Leaders Development Institute

# Certified Courses

# Heavy Duty Diesel Engine (HDD) Operation and Maintenance

## INTRODUCTION

- This interactive, applications-driven 5-day Heavy Duty Diesel Engine (HDD) Operation and Maintenance training seminar will highlight the added value that Heavy Duty Diesel Engines can offer to support engineers and technicians working in power plants, petroleum industries, and fleet management and maintenance. It will show how to safely use such engines economically, safely and environment friendly.
- This Maintenance Engineering training seminar will emphasize the application of related recommended operation and maintenance practices advised by the most reputable manufacturers and by the relevant standards, focus on proper HD Diesel engine selection for specific jobs, retrieval and interpretation of data from HD Diesel engines manuals.

### This training seminar will feature:

- Discussions on the benefits and applications of heavy duty Diesel HDD engines
- The importance of correct operation and maintenance of HDD for better reliability
- The detailed description of HDD systems and characteristic performance
- Focusing on electronic control of HDD for economy and environment friendly operation

## OBJECTIVES

### By the end of this training seminar, participants will be able to:

- Outline the principle of operation of diesel engines
- Specify the difference between Heavy Duty Diesel Engines and normal Diesel engines
- Describe how combustion occurs in diesel engines
- Explain the reason of air charging in diesel engines
- List and explain the principle of operation of air charging systems in diesel engines
- List and explain the operation principle of various types of fuel injection systems used in HDD
- Describe the layout and components of various fuel injection systems used in HDD
- Explain how quantity and timing of injected fuel can be controlled
- State the benefits of Diesel Electronic Control (DEC)
- List and explain the principle of operation of various HDD emission control systems
- Outline the procedure and requirements for servicing HDD
- Outline the HDD basic routine maintenance operations
- List and explain how to fix the common HDD troubles

## TRAINING METHODOLOGY

- This Maintenance Engineering training seminar on Heavy Duty Diesel Engine (HDD) Operation and Maintenance will utilise a variety of proven adult learning techniques to ensure maximum understanding, comprehension and retention of the information presented. The daily training seminar sections will be highly interactive and participative. It also involves detailed discussions accompanying the presentation of videos showing the recent development in HDD, their correct operation, control and and maintenance, and how to troubleshoot their common troubles. Delegates are strongly encouraged to bring and analyse data from their own work domain; this adds greater relevancy to the content.

## ORGANISATIONAL IMPACT

When a company sends their employees to attend this particular training course, it expects following benefits will be gained:

- Optimization of delegates` usage of tools, equipment, and materials while maintaining the organization HDD engines
- Improved operational HDD engines` integrity and performance
- Minimizing equipment failures as a result of delegates` enhanced ability to risk analyses on HDD engines
- Enable better specification of new and replacement of old elements of piping system.
- Adding a set of delegates` skills that reflect positively on organization activities and reputation.
- Enhancing delegates` abilities to act properly in HDD engines related hazardous situations.
- Better safety record

## PERSONAL IMPACT

When a company employee attends this particular training seminar, the participant expects to add to his underpinning knowledge and practical experience the following:

- Better grasp of HDD engines` maintenance and instrumentation on incident prevention
- Better ability to troubleshoot HDD engines
- Improved confidence when facing HDD engines related hazardous safety issues
- Enhanced confidence and ability to select the appropriate HDD engines thereby improving reliability and personal profile to senior management
- Better awareness of his job-related recent technical developments and a great deal of personal satisfaction will be achieved
- Better daily work performance as a result of deeper understanding of the technologies and operation principles of HDD engines' systems
- Enhancing his self-learning ability

## WHO SHOULD ATTEND?

This training seminar is suitable to a wide range of professionals but will greatly benefit:

- Vehicles fleet maintenance engineers and technicians
- Fleet maintenance supervisors
- Automotive maintenance engineers
- Automotive maintenance technicians
- Diesel power generation plants engineers and technicians

## Course Outline

### Introduction to Heavy Duty Diesel (HDD) Engines

- Meaning of HDD Engine: Rating – Load factor – Operation Duration
- HDD Engine Glossary of Terms
- International Standards for HDD Engine
- HDD Engine Internal and External Characteristic Performance curves
- Design Considerations of HDD Engine
- HDD Engine Construction Features and Materials
- HDD Engine Applications

### Work Cycle and Combustion in HDD Engines

- Work Cycle, Internal and External Characteristic Curves of HDD Engines
- Diesel Fuel (Classification – Fuel properties – Fuel tests)
- Combustion Process in Diesel Engines
- Compression Ratio
- Combustion Chambers Shapes
- Direct & Indirect Injection Methods
- Homogenous Charge Compression Ignition (HCCI)
- Air Charging in Heavy Duty Diesel Engines: Types (Mechanical – Turbo – Pressure wave)
- Turbocharger Configuration (Combined Two Stage - Variable Geometry – Sequential )
- Turbocharger Control (Pressure – Fuel compensation)
- Turbocharger Performance Characteristics

### Fuel Injection Systems in HDD Engines

- Types and Principle of Operation of Fuel Injection Systems:
- Cummins Systems: (PT – CELECT unit injector – Accumulator – HPI – XPI)
- Caterpillar Systems: (HUEI/A – HUEI/B – Navistar – MEUI/A – MEUI/B)
- In-line or Multi-plungers Systems
- Common Rail Systems
- HDD Engines Fuel Injection Systems Layout and Components
- Methods of Control of Injected Fuel Quantity and Timing: (Hydraulic, Pneumatic, Electronic)

## Electronic Diesel Control (EDC)

- Advantages of EDC
- EDC Basic Layout and Components (ECU – Sensors – Actuators – Layout for various types of fuel injection systems)
- Open & Closed Loops and Data Processing
- Controlled Quantities: (Start – Drive mode – Idle speed – Maximum speed – Intermediate speed – Cruise speed - etc.)
- Injected Fuel Quantity Limits
- Emission Control Systems;
- Diesel Oxidation Catalyst (DOC)
- Diesel Particulate Filter (DPF)
- Selective Catalyst Reduction (SCR)
- Urea Injection (UI)
- Exhaust Gas Recirculation (EGR)
- Closed Crankcase Ventilation (CCV)

## Operation and Maintenance of HDD Engine

- Operation Tips for HDD Engine
- Indicator Lamps
- On-Board Diagnostics
- Fuel Type
- Items to be Noticed
- Tips for Efficient Operation
- Maintenance of Diesel Engines
- Basics of Mechanical Maintenance
- Servicing of Diesel Fuel Injection Systems
- Diesel Engine Tune-up
- Diesel Engine Routine Maintenance Operations (time-based, distance- based)
- Diesel Engines Troubleshooting
- Forms of Diesel Engine Components Failure
- Engines Troubleshooting and Fault Rectification

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