



# Tech Tip

FUEL 135

## FUEL QUALITY ISSUES

### Rough Idle and Misfire Following a Hot Restart

**D**iagnosing engine performance problems can be a challenge. Heat and fuel related conditions can make the engine behave erratically, resulting in a rough idle or misfire, in addition to multiple trouble codes being stored in memory. Once the heat dissipates, the engine may perform perfectly. Those symptoms and conditions pose a real challenge for any technician who must create the identical drive cycle to recreate the condition.

Many performance problems arrive in the spring and early summer months, due to fuel related conditions. These conditions are especially prevalent on fleet vehicles such as police cars, taxis and limos, all of which may spend many hours idling, or in slow speed traffic. Let's consider two vehicle manufacturers with engine performance related symptoms due to heat and engine design, and then we will cover some fuel related issues that can promote the same driveability concerns. Be aware there are major differences in winter and summer blend fuels. This will be explained later in the article.

#### **MULTIPLE CODES AND ROUGH IDLE FOLLOWING LONG IDLING**

Ford acknowledges that the 2005–2006 Crown Victoria and Lincoln Town Car vehicles used as taxis, limos and police cars may encounter an illuminated malfunction indicator lamp (MIL), with diagnostic trouble codes stored in memory, in addition to a rough idle condition following an extended idle. The symptoms are caused by vaporization of the fuel near injector #5. The following codes are usually stored in memory.

**PO305...**This code indicates that a misfire occurred on number #5 cylinder. Conditions that could promote this symptom include problems with the following systems: *ignition system, fuel injection system or an individual injector, lack of fuel volume, EVAP canister purge valve, low fuel pressure, evaporative emission system, EGR system or mechanical engine related problems.* The malfunction indicator light (MIL) will blink once per second when a misfire is severe enough to cause damage to the catalytic converter. If the MIL light is on steady due to a misfire, this indicates the threshold for emissions was exceeded.

**PO316...**This code indicates that a misfire occurred in the first 1,000 revolutions. Possible components that would result in this code include: *a damaged crankshaft position sensor, ignition system, fuel injectors, running out of fuel, fuel quality, mechanical engine related problems or a damaged powertrain control module (PCM).* The diagnostic trouble code stored in memory and the freeze frame data should identify the problem cylinder.

**PO171 and/or PO174...**PO171 indicates that number 1 bank was too lean, and the PO174 indicates that bank 2 was too lean. Possible causes include the following:

- a) **Fuel system...**check for a damaged or leaking fuel pressure regulator, a restricted fuel filter, leaking or restricted fuel injectors, low fuel pressure/volume, EVAP canister purge valve leaking, restricted fuel supply line.
- b) **Air Induction System...**check for air leaks downstream from the Mass Air Flow sensor, vacuum leaks, PCV system.
- c) **Exhaust system...**check for air leaks prior to or near the oxygen sensor.
- d) **EGR system...**check for damaged or disconnected vacuum hose, EGR valve gasket leak, EVR solenoid vacuum leak.
- f) **Air Measurement System...**check for a damaged or contaminated Mass Air Flow sensor.

If the mentioned trouble codes are stored and a rough idle and misfire is present on one of the mentioned Crown Vics or a Town Car, remove the engine top cover (see Fig.1) to allow for improved air circulation. Clear the codes, road test the vehicle and monitor the fuel pressure. If the codes reoccur, then you will have to continue with the code charts and misfire diagnostics. Most likely, the vehicle will run perfectly. The cover restricts the air flow over the engine, resulting in fuel vaporization near the #5 injector. Ford recommends leaving the cover off the engine. In 2006, Ford deleted the cover from production on the Crown Victoria. Also, they have included a new program calibration for the PCM.

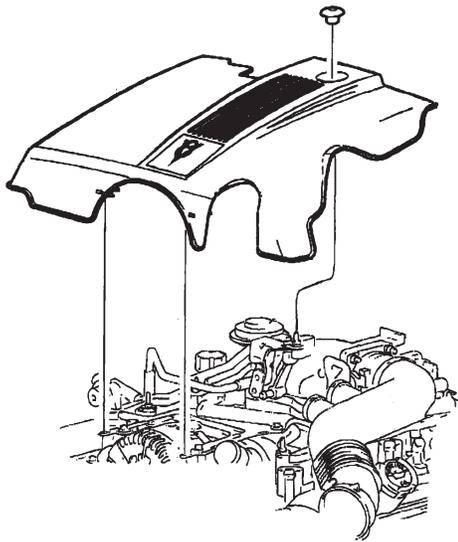


Fig. 1

Engine Top Cover

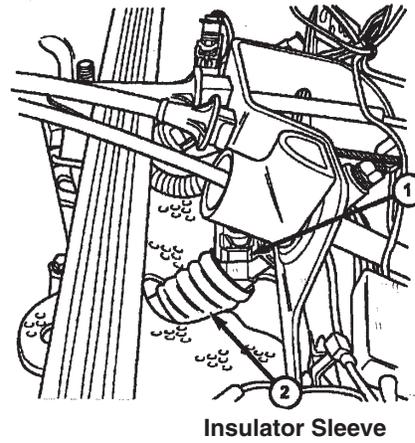


Fig. 2

#3 Injector

Insulator Sleeve

## JEEP ENCOUNTERS HOT MISFIRE AND ROUGH IDLE

Owners of 2000–2004 Wranglers, 1999–2004 Grand Cherokees and 2000–2001 Jeep Cherokees equipped with the 4.0L engine may complain of a rough idle condition following a hot re-start. The condition and symptoms are more prevalent when the engine is allowed to heat soak for 15-20 minutes in ambient temperatures of 90 degrees F or higher. The conditions are characteristic of a town-driven or short trip-driven vehicle. The symptoms are more pronounced on vehicles that are burning fuel with a high ethanol content, such as a winter fuel being used in the spring or early summer months. Often the symptoms will accompany an illuminated MIL lamp and a stored PO303 misfire code, which indicates a misfire on cylinder #3.

According to the vehicle manufacturer, a vapor lock condition is occurring in #3 fuel injector. The heat from the exhaust manifold, following engine shut-down, vaporizes the fuel in the injector. The misfire will occur for approximately 30 seconds, until the vapor is purged from the injector. The cure is to install an ignition wire heat shield around the injector. Obtain an ignition wire shield (Jeep #56028371AA) from the vehicle manufacturer. Cut the shield or insulator sleeve in half, and make two insulator sleeves approximately 1 inch in length. Install one sleeve around #3 injector with the slit facing the upward side of the injector and install the other sleeve with the slit on the downward side of the injector. Make certain the sleeve is flush with the intake manifold and the injector connector is rotated to the 2 o'clock position from the driver's side of the vehicle (Fig. 2). This will minimize strain on the injector harness connector.

## SEASONAL DRIVEABILITY PROBLEMS

It is not uncommon for driveability technicians to be inundated with engine performance problems in the spring or early summer. The engines may respond poorly due to the vapor pressure of the fuel that is being used at a given temperature.

If an engine has been performing perfectly, but suddenly develops a hesitation, surging or rough idle condition, and there has been an extreme change in temperature, chances are great the symptoms are due to a fuel related problem. The reason is that the barges, tankers and fuel depots still contain inventories of winter fuel, which has a higher volatility to promote adequate vaporization in cold weather. The higher volatility fuel, usually rated at 12 Reid Vapor Pressure (RVP), will turn to vapor on a hot day, especially following a heat soak. The required vapor pressure fuel for the best performance on a hot summer day is 9 RVP. While the 9 RVP fuel is suitable for summer driving, it will produce like performance symptoms of rough idle, surging, hard starts and backfiring if used during cold weather conditions. The vapor pressure of the fuel must be adjusted with seasonal changes. Octane selection is critical, too. Selecting a higher octane fuel than the vehicle is rated for may result in performance problems. For example, when a higher octane fuel than recommended by the vehicle manufacturer is used, performance problems may be induced due to less mid-range volatility, required to provide proper vaporization, especially at low ambient temperatures.

Do not add additives to the fuel tank to counteract the vapor related problem, as they are not effective. The customer should keep the fuel tank as full as possible until the winter fuel has been consumed.

Make certain you keep the fuel filter changed at the proper interval. In-tank electric pumps can be expensive. A restricted fuel filter can result in premature fuel pump failure, in addition to performance problems.

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