

Automotive Fuel and Emissions Control Systems 4/E


Chapter 7 Diesel & BioDiesel Fuel









Opening Your Class

KEY ELEMENT	EXAMPLES
Introduce Content	This course or class covers operation and service of Automotive Fuel and Emissions Control Systems . It correlates material to task lists specified by ASE and NATEF.
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. Discuss the specifications of diesel fuel. 2. Discuss API gravity. 3. List the advantages and disadvantages of biodiesel. 4. Discuss E-diesel.
Establish the Mood or Climate	Provide a <i>WELCOME</i> , 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 Fuel & Emission Control 4th Edition Chapter Images found on Jim's web site @ www.jameshalderman.com

LINK CHP 7: [Chapter Images](#)

ICONS	Ch07 Diesel & BioDiesel Fuel
	<p>1. SLIDE 1 CH7 Diesel & BioDiesel Fuel</p> <p>Check for ADDITIONAL VIDEOS & ANIMATIONS @ http://www.jameshalderman.com/ WEB SITE REGULARLY UPDATED</p> <p><u>Videos</u></p> <p>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</p> <p>Crossword Puzzle (Microsoft Word) (PDF) Word Search Puzzle (Microsoft Word) (PDF)</p> <p><u>DISCUSSION:</u> DISCUSS <u>CLOUD POINT</u>. HOW DOES CLOUD POINT AFFECT FILTERS? HOW DO DIESEL FUEL SUPPLIERS ACCOMMODATE POUR POINT AND CLOUD POINT?</p> <p><u>DISCUSSION:</u> HAVE THE STUDENTS TALK ABOUT FEATURES & REQUIREMENTS OF DIESEL FUEL. REVIEW WHAT AMBIENT TEMPERATURE IS. WHAT IS MEANT BY DIESEL FUEL'S "<u>POUR POINT</u>"?</p> <p><u>DISCUSSION:</u> TALK ABOUT <u>CETANE #</u> FOR DIESEL FUEL. REVIEW WHY OCTANE RATING FOR DIESEL IS LOWER THAN THE OCTANE RATING FOR GAS. DOES COMBUSTION PRESSURE AFFECT DIESEL FUEL'S CETANE NUMBER?</p> <p><u>HANDS-ON TASK:</u> HAVE STUDENTS EXPLAIN WHAT A CETANE RATING MEANS & WHAT EFFECTS IF ANY IT HAS ON DRIVABILITY.</p> <p><u>CETANE #</u> MEASURE OF IGNITION QUALITY OF FUEL RELATIVE TO A REFERENCE FUEL MIXTURE COMPOSED OF CETANE AND ALPHA-METHYLNAPHTHALENE, THE %, BY VOLUME, OF CETANE IN MIXTURE BEING CETANE #. CCI</p>

ICONS	Ch07 Diesel & BioDiesel Fuel
	<p>STANDS FOR CALCULATED CETANE INDEX. HIGH CETANE NUMBERS INDICATE GOOD IGNITION QUALITY RESULTING IN A SHORT DELAY PERIOD AND LOW CETANE NUMBERS INDICATE POOR IGNITION QUALITY THAT RESULTS IN LONG DELAY PERIOD. LOW CETANE NUMBERS CAN CAUSE A LONG IGNITON DELAY, WHICH CAN CAUSE A HARD STARTING WITH WHITE SMOKE & MISFIRING. CETANE # FOR DIESEL FUELS IS NOT TO BE INTERPRETED IN THE SAME MANNER AS THE OCTANE NUMBER FOR GASOLINE. OCTANE # REQUIREMENT DEPENDS ON THE FULL-LOAD PERFORMANCE, WHILE THE CETANE # DEPENDS ON THE REQUIREMENTS FOR GOOD IGNITION AT LIGHT LOADS AND LOW TEMPERATURES</p>
	<p>2. SLIDE 2 EXPLAIN DIESEL FUEL & Figure 7-1 (a) Regular diesel fuel on the left has a clear or greenish tint, whereas fuel for off-road use is tinted red for identification.</p>
	<p>3. SLIDE 3 EXPLAIN DIESEL FUEL & Figure 7-1 (b) fuel pump in a farming area that clearly states the red diesel fuel is for off-road use only.</p>
	<p><u>DEMONSTRATION: OBTAIN REGULAR DIESEL & OFF-ROAD DIESEL TO SHOW VISUALLY THE DIFFERENCE IN TWO FUELS. FIGURE 7-1</u></p>
	<p><u>DISCUSSION: HAVE THE STUDENTS TALK ABOUT GRADES OF DIESEL FUEL. IN WHICH APPLICATIONS IS GRADE #1 USED? WHY? IN WHICH APPLICATIONS IS GRADE #2 USED? WHY?</u></p>
	<p>4. SLIDE 4 EXPLAIN Figure 7-2 Testing API viscosity of a diesel fuel sample using a hydrometer.</p>
	<p><u>DEMONSTRATION: USE A HYDROMETER TO SHOW THE STUDENTS HOW TO TEST API GRAVITY OF DIESEL FUEL: FIGURE 7-2</u></p>
	<p><u>HANDS-ON TASK: FIGURE 7-2 HAVE STUDENTS SAMPLE DIESEL FUEL AND TAKE AN API GRAVITY READING. HAVE THEM FIND WEIGHT DENSITY & POUNDS PER GALLON OF FUEL THAT THEY ARE SAMPLING.</u></p>

ICONS**Ch07 Diesel & BioDiesel Fuel****DEMO**

5. **SLIDE 5 EXPLAIN FIGURE 7-3** A fuel heater is part of the fuel filter and water separator located on the frame rail of a Ford pickup truck equipped with a PowerStroke 6.0 liter V-8 diesel engine

DEMONSTRATION: SHOW LOCATION OF FUEL HEATER & FUEL FILTER ON A DIESEL VEHICLE

DISCUSS FREQUENTLY ASKED QUESTION

6. **SLIDE 6 EXPLAIN Biodiesel & Figure 7-4** pump decal indicating that biodiesel fuel is ultra-low-sulfur diesel (ULSD) and must be used in 2007 and newer diesels

DISCUSSION: HAVE THE STUDENTS TALK ABOUT WHY SULFUR DIOXIDE IS HARMFUL TO ENVIRONMENT. WHAT IS DIFFERENCE IN APPEARANCE OF ULSD?

DISCUSS FREQUENTLY ASKED QUESTION

DISCUSSION: HAVE THE STUDENTS TALK ABOUT BIODIESEL BLENDS. CAN B20 BE USED IN UNMODIFIED DIESEL ENGINES? SINCE BIODIESEL COSTS MORE THAN REGULAR DIESEL, WHAT ARE ITS BENEFITS?

DISCUSSION: HAVE STUDENTS TALK ABOUT BIODIESEL IN RELATION TO VEGETABLE OIL. WHAT IS DIFFERENCE BETWEEN BIODIESEL POWERED VEHICLES & VEGETABLE-OIL-POWERED VEHICLES? ALSO DISCUSS E-DIESEL FUEL. WHAT IS A TYPICAL BLEND LEVEL FOR E-DIESEL?

DISCUSSION: HAVE THE STUDENTS TALK ABOUT THE CETANE RATING OF E-DIESEL. IN WHAT APPLICATIONS IS E-DIESEL CURRENTLY USED?