WHAT'S A TUNE-UP TODAY?

The OBD II Home Page

Some things never change, such as the need for periodic preventive maintenance. But a tune-up is one job that's changed a great deal over the course of automotive history. The outdated term is still widely used by many people to describe a service procedure that's supposed to make an engine run better. There's no absolute definition of what exactly a tune-up should include, but most would agree that it involves replacing the spark plugs and performing other adjustments to maintain or restore like-new engine performance. The problem is there's not much that can adjusted under the hood on many late model vehicles. Ignition timing is fixed and controlled by the engine computer, as is idle speed and the fuel mixture. You can still check base timing (maybe), idle speed and various emission functions to make sure everything is functioning within factory specs and are functioning properly. But there really isn't much of anything left to "tune." Yet many motorists still want tune-ups and believe tune-ups are an important and necessary service.

Most likely, when you talk about a tune-up its probably because you're experiencing some kind of driveability problem. Your vehicle might be getting hard to start, not getting the fuel mileage it once did, hesitating or stalling, knocking or not running with the same zip and power as before. Or, your vehicle may have failed an emissions test. So what you probably need is an engine performance analysis -- and maybe a new set of spark plugs, too.

A simple maintenance type tune-up (a new set of plugs) may make an engine easier to start, improve fuel economy, lower emissions, restore lost pep and power, and so on provided engine performance deteriorated because of worn or fouled spark plugs. But if the problem lies elsewhere, a new set of plugs alone won't do the trick. A "tune-up" under these circumstances would be a waste of time and money.

TUNE-UP CHECKS

Any tune-up today should start with a battery of performance checks to base line or confirm the engine's overall condition. These should include:

- Battery voltage (very important with all of today's onboard electronics). Charging voltage
- Power balance or dynamic compression (to identify any mechanical problems such as leaky exhaust valves, worn rings, bad head gasket, bad cam, etc. that could adversely affect compression and engine performance)
- Engine vacuum (to detect air leaks as well as exhaust restrictions) Operation of the fuel feedback control loop (to confirm that the system goes into closed loop operation when the engine warms up)
- Scan for fault codes (to verify no fault codes are present, or to retrieve any codes that may be present so they can be diagnosed and eliminated) Check exhaust emissions (this should be a must in any area that has an emissions testing program to confirm the vehicle's ability to meet the applicable clean air standards, and to detect gross fuel, ignition or emission problems that require attention)
- Verify idle speed (should be checked even if computer controlled to detect possible ISC motor problems); Idle mixture (older carbureted engines only, but injector dwell can be checked on newer vehicles to confirm proper feedback fuel control)
- Check ignition timing -- if possible (should be checked even if it is not adjustable to detect possible computer or sensor problems) Operation of the EGR valve.

In addition to these performance checks, hoses and belts should be visually inspected. All fluids (oil, coolant, automatic transmission fluid, power steering fluid and brake fluid) should also be inspected to make sure all are at the proper level, and that the appearance and condition of each is acceptable.
There should be no sludge in the oil, the ATF should not smell like burnt toast, the coolant should have the proper concentration of antifreeze and not be full of rust or sediment, the brake fluid should be clear and not full of muck, etc.

WHAT TO REPLACE

If the tune-up checks find no major faults, the following items should be replaced for preventive maintenance:

- Spark plugs (gapped to the correct specs, of course). Consider long life plugs on applications where plug accessibility is difficult or where longer service life may be beneficial
- Rotor and/or distributor cap (if required)
- Fuel filter; Air filter; PCV valve and breather filter
- Other parts on an "as needed" basis (things like spark plug wires, belts, hoses, fluids, etc.)
- Check and adjust (if required on older vehicles) ignition timing, idle speed and idle mixture; O2 sensor(s).

Spark plugs need to be changed periodically because the electrodes wear every time a plug fires. When high voltage current jumps from one electrode to another, it wears away a little metal from both electrodes. After 45,000 miles of operation, the plug has fired 60 to 80 million times and wear has increased the distance between the electrodes. At the same time, the nice sharp edges on the center electrode have become rounded and dull. All this increases the voltage required to jump the gap. If the ignition system can't deliver, the plug may begin to misfire under load. Accumulated deposits on the plug tip may also be interfering with reliable ignition. So by the time the average plug has seen 45,000 miles, it's getting close to the end of its service life.

Long-life plugs, on the other hand, don't wear as much as standard plugs. The electrodes are made of tough platinum or gold-palladium alloys that resist erosion. Such plugs may go 100,000 miles under optimum conditions (no fouling). Of course, no plug will last anywhere near its potential lifespan if an engine is burning oil, experiencing abnormal combustion such as detonation or preignition, or has a fouling problem.

OXYGEN SENSOR

Though many motorists don't even know what an oxygen sensor is, let alone that their engine may have one or more of these devices, the fact remains that sluggish O2 sensors cause a lot of driveability problems. A recent EPA study found that 70% of all vehicles that fail an emissions test need a new O2 sensor.

To prevent such woes, the O2 sensor can be replaced for preventive maintenance during a tune-up. Unheated 1 or 2 wire wire O2 sensors on 1976 through early 1990s applications should be replaced for preventative maintenance every 30,000 to 50,000 miles. Heated 3 and 4-wire O2 sensors on mid-1980s through mid-1990s applications should be changed every 60,000 miles. And on OBD II equipped vehicles (all '96 and newer), the recommended replacement interval is 100,000 miles.

The O2 sensor is the master switch in the fuel control feedback loop. The sensor monitors the amount of unburned oxygen in the exhaust and produces a voltage signal that varies from about 0.1 volts (lean) to 0.9 volts (rich). The computer uses the O2 sensor's signal to constantly fine tune and flip-flop the fuel mixture so the catalytic converter can do its job and clean the exhaust. If the O2 sensor circuit opens, shorts or goes out of range, it usually sets a fault code and illuminates the Check Engine or Malfunction Indicator Lamp. But many an O2 sensor that is badly degraded will continue to function well enough not to set a fault code but not well enough to prevent an increase in emissions and fuel consumption. So the absence of a fault code or warning lamp doesn't mean the O2 sensor is doing its job.

Deterioration of the O2 sensor can be caused by a variety of substances that find their way into the exhaust (such as lead, silicone, sulfur, even oil ash) as well as environmental factors such as water, splash from road salt, oil and dirt.

A sluggish sensor may not allow the computer to flip-flop the fuel mixture fast enough to keep emissions within acceptable limits. A dead sensor will causes the system to go back into open loop with a fixed, rich fuel mixture. Fuel consumption and emissions go up, and the converter may suffer damage if it overheats.

You can use your AutoTap OBDII Scan tool to check your O2 sensor performance, read the other O2 sensor articles in the AutoTap OBDII Library for detailed information.

OTHER STUFF

Something else that should be part of a tune-up today is cleaning the fuel injectors and intake system. The need for injector cleaning isn't as great as it once was thanks to improved fuel additives and redesigned injectors. But in areas that have gone to reformulated gasoline, injector clogging is on the rise again.

Fuel varnish deposits that form in injectors restrict the amount of fuel that's delivered with every squirt, which has a leaning effect on the air/fuel mixture. The result can be lean misfire and a general deterioration in engine performance and responsiveness. Deposits can also build up on the backs of intake valves, causing cold hesitation problems in many engines.

The cure is to clean the injectors and valves. Cleaning should is recommended for any engine that is suffering a performance complaint or has more than 50,000 miles on the odometer. Cleaning the throttle body can also help eliminate idle and stalling problems that plague many of today's engines.

THE 100,000 MILE "NO TUNE-UP" MYTH

Some would say the auto maker's move to 100,000 mile "tune-up" intervals on many new vehicles will finally kill the tune-up as we know it today. Maybe, but what the car makers are really talking about are 100,000 mile spark plug change intervals -- which does not include the need for other maintenance such as oil and filter changes or other repairs that might be needed during the life of the vehicle.

If you think you can get away with gas-and-go driving for 100,000 miles without spending a dime on maintenance or repairs, you might find the hard way that lack of proper maintenance can be very costly. Today's vehicles don't require as much maintenance as they used to because things such as idle speed and mixture adjustments, timing adjustments, etc. have been eliminated. So too has the need for chassis lubrication thanks to "sealed-for-life" ball joints and tie rod ends. Many OEM parts are also being built to much higher standards of durability.

Even so, regular oil and filter changes are still necessary to maintain proper engine lubrication. Most experts still recommend changing the oil and filter 3,000 miles or three to six months. The oil change interval can be stretched out to reduce maintenance costs if a vehicle is driven under ideal conditions (no extremely hot or cold weather, no short trip, stop-and-go driving, no excessive idling, no extremely dusty road conditions, no trailer towing, no turbocharging). But the average driver is more often than not a "severe service" driver so should follow the 3,000 mile change interval.

Today's 100,000 mile tune-up interval also skirts around the issue of fuel and air filter replacement, too. A number of new cars and trucks now have "lifetime" fuel filters, most of which are located inside the fuel tank with the electric fuel pump. Such a filter might go 100,000 miles. Then again, it might not. A couple of tanks of bad gas or some corrosion caused by accumulated moisture can cut short the life of any filter, even a so-called lifetime filter. Sooner or later even a lifetime fuel filter will have to be replaced.

Does it make sense to replace a lifetime in-tank fuel filter for preventative maintenance? Maybe -- if one considers what it costs to have a vehicle towed because of a plugged fuel filter.

As for air filters, the service life depends more on environmental factors rather than time or mileage. If a vehicle is driven on gravel roads, filter life may only be a few months or few thousand miles.

Repairs are also inevitable regardless of what the tune-up interval is supposed to be. It's pretty unlikely that a set of front disc brake pads will go 100,000 miles in city driving -- 20,000 to 30,000 miles is a more realistic figure. The same goes for belts, hoses, the battery, water pump, exhaust system and many other parts. No vehicle that's yet been built can even come close to going 100,000 miles without needing some type of maintenance or repair.

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