DIESEL TECHNOLOGY 1, 2, 3, and 4
ACTIVITY COURSE CODES: 6310, 6311, 6312, 6313

Description:

The Diesel Technology program provides a broad foundation in the diesel repair field by preparing students for entry level positions in the field of heavy duty diesel vehicle repair. Students gain skills in engine repair, fuel supply and management, suspension and brakes, hydraulic systems operation, and lighting and instrumentation. Students entering this program should exhibit mechanical aptitude, the ability to read and follow instructions as outlined in service repair manuals, and enjoy precision work and problem solving.

Objective:

Given the necessary equipment, materials, and instruction, students, on completion of the prescribed course of study, will be able to successfully accomplish the following industry standards; they will complete a minimum four-unit sequence of CATE courses in order to be completers of the Diesel Technology program.

Credit: 1, 2, or 3 Carnegie units (per course code; dependent upon a school's schedule)

Resource:

National Automotive Technicians Education Foundation
http://www.natef.org

A. General Engine Diagnosis

1. Inspect fuel, oil, and coolant levels, condition, and consumption; determine needed action.
2. Diagnose causes of engine fuel, oil, coolant, air, and other leaks; determine needed action.
3. Interpret engine noises; determine needed action.
4. Observe engine exhaust smoke color and quantity; determine needed action.
5. Perform air intake system restriction and leakage tests; determine needed action.
6. Perform intake manifold pressure (boost) test; determine needed action.
7. Perform exhaust back pressure test; determine needed action.
8. Perform crankcase pressure test; determine needed action.
9. Diagnose no cranking, cranks but fails to start, hard starting, and starts but does not continue to run problems; determine needed action.
10. Diagnose surging, rough operation, misfiring, low power, slow deceleration, slow acceleration, and shutdown problems; determine needed action.
11. Diagnose engine vibration problems; determine needed action.
12. Check, record, and clear electronic diagnostic (fault) codes; monitor electronic data; determine needed action.
13. Perform cylinder compression test; determine needed action.

B. Cylinder Head and Valve Train Diagnosis and Repair

1. Remove, clean, inspect for visible damage, and replace cylinder head(s) assembly.
2. Clean and inspect threaded holes, studs, and bolts for serviceability; determine needed action.
3. Inspect cylinder head for cracks/damage; check mating surfaces for warpage; check condition of passages; inspect core/expansion and gallery plugs; determine needed action.
4. Disassemble head and inspect valves, guides, seats, springs, retainers, rotators, locks, and seals; determine needed action.
5. Measure valve head height relative to deck and valve face-to-seat contact; determine needed action.
6. Inspect and adjust valve bridges (crossheads) and guides; perform needed action.
7. Reassemble cylinder head.
8. Inspect, measure, and replace/reinstall overhead camshaft; measure/adjust end play and backlash.
9. Inspect pushrods, rocker arms, rocker arm shafts, electronic wiring harness, and brackets for wear, bending, cracks, looseness, and blocked oil passages; perform needed action.
10. Inspect cam followers; perform needed action.
11. Adjust valve clearance.

C. Engine Block Diagnosis and Repair

1. Remove, inspect, service, and install pans, covers, vents, gaskets, seals, and wear rings.
2. Disassemble, clean, and inspect engine block for cracks/damage; measure mating surfaces for warpage; check condition of passages, core/expansion, and gallery plugs; inspect threaded holes, studs, dowel pins, and bolts for serviceability; determine needed action.
3. Inspect cylinder sleeve counterbore and lower bore; check bore distortion; determine needed action.
4. Clean, inspect, and measure cylinder walls or liners for wear and damage; determine needed action.
5. Replace/reinstall cylinder liners and seals; check and adjust liner height (protrusion).
6. Inspect in-block camshaft bearings for wear and damage; determine needed action.
7. Clean and inspect crankshaft for surface cracks and journal damage; check condition of oil passages; check passage plugs; measure journal diameter; determine needed action.
8. Inspect main bearings for wear patterns and damage; replace as needed; check bearing clearances; check and adjust crankshaft end play.
9. Inspect, install, and time gear train; measure gear backlash; determine needed action.

10. Inspect connecting rod and bearings for wear patterns; measure pistons, pins, retainers, and bushings; perform needed action.
11. Determine piston-to-cylinder wall clearance; check ring-to-groove clearance and end gap; install rings on pistons.
12. Assemble pistons and connecting rods; install in block; install rod bearings and check clearances.
13. Check condition of piston cooling jets (nozzles); determine needed action.
14. Inspect and measure crankshaft vibration damper; determine needed action.
15. Inspect flywheel/flexplate (including ring gear) and mounting surfaces for cracks and wear; measure runout; determine needed action.

D. Lubrication Systems Diagnosis and Repair

1. Test engine oil pressure and check operation of pressure sensor, gauge, and/or sending unit; determine needed action.
2. Check engine oil level, condition, and consumption; determine needed action.
3. Inspect and measure oil pump, drives, inlet pipes, and pick-up screens; determine needed action.
4. Inspect oil pressure regulator valve(s), by-pass and pressure relief valve(s), oil thermostat, and filters; determine needed action.
5. Inspect turbocharger lubrication system; determine needed action.
6. Determine proper lubricant and perform oil and filter change.

E. Cooling System Diagnosis and Repair

1. Check engine coolant type, level, condition, and consumption; determine needed action.
2. Test coolant temperature and check operation of temperature sensor, gauge, and/or sending unit; determine needed action.
3. Inspect and reinstall/replace pulleys, tensioners, and drive belts; adjust drive belts and check alignment.
4. Inspect thermostat(s), by-passes, housing(s), and seals; replace as needed.
5. Test coolant for freeze protection and additive package concentration; adjust as needed.
6. Recover, flush, and refill with recommended coolant/additive package; bleed cooling system.
7. Inspect coolant conditioner/filter assembly for leaks; inspect valves, lines, and fittings; replace as needed.
8. Inspect water pump and hoses; replace as needed.
9. Inspect, clean, and pressure test radiator, pressure cap, tank(s), and recovery systems; determine needed action.
10. Inspect thermostatic cooling fan system (hydraulic, pneumatic, and electronic) and fan shroud; replace as needed.

F. Air Induction and Exhaust Systems Diagnosis and Repair

1. Inspect turbocharger(s), wastegate, and piping systems; determine needed action.
2. Check air induction system: piping, hoses, clamps, and mounting; check for air restrictions and leaks; service or replace air filter as needed.
3. Remove and reinstall turbocharger/wastegate assembly.
4. Inspect intake manifold, gaskets, and connections; replace as needed.
5. Inspect, clean, and test charge air cooler assemblies; replace as needed.
6. Inspect exhaust manifold, piping, mufflers, exhaust after-treatment device(s), and mounting hardware; repair or replace as needed.
7. Inspect and test preheater/inlet air heater or glow plug system and controls; perform needed action.
8. Inspect and test exhaust gas recirculation (EGR) system; determine needed action.

G. Fuel System Diagnosis and Repair: Fuel Supply System Diagnosis and Repair

1. Check fuel level, quality, and consumption; determine needed action.
2. Inspect fuel tanks, vents, caps, mounts, valves, screens, crossover system, and supply and return lines and fittings; determine action needed.
3. Inspect, clean, and test fuel transfer (lift) pump, pump drives, screens, fuel/water separators/indicators, filters, heaters, coolers, ECM cooling plates, and mounting hardware; determine needed action.
4. Inspect and test low pressure regulator systems (check valves, pressure regulator valves, and restrictive fittings); determine needed action.
5. Check fuel system for air; determine needed action; prime and bleed fuel system; check primer pump.

H. Fuel System Diagnosis and Repair: Mechanical Fuel Supply System Diagnosis and Repair

1. Perform on-engine inspections, tests, and adjustments; check and adjust timing or replace and time a distributor (rotary) type injection pump; determine needed action.
2. Perform on-engine inspections, tests, and adjustments; check and adjust timing or replace and time an in-line type injection pump; determine needed action.
3. Inspect and adjust throttle control linkage; determine needed action.
4. Inspect, test, and adjust engine fuel shut-down devices and controls; determine needed action.
5. Inspect high pressure injection lines, hold downs, fittings, and seals; replace as needed.

I. Fuel System Diagnosis and Repair: Electronic Fuel Management System Diagnosis and Repair

1. Inspect and test power and ground circuits and connections; measure and interpret voltage, voltage drop, amperage, and resistance readings using a digital multimeter (DMM); determine needed action.
2. Locate and use relevant service information (to include diagnostic procedures, flow charts, and wiring diagrams).
3. Inspect and replace electrical connector terminals, seals, and locks.
4. Inspect and test switches, sensors, controls, actuator components, and circuits; adjust or replace as needed.
5. Access and change customer parameters using recommended electronic diagnostic tools (to include PC-based software and/or data scan tools).
6. Perform on-engine inspections and tests on common rail type injection systems; determine needed action.

J. Engine Brakes

1. Inspect and adjust engine compression/exhaust brakes; determine needed action.
2. Inspect, test, and adjust engine compression/exhaust brake control circuits, switches, and solenoids; repair or replace as needed.
3. Inspect engine compression/exhaust brake housing, valves, seals, screens, lines, and fittings; repair or replace as needed.