

# Hybrids & Alternative Fuel Vehicles 4/E

## Chapter 7 Diesel and Biodiesel Fuels

### Opening Your Class

KEY ELEMENT	EXAMPLES
Introduce Content	This course or class covers operation and service of <a href="#">Hybrid and Alternative Fueled Vehicles</a> . 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. <ol style="list-style-type: none"> <li>1. Explain diesel fuel specifications.</li> <li>2. List the advantages and disadvantages of biodiesel.</li> <li>3. Discuss API gravity.</li> <li>4. Explain E-diesel specifications</li> </ol>
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 Hybrids 4<sup>th</sup> Edition**  
**Chapter Images found on Jim's web site @**  
[www.jameshalderman.com](http://www.jameshalderman.com)  
**LINK CHP 7: [Chapter Images](#)**

## ICONS

## Ch07 Diesel and Biodiesel Fuels



### 1. SLIDE 1 DIESEL & BIODIESEL FUELS



Check for **ADDITIONAL VIDEOS & ANIMATIONS**  
@ <http://www.jameshalderman.com/>  
**WEB SITE IS CONSTANTLY 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)



**DISCUSSION: HAVE THE STUDENTS TALK ABOUT FEATURES & REQUIREMENTS OF DIESEL FUEL. REVIEW WHAT AMBIENT TEMPERATURE IS. WHAT IS MEANT BY DIESEL FUEL'S "POUR POINT"?**



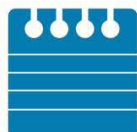
**DISCUSSION: DISCUSS CLOUD POINT. HOW DOES CLOUD POINT AFFECT FILTERS? HOW DO DIESEL FUEL SUPPLIERS ACCOMMODATE POUR POINT AND CLOUD POINT?**



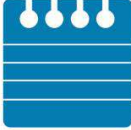







**DISCUSSION: TALK ABOUT CETANE # FOR DIESEL FUEL. REVIEW WHY OCTANE RATING FOR DIESEL IS LOWER THAN THE OCTANE RATING FOR GAS. DOES COMBUSTION PRESSURE AFFECT DIESEL FUEL'S CETANE NUMBER?**












**HANDS-ON TASK: HAVE STUDENTS EXPLAIN WHAT A CETANE RATING MEANS & WHAT EFFECTS IF ANY IT HAS ON DRIVABILITY.**



**CETANE # IS A 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 STANDS FOR CALCULATED CETANE INDEX. HIGH CETANE NUMBERS**

ICONS	Ch07 Diesel and Biodiesel Fuels
	<p>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 IGNITION DELAY, WHICH CAN CAUSE A HARD STARTING WITH WHITE SMOKE &amp; 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>
	<ol style="list-style-type: none"> <li>2. SLIDE 2 EXPLAIN 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.</li> <li>3. SLIDE 3 EXPLAIN Figure 7-1 (b) fuel pump in a farming area that clearly states red diesel fuel is for off-road use only.</li> </ol>
	<p><b><u>DEMONSTRATION: OBTAIN REGULAR DIESEL AND OFF-ROAD DIESEL TO SHOW TO VISUALLY NOTE DIFFERENCE IN 2 FUELS. FIGURE 7-1</u></b></p>
	<p><b><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></b></p>
	<ol style="list-style-type: none"> <li>4. SLIDE 4 EXPLAIN Figure 7-2 Testing API viscosity of a diesel fuel sample using a hydrometer.</li> </ol>
	<p><b><u>DEMONSTRATION: USE A HYDROMETER TO SHOW THE STUDENTS HOW TO TEST API GRAVITY OF DIESEL FUEL: FIGURE 7-2</u></b></p>
	<p><b><u>DISCUSS FREQUENTLY ASKED QUESTION</u></b></p>
	<p><b><u>HANDS-ON TASK: FIGURE 7-1 HAVE STUDENTS SAMPLE DIESEL FUEL AND TAKE AN API GRAVITY READING. HAVE THEM USE CHART 68-1 TO FIND WEIGHT DENSITY &amp; POUNDS PER GALLON OF FUEL THAT THEY ARE SAMPLING.</u></b></p>

ICONS	Ch07 Diesel and Biodiesel Fuels
	<p><b><u>SAFETY</u> REVIEW WITH STUDENTS THE <u>SAFETY PRECAUTIONS</u> THAT SHOULD BE TAKEN WHEN WORKING WITH AND TESTING, <u>DIESEL FUEL</u>.</b></p>
	<p>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.</p>
	<p><b><u>DEMONSTRATION: SHOW LOCATION OF FUEL HEATER &amp; FUEL FILTER ON A DIESEL VEHICLE: FIGURE 7-3</u></b></p>
	<p>6. SLIDE 6 EXPLAIN Figure 7-4 A pump decal indicating that the biodiesel fuel is ultra-low-sulfur diesel (ULSD) and must be used in 2007 and newer diesel vehicles.</p>
	<p><b><u>DISCUSSION: HAVE THE STUDENTS TALK ABOUT WHY <u>SULFUR DIOXIDE</u> IS HARMFUL TO ENVIRONMENT. WHAT IS DIFFERENCE IN APPEARANCE OF <u>ULSD</u>? FIGURE 7-4</u></b></p>
	<p>DISCUSS FREQUENTLY ASKED QUESTION</p>
	<p><b><u>DISCUSSION: HAVE THE STUDENTS TALK ABOUT <u>BIODIESEL BLENDS</u>. CAN <u>B20</u> BE USED IN UNMODIFIED DIESEL ENGINES? SINCE BIODIESEL COSTS MORE THAN REGULAR DIESEL, WHAT ARE ITS BENEFITS?</u></b></p>
	<p><b><u>DISCUSSION: HAVE STUDENTS TALK ABOUT BIODIESEL IN RELATION TO VEGETABLE OIL. WHAT IS DIFFERENCE BETWEEN BIODIESEL POWERED VEHICLES &amp; <u>VEGETABLE-OIL-POWERED VEHICLES</u>? ALSO DISCUSS <u>E-DIESEL FUEL</u>. WHAT IS A TYPICAL BLEND LEVEL FOR E-DIESEL?</u></b></p>
	<p><b><u>DISCUSSION: HAVE THE STUDENTS TALK ABOUT THE <u>CETANE RATING OF E-DIESEL</u>. IN WHAT APPLICATIONS IS E-DIESEL CURRENTLY USED?</u></b></p>
