Advanced Engine Performance Diagnosis

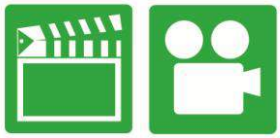
Chapter 5 IN-VEHICLE ENGINE SERVICE

Opening Your Class

KEY ELEMENT	EXAMPLES
Introduce Content	This course or class provides complete coverage of the components, operation, design, and troubleshooting. 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, Real World Fixes, Videos, Animations, and NATEF Task Sheet references.
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, which translates into more money.
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. 1. Diagnose and replace the thermostat. 2. Diagnose and replace the water pump. 3. Diagnose and replace an intake manifold gasket 4. Determine and verify correct cam timing 5. Replace a timing a belt 6. Describe how to adjust valves 7. Explain hybrid engine precautions 8. Prepare for ASE certification test content area "A" (General Engine Diagnosis)
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 Advanced Engine Performance Diagnosis 6/E Chapter Images found on Jim's web site @ www.jameshalderman.com

LINK CHP 05: Chapter Images

ICONS	Ch05 IN-VEHICLE ENGINE SERVICE
	**1. SLIDE 1 CH05 IN-VEHICLE ENGINE SERVICE**
	**Check for ADDITIONAL VIDEOS & ANIMATIONS @ http://www.jameshalderman.com/** **WEB SITE REGULARLY UPDATED**
	**At the beginning of this class, you can download the crossword puzzle & Word Search from the links below to familiarize your class with the terms in this chapter & then discuss them**
	**Crossword Puzzle (Microsoft Word) (PDF)** **Word Search Puzzle (Microsoft Word) (PDF)**
	**2. SLIDE 2 EXPLAIN Figure 5-1** If thermostat has a jiggle valve, it should be placed toward the top to allow air to escape. If a thermostat were to become stuck open or open too soon, this can set a DTC P0128 (coolant temperature below thermostat regulating temperature). **RUNNING ENGINE WITHOUT A THERMOSTAT COULD CAUSE OVERHEATING. COOLANT FLOWS TOO FAST TO ALLOW RADIATOR TO REMOVE HEAT.**
	
	**HANDS-ON TASK: HAVE STUDENTS BENCH TEST A THERMOSTAT**
	**DEMONSTRATION: SHOW STUDENTS HOW TO BURP (PURGE) THE AIR FROM A COOLING SYSTEM.**
	**3. SLIDE 3 EXPLAIN Figure 5-2** Use caution if using a steel scraper to remove a gasket from aluminum parts. It is best to use a wood or plastic scraper.
	**WATER PUMP WEEP HOLE LEAKS WILL SOMETIMES LEAK ONLY HOT OR COLD**

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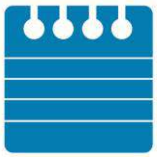
	**ON-VEHICLE HANDS-ON TASK: HAVE STUDENTS INSPECT WATER PUMP. INSPECTIONS SHOULD INCLUDE: BEARINGS, LEAKS, FLOW.**
	**AFTER WATER PUMP REPLACEMENT, COOLING SYSTEM SHOULD BE FILLED AND PRESSURED AS SOON AS POSSIBLE. THIS WILL ENABLE YOU TO FIND ANY LEAKS BEFORE JOB IS COMPLETED.**
	4. **SLIDE 4 EXPLAIN** Figure **5-3** An intake manifold gasket that failed and allowed coolant to be drawn into the cylinder(s). 5. **SLIDE 5 EXPLAIN Figure 5-4** The lower intake manifold attaches to the cylinder heads. 6. **SLIDE 6 EXPLAIN Figure 5-5** upper intake manifold, often called a plenum, attaches to the lower intake manifold. 7. **SLIDE 7 EXPLAIN Figure 5-6** Some plastic intake manifold are equipped with a pressure relief valve that would open in the event of a backfire condition to prevent the higher internal pressures from causing damage to the manifold
	**DEMONSTRATION: SHOW STUDENTS HOW TO USE TORQUE WRENCH TO TIGHTEN AN INTAKE MANIFOLD.**
	**ON-VEHICLE HANDS-ON TASK: HAVE STUDENTS R&R AN INTAKE MANIFOLD GASKET, USING THE CORRECT PROCEDURE. W3D2-TS1 PAGE 62 REPLACE INTAKE MANIFOLD GASKET**
	8. **SLIDE 8 EXPLAIN FIGURE 5–7** A single overhead camshaft engine with a timing belt that also rotates the water pump.
	**MOST OVERHEAD CAM (OHC) ENGINES USED TODAY ARE NOT FREE RUNNING. THIS MEANS THAT ENGINE DAMAGE CAN OCCUR IF TIMING BELT BREAKS. THIS DAMAGE COULD BE BENT VALVES, DAMAGED VALVE SEATS, HOLED PISTONS, ETC.**

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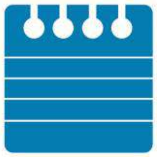  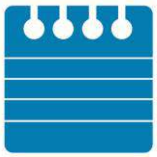 	**ALWAYS ROTATE AN ENGINE BY HAND TO VERIFY TIMING. IF ANY BINDING IS FELT, STOP! THIS COULD MEAN THAT VALVES ARE HITTING PISTONS.** **ON-VEHICLE NATEF TASK: INSPECT AND REPLACE CAMSHAFT & DRIVE BELT/CHAIN** **DIGITAL PHOTOGRAPHS TAKEN BEFORE DISASSEMBLY FOR VALVE ADJUSTMENT CAN SAVE TIME WHEN REASSEMBLING** 9. **SLIDE 9 EXPLAIN Figure 5-8** A Toyota/Lexus hybrid electric vehicle has a ready light. If the ready light is on, the engine can start at anytime without warning. 10. **SLIDE 10 EXPLAIN Figure 5-9** Always use viscosity of oil as specified on oil fill cap. 11. **SLIDE 11 EXPLAIN Figure 5-10** Diesel exhaust fluid cost $4 to $8 a gallon and is housed in a separate container that holds from 5 to 10 gallons, or enough to last until the next scheduled oil change in most diesel vehicles that use SCR  **DISCUSSION: ASK STUDENTS WHY IT IS IMPORTANT TO USE CORRECT TORQUE SEQUENCE AND TORQUE VALUES.**  12. **SLIDES 12-35 VALVE ADJUSTMENT SHOW**  **ON-VEHICLE NATEF TASK: ADJUST VALVES (MECHANICAL OR HYDRAULIC LIFTERS)**