

Automotive Technology 5th Edition

Chapter 83 Evaporative Emission Control Systems

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 learning objectives to students as listed below: <ol style="list-style-type: none"> 1. Explain the operation of an evaporative emission control system and compare enhanced and non-enhanced evaporative control (EVAP) systems. 2. Discuss leak detection pump systems and onboard refueling vapor recovery, and explain how to diagnose the EVAP system. 3. Discuss the functions of an evaporative system monitor and interpret the EVAP diagnostic trouble codes
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 5th Edition Chapter Images found on Jim's web site @ www.jameshalderman.com

LINK CHP 83: [ATE5 Chapter Images](#)

ICONS



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1. SLIDE 1 CH83 EVAPORATIVE EMISSION CONTROL SYSTEMS

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

Videos

Evaporative Emission Control System (View) (Download)

DEMONSTRATION: Show students basic **evaporative emissions system components.** Make sure students can identify components & their functions

2. **SLIDE 2 EXPLAIN Figure 83-1** Capless system from a Ford Flex does not use a replaceable cap; instead, it is spring-loaded closed.
3. **SLIDE 3 EXPLAIN Figure 83-2** A charcoal canister can be located under the hood or underneath the vehicle.
4. **SLIDE 4 EXPLAIN Figure 83-3** The EVAP system includes all of the lines, hoses, and valves, plus the charcoal canister.

DISCUSSION: describe main functions of the evaporative system & potential problems. What is system designed to do with fuel vapors (HC)? What are potential problems with system?

5. **SLIDE 5 EXPLAIN Figure 83-4** A typical EVAP system. Note that when the computer turns on the canister purge solenoid valve, manifold vacuum draws any stored vapors from the canister into the engine. Manifold vacuum also is applied to the pressure control valve. When this valve opens, fumes from the fuel tank are drawn into the charcoal canister and eventually into the engine. When the solenoid valve is turned off (or the engine stops and there is no manifold vacuum), pressure control valve is spring-loaded shut to keep vapors inside the fuel tank from escaping to atmosphere.

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DEMONSTRATION: Pass around examples of evaporative purge & vent solenoids. Show how to locate purge and vent solenoids on a vehicle using electrical component locator. **FIGURE 83-4**

HANDS-ON TASK: STUDENTS Cut open a used evaporative canister to show the students what activated charcoal granules look like.

SAFETY Remind the students of **extreme fire hazard** of working around & servicing evaporative emission system on a vehicle. **Fuel vapors are extremely explosive.**

DISCUSSION: Have the students talk about **fuel evaporation rates.** What factors (e.g., alcohol content, temperature, atmospheric pressure, etc.) influence fuel evaporation rates?

DEMONSTRATION: Show how to use an **alcohol test kit** to obtain a sample of fuel from a vehicle & test for alcohol content.

6. **SLIDE 6 EXPLAIN** Figure 83-5 enhanced EVAP system is able to perform system & leak diagnosis.

DEMONSTRATION: Show the students how to use a vehicle underhood ECS label & wiring diagram and/or vacuum diagram to determine whether the vehicle has an enhanced or non-enhanced system. **FIGURES 83-4 & 5**

HANDS-ON TASK: Ask the students to identify and locate purge solenoid & evaporative canisters on their own cars using OEM service information. Students can easily remember rest position of both **purge & vent solenoids** (normally closed & normally open, respectively) by using analogy of a home's front & back doors. Front door is usually **closed**, whereas back door is frequently left **open**.

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Explain to the students how vent solenoids can be tested using jumper wires and a 12 V source to allow system testing. Remember, the vent solenoid is normally open and should be energized for only short periods (5 minutes or less) to prevent damage.

7. **SLIDE 7 EXPLAIN** Figure 83-6 leak detection pump (LDP) used on some Chrysler and other vehicles to pressurize (slightly) the fuel system to check for leaks

DEMONSTRATION: Pass around various leak detection pumps. Show location of the pump on vehicle. **FIGURE 83-6**

DISCUSSION: Have the students talk about leak detection pump systems. What other possible methods might manufacturers use to leak test an evaporative system without using a pump?

DEMONSTRATION: Using small drill bits for automatic transmission service, drill two .020" & 0.040" holes in a small aluminum plate. Have students observe drilled plate so they can visualize size of leak that an enhanced system must detect.

53. **SLIDE 53 ONBOARD REFUELING VAPOR RECOVERY**

8. **SLIDE 8 EXPLAIN** Figure 83-7 restricted fuel fill pipe shown on vehicle with the interior removed
9. **SLIDE 9 EXPLAIN** Figure 83-8 Some vehicles will display a message if an evaporative control system leak is detected that could be the result of a loose gas cap.
10. **SLIDE 10 EXPLAIN** Figure 83-9 To test for a leak, this tester was set to the 0.020-inch hole and turned on. The ball rose in the scale on the left, and the red arrow was moved to that location. If when testing the system for leaks the ball rises higher than the arrow, then the leak is larger than 0.02 inch. If the ball does not rise to the level of the arrow, the leak is smaller than 0.020 inch
11. **SLIDE 11 EXPLAIN** Figure 83-10 unit is applying smoke to the fuel tank through an adapter, and the leak was easily found to be the gas cap seal

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DEMONSTRATION: Show how to leak-check an evaporative system using a smoke machine. Create a small leak by disconnecting a vacuum or vapor hose to show smoke diagnosis. **FIGURES 83-8, 9, & 10**

12. **SLIDE 12 EXPLAIN** Figure 83-11 emission tester that uses nitrogen to pressurize the fuel system.

SAFETY Remind students that it is imperative to use an inert gas such as nitrogen **FIGURE 83-11** to prevent possible explosions when pressure-checking evaporative emission system for leaks. Using compressed air could produce a flammable mixture of fuel vapors and oxygen.

ON-VEHICLE NATEF TASK: Diagnose emissions and driveability concerns caused by the evaporative emissions control system; determine necessary action. **Page 257**

ON-VEHICLE NATEF TASK Inspect and test components and hoses of evaporative emissions control system; perform necessary action. **Pg 258**

ON-VEHICLE NATEF TASK: Interpret diagnostic trouble codes (DTCs) and scan tool data related to the emissions control systems; determine necessary action. **Page 259**

ON-VEHICLE NATEF TASK: Diagnose emissions and driveability concerns caused by the exhaust gas recirculation (EGR) system; determine necessary action. **Page 260**

13. **SLIDE 13 EXPLAIN** Figure 83-12 The fuel tank pressure sensor (black unit with three wires) looks like a MAP sensor and is usually located on top of the fuel pump module (white unit)

DISCUSSION: Have the students discuss the role that fuel stability as well as engine-operating conditions play before OBD II evaporative monitor will run. Ask students to list or explain enabling criteria for the evaporative monitor to run.

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DEMONSTRATION: Show students fuel tank units with **Fuel Tank Pressure (FTP) Sensors:** **FIGURE 83-12.** Point out that these sensors, able to sense very small pressure changes, are much more sensitive than traditional pressure sensors.

14. **SLIDE 14 EXPLAIN** Figure 83-13 tank car was cleaned using steam, and then both bottom drain and top vent were closed. The next day, the tank had collapsed because of air pressure difference when inside cooled. The higher outside air pressure caused tank to collapse.

HANDS-ON TASK: Have the students look up an **EVAP DTC** for a particular vehicle using **electronic service information.** What conditions must be met to cause **PCM** to set **DTC?** Have students describe OEM troubleshooting process for diagnosing **DTC.** **FIGURE 83-14**

15. **SLIDE 15 EXPLAIN** Figure 83-14 This Toyota cap warns that the check engine light will come on if not tightened until one click
16. **SLIDE 16 EXPLAIN** Figure 83-15 To easily check the fuel tank pressure sensor, remove the cap, and the sensor should read about 1.7 volts

Most OEMs will not run EVAP monitor until vehicle reaches normal operating temperature from a cold start and is operating at a steady cruise speed of 35–55 mph. Vehicles used for in-town use only may never run this monitor.

PCM on a vehicle that uses engine-off natural vacuum for evaporative system testing must stay "on," operating long after vehicle owner has shut off ignition, in order to satisfactorily test evaporative system integrity. Don't overlook this capability when diagnosing a parasitic battery drain.

DISCUSSION: Have the students discuss how a **hybrid vehicle's evaporative emission system** should differ from that of a traditional vehicle. Will hybrid vehicle operate longer with fuel in tank? What must the hybrid's system be capable of doing for longer periods of time?

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[Crossword Puzzle \(Microsoft Word\) \(PDF\)](#)

[Word Search Puzzle \(Microsoft Word\) \(PDF\)](#)