

Automotive Heating and Air Conditioning, 8e

Chapter 7 Coolant

Opening Your Class

KEY ELEMENT	EXAMPLES
Introduce Content	This course or class covers operation and service of Automotive Heating and Air Conditioning, 8e . It correlates material to task lists specified by ASE and NATEF/ASEEducation.
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 as listed: 1. Discuss coolant fundamentals. 2. Compare the different types of coolant. 3. Discuss coolant freezing/boiling temperatures. 4. Discuss coolant testing and coolant replacement issues.
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 8th Edition Chapter Images found on Jim's web site @ www.jameshalderman.com

LINK CHP 07:

http://www.jameshalderman.com/links/book_hvac/ci/hvac_ci_ch_7.pptx

These Power Point files contain more than just the images.

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DISCUSSION: Discuss how the mixing of types of coolants may harm the system. Discuss with students some examples of manufacturer issues with DEX-COOL. Who was the first OEM to use DEX-COOL?

10. SLIDE 10 **EXPLAIN** Figure 7-4 Coolant used in Fords that use Mazda engines and Mazda vehicles. It requires the use of a **PHOAT** coolant which is dark green.

11. SLIDE 11 **EXPLAIN WATER**

DISCUSSION: Discuss the importance of a proper coolant and water mix, and the problems that arise from incorrect mixtures.

DISCUSSION: Discuss with students why the freezing point and the boiling point are not the only things to check when testing coolant. What is the difference between freezing & boiling point?

12. SLIDES 12-14 **EXPLAIN** Coolant Freezing/Boiling Temperatures

15. SLIDES 15-16 **EXPLAIN** Coolant Testing

17. SLIDE 17 **EXPLAIN** FIGURE 7-7 Using refractometer is an accurate method to check freezing point of coolant

18. SLIDE 18 **EXPLAIN** FIGURE 7-8 meter that measures actual pH of coolant can be used for all coolants, unlike many test strips that cannot be used to test pH of red or orange coolants

19. SLIDE 19 **EXPLAIN** FIGURE 7-9 Galvanic activity is created by two dissimilar metals in contact with a liquid, in this case coolant.

DISCUSSION: Discuss with students why galvanic activity was not a big problem with the older steel engines.

DEMONSTRATION: Show students how to test for electrolysis in cooling system.

Coolant colors vary even within OEMS models. Color has no bearing on the service life of the coolant. Most OEMS recommend using distilled water, not tap water, in cooling systems. Distilled water does not have all the chemicals that can

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harm your cooling system.

Electrolysis in cooling system can create corrosion that destroys components from the inside out

20. SLIDE 20 **EXPLAIN** FIGURE 7-1 A test strip can be used to determine the pH and percentage of glycol of the coolant. The percentage of glycol determines the freezing and boiling temperatures, as shown on the bottle that contains the test strips.

HANDS-ON TASK: Have students use test strips to verify the coolant condition



21. SLIDE 21 **EXPLAIN** Coolant Replacement Issues

SEARCH INTERNET research the Internet to find out which coolants are organic acid technology types besides DEX-COOL. Have students research which states require embittered coolant other than California and Oregon. Have them share their findings in class.

ON-VEHICLE NATEF TASK

**Test and Replace Coolant (A1-D-7, A7-C-5) PG 44
Coolant Flush (A7-C-6) PG 45**



22. SLIDES 22-23 **EXPLAIN** Summary