Light Vehicle Diesel Engines

Chapter 6 Diesel Engine Condition Diagnosis

Opening Your Class

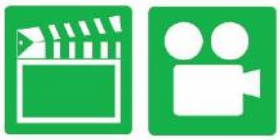
KEY ELEMENT	EXAMPLES
Introduce Content	This Light Vehicle Diesel Engines 1st text provides complete coverage of light duty diesel engine components, operation, and diagnosis. It correlates material to task lists specified by ASE and NATEF and emphasizes a problem-solving approach. Chapter features include Tech Tips, Frequently Asked Questions, and Real World Fixes: www.jameshalderman.com contains Videos, Animations, and Task Sheets for use in the lab and classroom.
Motivate Learners	Explain how the knowledge of how something works translates into the ability to use that knowledge to figure why the engine does not work correctly and how this saves diagnosis time.
State the learning objectives for the chapter or course you are about to cover and explain this is what they should be able to do as a result of attending this session or class.	Explain the chapter learning objectives to the students as listed: 1. Prepare for the Light Vehicle Diesel Engine (A9) ASE certification test content area "A" (General Diagnosis). 2. Discuss the importance of checking for diagnostic trouble codes (DTCs) and technical service bulletins (TSBs). 3. Discuss typical engine-related complaints and diesel engine smoke diagnosis. 4. Discuss the importance of visual checks. 5 Discuss engine noise diagnosis 6. Explain oil pressure testing and the purpose of oil pressure warning lamps. 7. Discuss the crankcase pressure test. 8. Explain compression testing, and compare wet and compression tests. 9. Describe the cylinder power balance test. 10. Discuss engine starting and charging system tests.
Establish the Mood or Climate	Provide a ***WELCOME,*** Avoid put downs and bad jokes.
Complete Essentials	Restrooms, breaks, registration, tests, etc.
Clarify and Establish Knowledge Base	Do a round robin of the class by going around the room and having each student give their backgrounds, years of experience, family, hobbies, career goals, or anything they want to share.

NOTE: This lesson plan is based on the 1st Edition Chapter Images found on Jim's web site @ www.jameshalderman.com

LINK CHP 06 Chapter Images: USE BELOW LINK

http://www.jameshalderman.com/books_a9.html

NOTE: You can use Chapter Images or Power Point files: Though out Power Point Presentations, you will find questions and answers on slides that can be used for discussion.

ICONS	CH06 Diesel Engine Condition Diagnosis
        	1. SLIDE 1 CH06 DIESEL ENGINE CONDITION DIAGNOSIS Check for ADDITIONAL VIDEOS & ANIMATIONS @ http://www.jameshalderman.com/ WEB SITE IS CONSTANTLY UPDATED **Light Diesel (111 Links)** http://www.jameshalderman.com/books_a9.html Crossword Puzzle (Microsoft Word) (PDF) Word Search Puzzle (Microsoft Word) (PDF **SAFETY** Always be very careful when working on a Diesel engine that is running with air intake removed. MOST ENGINES DO NOT USE a throttle plate, objects can very easily be sucked into engine, causing serious engine damage. MOST OEMs offer intake covers. 2. SLIDE 2 EXPLAIN FIGURE 6–1 typical "Check Engine" light which should come on when ignition is first turned on as bulb check and then go out. If check engine light remains on, then PCM detected fault & DTC set 3. SLIDE 3 EXPLAIN FIGURE 6–2 After checking for stored DTCs, wise technician checks service information for any technical service bulletins that may relate to the vehicle being serviced. **DISCUSSION: Ask students to describe some common mechanical-related customer complaints about the engine.** **DISCUSSION: Ask students to consider kinds of questions they should ask customers prior to diagnosing an engine problem. Then discuss visual inspections they should conduct** 4. SLIDE 4 EXPLAIN FIGURE 6–3 Checking engine oil level and condition is almost always first step in diagnosis of any diesel engine diagnosis.

ICONS	CH06 Diesel Engine Condition Diagnosis
	5. **SLIDE 5 EXPLAIN FIGURE 6–4** Coolant condition can be easily checked using test strips. 6. **SLIDE 6 EXPLAIN FIGURE 6–5** Using black light to spot leaks after adding dye to oil. Fluorescent dye works best with clean oil.
	**HANDS-ON TASK: Have students check oil level and condition of an engine. Then have them check the coolant level and condition of an engine.**
	**DISCUSSION: Talk about different types of leaks that may be observed under vehicle and how color of the fluid indicates type of leak. Discuss consequences of oil leaks.**
	**HANDS-ON TASK: Use foot powder spray trick to check for engine oil leaks.**
	**ON-VEHICLE TASK: Task Inspect engine for fuel, oil, coolant and other leaks; determine necessary action**
	7. **SLIDE 7 EXPLAIN FIGURE 6–6** accessory belt tensioner. Most tensioners have a mark that indicates normal operating location. If belt has stretched, this indicator mark will be outside of normal range. Anything wrong with belt or tensioner can cause noise.
	**DISCUSS CHART 6-1: Typical noises and possible causes.**
	**DISCUSSION: Ask students to describe some of possible causes of engine knock. Discuss possible causes of low oil pressure.**
	**ON-VEHICLE TASK: Task Diagnose engine noises and vibration; determine necessary action**

ICONS	CH06 Diesel Engine Condition Diagnosis
         	8. **SLIDE 8 EXPLAIN FIGURE 6–7** crankcase breather being removed from valve cover of a 6.7 liter Cummins diesel engine. **DEMONSTRATION: Show students location of crankcase vent hose** 9. **SLIDE 9 EXPLAIN FIGURE 6–8** gauge measures low positive and negative pressures in units of inches of water. (1 inch of mercury (in. Hg) equals 14 inches of water so this unit is very small.) Connect gauge to source that can measure crankcase pressure, usually at oil dipstick tube. **EXPLAIN TECH TIP: Quick & Easy Crankcase Pressure Test** 10. **SLIDE 10 EXPLAIN FIGURE 6–9** measure **engine oil pressure**, remove oil pressure sending (sender) unit, usually located near the oil filter. Screw the pressure gauge into the oil pressure sending unit hole. **DISCUSS FREQUENTLY ASKED QUESTION: If the Oil Pressure Light Is Not On, Why Should I Check the Oil Pressure?** **DEMONSTRATION: Show how to use oil pressure gauge to test oil pressure.** **ON-VEHICLE TASK: Perform oil pressure test; determine necessary action** **DISCUSSION: When you are driving your car, oil pressure warning light IS ON. What conditions are indicated? What actions should you take as a driver? Discuss differences between oil light and an oil gauge on dash. Why does oil gauge vary at idle on some vehicles and not on others?** 11. **SLIDE 11 EXPLAIN FIGURE 6–10** GM Tech 2 scan tool display showing a random **MISFIRE DTC (P0300)** has been detected. 12. **SLIDE 12 EXPLAIN FIGURE 6–11** Ford IDS scan tool has graph function that allows technician to view data

ICONS	CH06 Diesel Engine Condition Diagnosis
	on cylinder contribution test visually, making diagnosis easier. Cylinders on bank 2 on Ford 6.7 Power Stroke (cylinders 7, 6, 5, & 8) are weak 13. **SLIDE 13 EXPLAIN FIGURE 6–12 (a)** relative compression test using an amp clamp around starter motor power cable & Pico scope. 14. **SLIDE 14 EXPLAIN FIGURE 6–12 (b)** result is a waveform that displays current needed for each cylinder under compression. This test indicates that all cylinders are requiring same current to rotate starter motor, indicating that all cylinders have same relative compression
	**DEMONSTRATION: Show how to DO relative compression test using amp clamp around starter motor power cable & Pico scope.**
	15. **SLIDE 15 EXPLAIN FIGURE 6–13** diesel engine compression gauge being used to test compression on Duramax diesel engine.
	**DEMONSTRATION: Show students a compression gauge & how it attaches to engine.**
 	**DISCUSSION: Discuss the reasons for loss of compression. Ask students to describe how to perform a Compression Test**
	**DEMONSTRATION: Show students how to perform a wet compression test and discuss results.**
 	**ON-VEHICLE TASK: Perform cylinder compression tests; determine necessary action (P-1)**
	16. **SLIDE 16 EXPLAIN FIGURE 6–14** Most light-duty diesel vehicles are equipped with two **BATTERIES** connected in parallel as shown. Two 500 amperes, 12-volt batteries are capable of supplying 1,000 amperes at 12 volts, which is needed to start many diesel engines. 17. **SLIDE 17 EXPLAIN FIGURE 6–15** battery that measures 12.6 volts or higher after the surface charge has been removed is 100% charged.

ICONS	CH06 Diesel Engine Condition Diagnosis
	**DISCUSS CHART 6-2: estimated state of charge of a 12-volt battery after surface charge has been removed**
	**18. SLIDE 18 EXPLAIN FIGURE 6–16** Midtronics tester that can not only test battery, but can also detect faults with starter & alternator.
	**DEMONSTRATION: Show students how to properly test a battery using Conductance Tester**
	**TECH TIP: Dead Batteries Can Freeze**
	**DEMONSTRATION: Using a voltmeter, demonstrate how to find corroded and/or poor connections by measuring voltage drop.**
	**Jump Box Usage (View) (Download)** **Jump Starting Hybrids (View) (Download)** **Jumper Cable Usage (View) (Download)** **Measure Battery Voltage Drop (View) (Download)** **Meter Usage Battery Volt Check (View) (Download)**
	**19. SLIDE 19 EXPLAIN FIGURE 6–17** Clamp-on digital multimeter (DMM) used to check **BATTERY ELECTRICAL DRAIN**. Meter reads over a half an ampere, which exceeds normal specification of 0.050A.
	20. SLIDE 20 EXPLAIN FIGURE 6–18 After connecting shut-off tool, start engine operate all accessories. Stop engine and turn off everything. Connect ammeter across shut-off switch in parallel. Wait 20 minutes. This time allows all electronic circuits to "time out" or shut down. Open switch—all current now will flow through ammeter. A reading greater than specified (usually > 50 milliamperes, or 0.05 ampere) indicates a problem that should be corrected.
	**DEMONSTRATION: Show students how to perform a parasitic draw test using an ammeter with an inductive lead.**
	**DEMONSTRATION: Show the students how to perform a parasitic draw test using an ammeter hooked up in series.**

ICONS	CH06 Diesel Engine Condition Diagnosis
	Students complete Task Sheet, Task Sheet: Measure and diagnose the cause (s) of excessive parasitic draw; determine necessary action (P-1)
	Students complete Task Sheet Perform battery state-of-charge (conductance) test; determine necessary action. (P-1),
	Students complete NATEF Task Sheet, Page 151 Task Sheet: Perform battery charge (P-1)