

Light Vehicle Diesel Engines

Chapter 7 Diesel Engine Disassembly, Cleaning, Crack Detection

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: <ol style="list-style-type: none"> 1. Prepare for the Light Vehicle Diesel Engine (A9) ASE certification test content area "B" (Cylinder Head Diagnosis and Repair) and content area "C" (Engine Block Diagnosis and Repair). 2. Explain the engine removal procedure. 3. Explain the disassembly of the short block, rotating engine assembly, and cylinder head. 4. Explain the mechanical cleaning procedure of engines. 5. Discuss chemical cleaners. 6. Compare spray, steam cleaning, thermal cleaning, tank, vapor cleaning, ultrasonic and vibratory cleaning. 7. Explain crack detection
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 07_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	CH07 DIESEL ENGINE DISASSEMBLY
         	<p>1. SLIDE 1 CH07 DIESEL ENGINE DISASSEMBLY, CLEANING, CRACK DETECTION</p> <p>Check for ADDITIONAL VIDEOS & ANIMATIONS @ http://www.jameshalderman.com/ WEB SITE IS CONSTANTLY UPDATED</p> <p><u>Light Diesel (111 Links)</u></p> <p>http://www.jameshalderman.com/books_a9.html Crossword Puzzle (Microsoft Word) (PDF) Word Search Puzzle (Microsoft Word) (PDF)</p> <p><u>SAFETY</u> Always be very careful when working on a Diesel engine that is running with air intake removed. Because most diesel ENGINES DO NOT USE a throttle plate, objects can very easily be sucked into engine, causing serious engine damage. MOST OEMs offer intake covers.</p> <p>2. SLIDE 2 EXPLAIN FIGURE 7-1 Several sections of the exhaust system to the turbocharger on a Duramax diesel engine need to be disconnected before the engine can be easily removed</p> <p><u>DEMONSTRATION:</u> Show how to identify engine in order to replace it. This includes knowing how to decode the VIN & finding certification labels.</p> <p><u>HANDS-ON TASK:</u> Have students locate & identify different engines in the shop as if they were going to replace them. Be sure to have them decode VIN.</p>

ICONS



CH07 DIESEL ENGINE DISASSEMBLY

3. **SLIDE 3 EXPLAIN FIGURE 7-2** Cummins 6.7 liter inline six-cylinder diesel engine is so long that it is best to use an engine stand that supports the engine from the side rather than from the bell housing section of the block..

DEMONSTRATION: Show students how to properly use a transverse engine support bracket.

HANDS-ON TASK: Have students set up transverse engine support bracket on LAB VEHICLE

ON-VEHICLE TASK Remove and reinstall diesel engine

4. **SLIDE 4 EXPLAIN FIGURE 7-3** Rocker arm shaft being removed from a Duramax V-8 diesel engine.
5. **SLIDE 5 EXPLAIN FIGURE 7-4** Cylinder head bolts being loosened on a Cummins 6.7-liter diesel engine, starting at the ends of the head and working toward the center.
6. **SLIDE 6 EXPLAIN FIGURE 7-5** Removing the rod cap from a Fiat Chrysler 3.0 liter V-6 diesel engine shows that the rod uses a fracture rod cap design.

DEMONSTRATION: Show how to identify rod caps, main bearing caps, and camshaft journals.

7. **SLIDE 7 EXPLAIN FIGURE 7-6** front cover covering gears for camshaft and high-pressure pump is being removed from a Duramax diesel engine.
8. **SLIDE 8 EXPLAIN FIGURE 7-7** Main bearing cap being removed from a Cummins 6.7-liter diesel engine. The caps are marked so there was no need to mark their location or direction.

ON-VEHICLE TASK Disassemble engine block; clean and prepare components for inspection and reassembly

ICONS	CH07 DIESEL ENGINE DISASSEMBLY
	<p>EXPLAIN TECH TIP: Mark it to Be Safe</p>
	<p>9. SLIDE 9 EXPLAIN FIGURE 7–8 valve spring compressor is used to compress the valve spring before removing the keepers (locks).</p>
	<p>EXPLAIN TECH TIP: USE A PLASTIC SCRAPER</p>
	<p>10. SLIDE 10 EXPLAIN FIGURE 7–9 Abrasive disc commonly called by its trade name, Scotch Brite™ pad.</p> <p>11. SLIDE 11 EXPLAIN FIGURE 7–10 Smaller engine parts can be blasted clean in a sealed cabinet.</p>
 	<p>ON-VEHICLE TASK Remove cylinder head; inspect gasket condition; install cylinder head, gasket; tighten according to specifications & procedures</p>
	<p>12. SLIDE 12 EXPLAIN FIGURE 7–11 pressure jet washer is similar to a large industrial-sized dishwasher. Each part is then rinsed with water to remove chemicals or debris that may remain there while it is still in the tank.)</p>
	<p>13. SLIDE 13 EXPLAIN FIGURE 7–12 microbial cleaning tank uses microbes to clean grease and oil from parts.</p>
	<p>14. SLIDE 14 EXPLAIN FIGURE 7–13 (a) pyrolytic (high-temperature) oven cleans by baking engine parts. After parts have been cleaned, they are then placed into an airless blaster. This unit uses a paddle to scoop stainless steel shot from a reservoir and forces it against the engine part. Parts must be free of grease and oil to function correctly.</p>
	<p>15. SLIDE 15 EXPLAIN FIGURE 7–13 (b) This cleaned engine block has been baked and shot blasted</p>
	<p>DEMONSTRATION: Show different types of engine cleaning chemicals and equipment & demonstrate how to use them.</p>
	<p>DISCUSSION: Have students discuss different types of metals used in an engine.</p>

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  	<p>Some examples are steel, aluminum, copper, brass, & magnesium.</p> <p>DEMONSTRATION: Show how to properly clean a cylinder head using solvents. Follow all safety precautions and make sure the students understand the reasons for each.</p> <p>16. SLIDE 16 EXPLAIN FIGURE 7-14 ultrasonic cleaner is used to clean fuel injectors</p> <p>17. SLIDE 17 EXPLAIN FIGURE 7-15 top deck surface of a block is being tested using magnetic crack inspection equipment.</p> <p>18. SLIDE 18 EXPLAIN FIGURE 7-16 If lines of force are interrupted by a break (crack) in the casting, then two magnetic fields are created and the powder will lodge in the crack.</p> <p>19. SLIDE 19 EXPLAIN FIGURE 7-17 cylinder head is under water and being pressure tested using compressed air. Note that the air bubbles indicate a crack.</p>
       	<p>DEMONSTRATION: Show how to check for cracks in engine components using compression gauge & cylinder leak-down test.</p> <p>Welding is another way to fix cracks in outside of engine block</p> <p>DISCUSSION: Ask how strong weld should be. The weld should be stronger than metal that it bonds to. A weld that fails is considered to be of poor quality and workmanship.</p> <p>DISCUSSION: Ask whether it is possible to repair a cracked cylinder head using an oil or coolant additive.</p> <p>ON-VEHICLE TASK Inspect for cracks in cylinder head Check for cracks in engine block</p>