal and external characteristic performance curves Design considerations
- Applications for HDD Engines

### Day 2

#### HDD Engine Work Cycle and Combustion

- Work Cycle, Internal and External HDD Engine Characteristic Curves
- Diesel Fuel: Properties, Testing, Classification
- The process of combustion in diesel engines
- Ratio of Compression
- Shapes of Combustion Chambers

- Equivalent Charge Ignition by Compression (HCCI)
- Types of Air Charging for Heavy Duty Diesel Engines (Turbo – Pressure wave – Mechanical)
- Turbocharger Configuration (Sequential, Variable Geometry, Combined Two Stage)
- Control of the turbocharger (Pressure – Fuel Compensation)
- Performance Characteristics of a Turbocharger

## Day 3

### HDD Engine Fuel Injection Systems

- Fuel Injection System Types and Operating Principles: Cummins Systems: (PT, Accumulator, CELECT unit injector, HPI, XPI)
- MEUI/A - MEUI/B - Navistar - HUEI/A - HUEI/B - Caterpillar Systems
- Multi- or in-line plungers Systems
- Common Rail Frameworks
- HDD Power Plants Component and System Layout for Fuel Injection Systems
- Techniques for Regulating the Amount and Time of Injected Fuel: (Electronic, pneumatic, hydraulic)
- Water Separation and Diesel Fuel Filtration

## Day 4

### Benefits of Electronic Diesel Control (EDC)

- Basic Components and Layout of the EDC (ECU, Sensors, Actuators, and Layout for Different Fuel Injection System Types)
- Data processing controlled quantities and open and closed loops include: (start, drive mode, idle speed, maximum speed, intermediate speed, cruise speed, etc.)
- Limits on Injected Fuel Quantity
- Systems for reducing emissions;
- Catalyst for Diesel Oxidation (DOC)
- Particulate Filter for Diesel (DPF)
- Catalyst reduction with selectivity (SCR)
- Injection of Urea (UI)
- Recirculation of exhaust gases (EGR)
- CCV, or closed crankcase ventilation

## Day 5

### HDD Engine Maintenance and Operation: Tips for Using the Indicator Lamps

- Board-Level Diagnostics

- Advice for Effectively Operating and Maintaining Diesel Engines
- The Fundamentals of Mechanical Repair
- Diesel fuel injection system maintenance
- Tuning Up a Diesel Engine
- Routine Maintenance Operations for Diesel Engines (time- and distance-based)
- Diesel Engine Component Types and Troubleshooting Procedures Engine Failures  
Troubleshooting and Identification of Faults
- Testing Fuel Feed Pumps, Injectors, and Injection Pumps
- Engine condition assessment tests (compression and leakage testing)