

Heavy-Duty Diesel Engine Operations and Maintenance Training Course

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Overview

Heavy-Duty Diesel Engine Operations and Maintenance Training Course is a one-week intermediate course for technicians, mechanics, engineers, supervisors, and operators who leave with an Engine Condition and Service Decision File. The course connects safe engine operation, combustion evidence, lubrication and cooling checks, common-rail fuel systems, turbocharging, exhaust aftertreatment, electronic engine diagnostics, preventive maintenance, fault isolation, and return-to-service decisions across fleet and industrial applications. Agile Leaders Training Center delivers this course on heavy-duty diesel engine operations and maintenance.

Who Should Attend

- Teams responsible for operating heavy-duty diesel engines within load, temperature, pressure, and emissions boundaries
- Functions responsible for inspection, lubrication, cooling, filtration, scheduled service, and maintenance records
- Teams responsible for fuel-system, air-system, turbocharger, and exhaust-aftertreatment condition
- Functions responsible for electronic engine diagnostics, fault-code evidence, sensor checks, and troubleshooting
- Supervisory groups responsible for work scope, parts decisions, test results, and return-to-service approval

The course assumes participants already use engine manuals, service records, measurement tools, or diagnostic displays and leaves out live repair authorization, machining, component rebuilding, and manufacturer-specific certification.

Departments and Industries

The course supports heavy-duty diesel engine operations and maintenance across mobile and stationary applications.

- Fleet maintenance, workshops, field service, and reliability engineering
- Mining, construction, quarrying, and earthmoving operations
- Power generation, utilities, industrial plants, and process facilities
- Road transport, logistics, marine service, and port equipment
- Technical services, spare-parts planning, and maintenance quality assurance

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Learning Objectives

By the end of this course, participants will be able to:

- Analyze diesel combustion, engine architecture, and operating evidence.
- Apply lubrication, cooling, intake, exhaust, and filtration checks.
- Diagnose common-rail fuel, turbocharger, sensor, and aftertreatment faults.
- Use electronic engine diagnostics and condition-test results.
- Build preventive maintenance and service decision controls.
- Evaluate corrective actions and return-to-service evidence.

Course Agenda

Day 1: Map Engine Operation

- Four-Stroke Compression-Ignition Cycle and Combustion Evidence Map
- Block, Head, Pistons, Cranktrain, Valve Train, and Timing-System Diagram
- Power, Torque, Speed, Load, Fuel-Rate, and Thermal Operating Envelope
- Starting, Warm-Up, Loading, Idle, Cool-Down, and Shutdown Checklist
- Operator Observation, Warning-Lamp, Noise, Smoke, and Trend Record

Day 2: Control Fluids and Airflow

- Lubrication Circuit, Oil-Pressure, Consumption, Contamination, and Sampling Check
- Cooling Circuit, Thermostat, Pump, Pressure, Temperature, and Leakage Test
- Air Cleaner, Intake Restriction, Charge-Air Cooler, and Boost Path Inspection
- Turbocharger Lubrication, Compressor, Turbine, Wastegate, and Actuator Assessment
- Crankcase Ventilation, Blowby, Compression, and Cylinder-Sealing Condition Test

Day 3: Assess Fuel and Aftertreatment

- Fuel Tank, Water Separation, Filtration, Priming, and Low-Pressure Supply Check
- Common-Rail Pump, Rail Pressure, Injector, Return-Flow, and Leakage Test
- Injection Timing, Cylinder Balance, Fuel Correction, and Combustion Symptom Matrix
- Exhaust Gas Recirculation and Diesel Oxidation Catalyst Condition Review
- Diesel Particulate Filter, Regeneration, Backpressure, SCR, and DEF Evidence Sheet

Day 4: Diagnose and Plan Service

- Heavy-Duty Diagnostic Trouble Code, Lamp Status, Freeze-Frame, and Parameter Review
- Sensor Supply, Ground, Signal, Plausibility, Harness, and Connector Test Sequence
- Hard-Start, Low-Power, Overheating, Smoke, Noise, and High-Consumption Fault Tree
- Service Interval, Duty Cycle, Inspection Finding, Fluid Trend, and Work-Scope Plan
- Repair Verification, Road-or-Load Test, Alarm Clearance, and Acceptance Record

Day 5: Practice Engine Decisions

- Exercise: Reconcile Operating Data, Warning Lamps, Smoke, and Combustion Evidence
- Exercise: Diagnose Lubrication, Cooling, Intake, and Turbocharger Symptoms
- Exercise: Isolate Common-Rail Fuel and Electronic Control Faults
- Exercise: Evaluate Aftertreatment Service and Return-to-Service Evidence
- Capstone Exercise: Build the Engine Condition and Service Decision File

Practical Exercises

The course uses suggested activities to connect engine evidence with controlled maintenance decisions.

- Suggested activity: compare load, speed, temperature, pressure, smoke, noise, and fluid evidence against an operating envelope.
- Suggested activity: trace fuel, air, lubrication, cooling, and aftertreatment paths before selecting condition tests.
- Suggested activity: interpret diagnostic trouble codes, live parameters, sensor checks, compression results, and fluid trends.
- Suggested activity: assemble findings, work scope, verification results, acceptance criteria, and return-to-service approval.

FAQs

Who suits heavy-duty diesel engine operations and maintenance training, and what does it assume?

Heavy-duty diesel engine operations and maintenance training suits technicians, mechanics, engineers, supervisors, and operators who already use service records, measurements, manuals, or diagnostic displays.

How does heavy-duty diesel engine maintenance differ from general maintenance management?

Heavy-duty diesel engine maintenance focuses on engine systems, operating evidence, condition tests, diagnostic data, service actions, and verification, while general maintenance management focuses on work processes, resources, schedules, costs, and performance controls.

How are common-rail diesel engine faults diagnosed?

Common-rail diesel engine faults are diagnosed by confirming symptoms, checking supply pressure and contamination, comparing commanded and actual rail pressure, evaluating injector correction and return flow, testing electrical signals, and verifying repair results.

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What evidence supports diesel engine return-to-service decisions?

Diesel engine return-to-service decisions use resolved fault causes, acceptable fluid and pressure checks, cleared alarms, stable operating parameters, completed service records, verified aftertreatment function, and a controlled load test.

Conclusion

Participants take back an Engine Condition and Service Decision File. The file connects operating limits, system checks, diagnostic data, condition tests, service intervals, fault causes, corrective actions, verification results, and acceptance evidence. It changes scattered workshop observations into a traceable basis for maintenance scope, fault isolation, and return-to-service decisions.

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