FUEL INJECTED

ENGINE RUNS ROUGH, MISSES

Description

Engine speed is not smooth, one or more cylinders are misfiring.

Explanation

A problem exist with one or more of the essential elements for proper engine operation which prevents the engine from running smoothly. These problems may be broken down into 4 basic categories:

- Air/Fuel Mixture
- Ignition
- Compression
- Timing (Valves or Ignition)

Air/Fuel Mixture

The proper ration of air to fuel must be maintained at all times to ensure smooth engine operation. Improper fue mixture may either be lean (too much air, not enough fuel) or rich (too much fuel, not enough air).

Lean Air/Fuel Mixtures are generally more apparent when the engine is cold and just beginning to warm up. The idle speed may be erratic and the engine will seem weak. The engine may stumble or stall on acceleration. On deceleration, the engine may jolt harshly or die.

A lean mixture will result in:

- Unburned fuel, high HC emissions.
- High exhaust temperatures, possible pinging or detonation, high NOx emissions.

Rich Air/Fuel Mixtures are generally more apparent after the engine is warmed up. The exhaust will be black and sooty, especially on acceleration. The spark plugs will be carbon fouled (dry black or wet black if completely fouled). The idle speed may become unstable and the engine may bog down on acceleration.

A rich mixture will result in:

- Partially burned fuel, high CO emissions
- Unburned fuel, high HC emissions
- Carbon fouling of spark plugs
- Overheating, carbon fouling of catalytic converters

Possible Causes

High Fuel Pressure, Leaking Fuel Pressure Regulator

The fuel control system is calibrated for a specific range of fuel pressure. Higher Fuel Pressure will increase the amount of fuel flow from the Fuel Injector, resulting in a richer mixture. A leaking vacuum hose to the Fuel Pressure Regulator may also increase fuel pressure.

A leaking diaphragm on the fuel pressure regulator will allow fuel to be drawn from the pressure regulator, through the vacuum hose, and into the intake. See: Fuel Pressure Regulator

Testing

- Install a Fuel Pressure Gauge and check Fuel Pressure.
- Remove vacuum hose to Fuel Pressure Regulator and inspect for signs of fuel leakage.
- Using a vacuum pump, check the Fuel Pressure Regulator for leakage, the regulator should hold vacuum.

Engine Oil Contaminated With Fuel

Fuel vapors from cylinder blow by are evacuated through the PCV system and drawn into the intake. Engine oil which is heavily contaminated with fuel vapors may result in a rich Air/Fuel Mixture.

Testing

- With the engine running, momentarily clamp off the PCV suction hose. If the Air/Fuel Mixture becomes leaner the engine oil is contaminated with fuel.
- Inspect the engine oil. Fuel contaminated engine oil will be black and thin and will have a strong gasoline odor.
- If the engine oil is contaminated with fuel it should be replaced.

Fuel Control Problems

Problems in the fuel control system will often result in rich Air/Fuel Mixtures.

Testing

- See **Computers and Control Systems** for further testing. See: Computers and Control Systems > Testing and Inspection

Ignition Misfire

An ignition misfire in one cylinder will trick the fuel control system into thinking the Air/Fuel Mixture is lean. The system will then add extra fuel to compensate, resulting in a rich mixture.

Testing

- See Ignition Misfire in this section for further testing.

Ignition Misfire

Ignition misfire will result in a jolting, erratic engine speed. As a cylinder misfires the engine speed will decelerate dramatically. Misfire in only one cylinder will produce a significant loss of power.

Testing

- Use an Ignition scope to verify proper secondary voltages and burn times.
- Inspect all spark plugs for signs of misfire. Complete ignition misfire will result in a wet fuel fouled spark plug. Occasional or intermittent misfire may show no signs of problems on the spark plugs. Check porcelain insulators for evidence of cracking.
- Inspect ignition cables for signs for insulation damage or arcing.
- Inspect ignition cables for high resistance readings or corroded terminals.
- Inspect the distributor cap for signs of cracking or arcing.
- For additional testing see **Ignition System.**

Low Compression

Loss of compression in one or more cylinders will result in a rough running engine and a significant loss of

power.

Testing

- Perform a Compression Check.
- If one or more cylinders indicate low compression, perform a cylinder leakdown check to determine the cause.

NOTE: A cylinder leakdown check utilizes regulated, compressed air to pressurize each cylinder (at Top Dead Center Compression). While performing this check, the cause of the compression leak may be determined by listening for escaping air:

- Air heard leaking from the exhaust indicates an exhaust valve problem
- Air heard leaking from the intake or throttle body indicates an intake valve problem.
- Air heard leaking from the PCV valve or PCV breather hose indicates a piston, ring, or cylinder wall problem.
- Air heard leaking from an adjacent cylinder indicates a head gasket failure between the two cylinders (both adjacent cylinders will have identically low compression).
- Air seen bubbling out of the radiator indicates a head gasket failure (or a cracked head/block).

Valve or Ignition Timing Variation

Smooth engine operation requires precise timing between the valve train, pistons, and ignition timing. Slack or wear in any of the timing components may introduce minor variations in timing. These minor variances in timing may produce misfire or stumbling on acceleration.

Testing

- Check Ignition Timing and adjust if necessary.
- Verify timing advance is operational.
- Verify timing belt is properly tensioned. See: Timing Belt > Procedures
- Verify distributor shaft and bushings are free of slack or wear.