MARYLAND

Vehicle Emissions Inspection Program

# REPAIRCARE

***The following is an excerpt from the article: Vapor Trails: Finding & Fixing Evaporative System Faults by Bob Pattengale. This article was published in the February 2006 issue of MOTOR Magazine. For the complete article please see <www.motor.com>.***

The evaporative system, or EVAP, is a vehicle emission control that captures and stores hydrocarbon vapors for later use in the engine. The EVAP system reduces evaporative losses related to gas tank venting, vehicle running, and refueling. Hydrocarbon control is important because it is one of the precursor pollutants for the formation of ozone. Depending on the model year and type of vehicle an EVAP system fails a self-test if leaks greater than 0.040 and 0.020 of an inch are found. All vehicles produced 2002 and later must adhere to the standard of 0.020 in. EVAP codes are one of the top 5 codes found in vehicles undergoing an On Board Diagnostic Vehicle Emission Inspection.

The first rule in diagnosing any evaporative emissions problem is: Don't touch anything! Do not fall into the trap of tightening the gas cap and then beginning your testing. What if the gas cap was the problem and you run an in-bay evaporative system leak test or perform a leak test with a smoke machine and no leaks are found? At this point, you won't know if the leak is intermittent or if it was actually the cap. In the early stages of your diagnosis, perform as many nonintrusive tests as possible. After retrieving and recording any DTCs, look up the exact description and recommendations for your specific code. Don't forget to check and record the freeze frame data. The key freeze frame data parameters (PIDs) to check are engine coolant temperature (ECT) and vehicle speed sensor (VSS). The ECT will let you know if the engine was cold or warm when the DTC was set. The VSS might help you decide if vehicle vibration might be a contributing factor in the case of an intermittent leak.

The next step in the diagnostic process is research—specifically, checking for technical service bulletins (TSBs), recalls or powertrain control module (PCM) reflashes. If you want to save time and money, spend a few minutes researching the problem; you might find a solution prior to testing. Checking for PCM software calibration updates or reflashes can correct issues that cannot be fixed any other way. Don't overlook checking <**www.iatn.net**> for good suggestions. Other techs may have already reached successful diagnostic conclusions under similar or identical conditions.

Evaporative emissions problems fall into three basic categories: component and circuit DTCs, purge flow DTCs and leak detection DTCs. The type of code present will determine the diagnostic path. Component and circuit DTCs normally point to opens, shorts and component failures.

The purge control circuit can be checked with a basic voltmeter or scan tool. The scan tool would be my first choice, if bidirectional controls are available for this component or circuit. For example, to quickly check the function and operation of the purge solenoid, use the scan tool to activate the solenoid and listen for a clicking sound. This checks the PCM, wiring and component all at one time. If the solenoid clicks, the circuit is currently working, and you might be dealing with an intermittent problem. At this point, perform a wiggle test on the related wiring and connection points and repeat the test. If the solenoid did not click, the problem may be with the wiring, the purge solenoid or even the PCM. The next step is to use a voltmeter to check

power and ground wires and to repair as needed. If the circuit checks good, then the problem is most likely with the purge solenoid, which can be checked with an ohmmeter or manually tested with a set of jumper wires.

The next area of the evap system is purge flow diagnostics. Possible DTCs for this problem include P0441 (Insufficient or Excessive Flow Detected During EVAP Operation), P1447 (Evaporative Control Purge Flow Monitoring) and other codes. Honda vehicles have a manufacturer specific DTC P1457 (Evaporative Control System Leak Detected - EVAP Canister System) that could create some confusion. The code description might have you looking for a leak in the system when the problem is actually a restricted or clogged evap system.

There are a variety of methods employed by vehicle manufacturers to detect purge flow. A widely used option is to monitor oxygen sensor or fuel trim values when the purge solenoid is activated. The PCM expects to see a change in either of these values when the purge solenoid is opened.

If you plan on using this method to verify purge operation, keep in mind that when the purge solenoid is commanded on, the values may go rich or lean. In most cases, the O2 sensor will read rich and short-term fuel trim (STFT) will go negative, due to the buildup of fuel vapors in the evap system. However, there are times when the content of the evap system is mostly air. In this case, the O2 sensor will read lean and STFT will go positive. Another option available to vehicle manufacturers is to monitor changes in the fuel tank pressure (FTP) sensor when the purge solenoid is activated. In most cases, the PCM will command the vent solenoid closed and the purge solenoid open, purging the vapors in the evap system and drawing the system into a slight vacuum condition. The PCM expects the FTP sensor reading to decrease.

Restrictions in the evap system can be caused by pinched or kinked hoses, dirt, mud or material from the charcoal canister blocking purge lines, or other situations. In some Nissan vehicles, the charcoal canister may leak charcoal into the evap system. Nissan TSB NTB00-085 covers this issue. The last diagnostic topic we'll discuss is looking for leaks in the evap system. The first step is to verify that a leak currently exists in the evap system. Most leaks are pretty easy to find, but some intermittent leaks are difficult to locate. Intermittent leaks can vary with changes in temperature, vehicle vibration and sticking vent or purge solenoids.

If you're unable to locate the leak with smoke, there are a few more options that might help. Move the gas analyzer probe slowly around the evap system. Hydrocarbons (HCs) are lighter than air, so be sure to check the areas above the evap system fittings and hoses to find a leak.

If you're still having trouble locating the leak, another option is to break the evap system into smaller test sections. This should be considered an option of last resort, because you may change something in the process by disturbing the evap system, and the leak may temporarily disappear.

Keep in mind that most leak-detection methods use pressure, but most evap systems are tested with vacuum under OBD II.