



MU014: Caterpillar Diesel Engine



Training Description:

This five-day course provides a full awareness of the main systems of Caterpillar Diesel Engine and teaches the ability to take simple measures to prevent mechanical breakdown. Mechanical failure is not accepted for terminals in case of Emergency Diesel Generation or Handling Equipment Engines because of the consequence of failure and its financial impact.

Training Objectives:

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

- ✓ Recognize all types and models of caterpillar diesel engines and their applications
- ✓ Have a better understanding with the major parts and component for caterpillar diesel engines and their function
- ✓ Understand troubleshooting and how to make failure analysis
- ✓ Summarize the technological advances in modern Caterpillar diesel engines
- ✓ Evaluate the sources of emissions from Caterpillar diesel engines and the influence of engine component design on curbing these emissions
- ✓ Recognize the importance of fuel injection parameters to performance and emission control
- ✓ Understand the importance of maintenance and servicing for Caterpillar diesel engines

Training Designed for:

This course is intended to those who are involved in diesel engine support industries such as catalytic converters, lube oils, gaskets, and turbocharger suppliers, and if you are not well versed with diesel engines although they play a major role in their career's survival.

Training Program:

DAY ONE:

- ❖ PRE-TEST
- ❖ **The Case for the Caterpillar Diesel Engine (Brief)**
 - Fuel consumption
 - Emissions
 - The Caterpillar diesel Engines and the future
 - Advantages and disadvantages of diesel engines
 - Thermal efficiency of diesel vs gasoline engines
 - Compression ratio limitations in diesel engines
- ❖ **The Diesel Combustion Process**
 - SI four-stroke
 - CI four-stroke
 - The diesel combustion cycle
- ❖ **Basic Types of Diesel Engines**
 - Open chamber - direct injection (DI)
 - indirect injection (IDI)
- ❖ **General Characteristics of DI & IDI Engines**
 - Peak combustion pressure and temperature





- Combustion severity
- Rate of pressure rise
- Noise
- Fuel economy
- Application
- Emissions

DAY TWO:

❖ The Caterpillar Diesel Fuel Injection System

- The basic system
- The Fuel tanks
- The water-separating pre-filter
- Fuel lift pump
- The engine fine filter
- Injection pump
- Injectors
- Functions of the diesel fuel injection system
- Types of diesel fuel injection systems
- Pump-line-nozzle systems (in-line pump)
- Pump-line-nozzle systems (distributor pump)
- Pump-line-nozzle systems (unit pump)
- Unit injector systems
- Common-rail injection systems
- Details of an in-line pump
- Operation of an in-line pump
- Multi-hole injector holder and nozzle
- Line dynamics and delivery valves
- Mechanical governors and boost control devices
- Engine installation and spray details
- Operation of a distributor pump
- Another type of distributor pump
- Mechanically-controlled unit injector
- Moving towards electronically-controlled systems
- Motivation for using electronically-controlled systems
- Basic electronic injection system
- Electronically-controlled in-line pump
- Visual differences between mechanical & electrical pumps
- Electronically-controlled distributor pumps

DAY THREE:

❖ Caterpillar Engines Air Management - Supercharging & Turbocharging

- The airway in
- The airway out
- Engine electrical systems
- The basic system





- Battery capacity and care
- Drive belts
- The alternator
- The purpose of air charging
- Methods of air charging
- Supercharger drives
- Types of superchargers
- Schematic representation of supercharger types
- Sample performance map of a supercharger
- Photographs of two centrifugal superchargers
- Sample performance map of a centrifugal supercharger
- Types of turbochargers
- Schematic representation of a turbocharging system
- Exhaust and charge airflow through a fixed geometry turbocharger
- Anatomy of a turbocharger
- Energy conversion in a turbocharger
- The importance of A/R in a turbocharger design
- Cutaway in a modern turbocharger
- Sample performance map of a turbocharger
- Waste-gated turbocharger
- Variable geometry turbocharger
- Combination system - wave charging
- Sequential turbocharging

Site Visit to Caterpillar Agent in Abu Dhabi

- Practical Illustration of the different Models of Caterpillar Engines and Discussion for Preventive Maintenance of CAT Engines

DAY FOUR:

- ❖ **Emissions Formation in Diesel Engines**
 - Hydrocarbon
 - Carbon monoxide
 - Nitrogen oxides
 - Particulate matter
 - Smoke
- ❖ **Emission Standards**
 - Europe
 - North America
- ❖ **Steps Towards the Modern Caterpillar Diesel Engine**
 - Injection
 - Combustion
 - Induction
 - Oil consumption
 - Engine electronics
 - Other design parameters



❖ Current Caterpillar Engines and Future Technologies

- Exhaust gas recirculation
- Multiple injections
- Auxiliary emission control devices (after treatment)
- Fuels and emulsion

DAY FIVE:

❖ Importance of weather and servicing

- Caterpillar Diesel Engine lubrication
- Transmission lubrication
- Winterization and servicing
- Service schedule

❖ Caterpillar Diesel Engines cooling system

- Seawater cooling
- Freshwater cooling
- Temperature control
- The thermostat
- The seawater impeller pump

❖ Starting System for Caterpillar Diesel Engines

- Air (Pneumatic Starting System)
- Electrical Starting System

“Practical Videos”

- ❖ Course Conclusion
- ❖ POST-TEST and EVALUATION

Training Requirement:

“Hand’s on practical sessions and personal safety equipment(s) is required during the site visit”:

- Safety Gears (Shoes, Gloves, Glasses and Helmet)

Please note that the above topics can be amended as per client’s learning needs and objectives. Further, it should be forwarded to us a month prior to the course dates.

Training Methodology:

This interactive training course includes the following training methodologies as a percentage of the total tuition hours:-

- 30% Lectures, Concepts, Role Play
- 70% Workshops & Work Presentations, Techniques, Based on Case Studies & Practical Exercises, Software & General Discussions
- Pre and Post Test

Training Certificate(s):

Internationally recognized certificate(s) will be issued to each participant who completed the course.





Training Fees:

As per the course location - This rate includes participant's manual, hand-outs, buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Note: The 5% VAT (Value Added Tax), will be effective starting 01st of January 2018 as per the new regulation from the UAE Government. The VAT applies for all quotation both for local and abroad.

Training Timings:

Daily Timings:

07:45 - 08:00	Morning Coffee / Tea
08:00 - 10:00	First Session
10:00 - 10:20	Recess (Coffee/Tea/Snacks)
10:20 - 12:20	Second Session
12:20 - 13:30	Recess (Prayer Break & Lunch)
13:30 - 15:00	Last Session

For training registrations or in-house enquiries, please contact:

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Training & Career Development Department

