SOLVING INTERMITTENT STALLING PROBLEMS

Diagnosing an intermittent stalling problem can be a challenge, especially if the engine only stalls occasionally (and at the least opportune time). And if there are no pending codes, hard codes or history codes in the vehicle's computer to give you some direction, you may find yourself guessing at a diagnosis.

Every engine needs three things to run and idle smoothly without stalling: a correct air/fuel ratio, sufficient idle speed for the idle load, and a good spark. If any of these is lacking, the engine may stall.

Cold stalling problems are the most common because the engine needs a richer fuel mixture to maintain idle speed until it warms up. Intermittent cold stalling problems are almost always fuel-related.

On older engines with carburetors, cold stalling (and hard starting) is most often due to an automatic choke that is sticking, misadjusted or broken. The engine may also be leaking vacuum around the base of the carburetor, vacuum hoses or the EGR valve. Other problems may include a faulty heat riser valve (stuck open) that prevents the intake manifold from warming up, or a defective thermostat that prevents the engine from warming up quickly or reaching normal operating temperature. Any of these things can upset the air/fuel mixture and prevent the engine from idling normally until it warms up.

On fuel injected engines, cold stalling can also be caused by conditions that upset the air/fuel mixture. This includes vacuum leaks or unmetered air entering the intake manifold downstream of the airflow sensor, a faulty throttle position, MAP or oxygen sensor, dirty fuel injectors, or low fuel pressure to the injectors (weak fuel pump, faulty fuel pressure regulator or restricted fuel filter). Like older carbureted engines, a defective thermostat may be preventing the engine from warming up quickly or reaching normal operating temperature. Or, a defective coolant sensor may be telling the PCM the engine is colder (or warmer) than it really is. Any of these conditions can upset the fuel calibration of the engine and cause a stalling problem.

Intermittent stalling can also be caused by a bad idle air bypass motor or a idle speed control motor. If these devices fail to provide the correct idle speed, the engine may die. Sometimes the fault is in the PCM or the inputs to the PCM. The factory programming may not provide enough idle speed when the A/C is on, when the alternator is under high load or when the temperature is extremely hot or cold. The fix here may be to reflash the PCM with the latest OEM update.

A faulty MAP sensor can sometimes mislead the PCM into thinking the engine is under a greater or lesser load than it actually is. The MAP sensor senses intake vacuum, which the PCM uses to estimate load so it can adjust the air/fuel mixture accordingly. If the MAP sensor isn't reading right, the PCM will receive bad information and possibly add or subtract more fuel than it should causing the engine to stall.

The same thing can happen if the throttle position sensor on a speed/density EFI system (no airflow sensor) is out of calibration or had a dead spot. The PCM may not realize the throttle is at idle, and may give the engine too much or not enough fuel causing it to stall.

When attempting to diagnose an intermittent stalling problem, therefore, it is important to always use a scan tool to first check for any codes that might shed light on the condition, and secondly to look at all the essential sensor inputs to see if they are within range and are supplying accurate information to the PCM.

Intermittent stalls that seem to happen at random are often ignition-related. A sudden loss of spark will kill the engine cold and prevent it from restarting. The most common causes for loss of spark include hot shorts/opens in ignition coils, ignition modules and crank position sensors. Loose or corroded wiring connectors that cause a sudden loss of voltage in the ignition circuit will also stop and engine dead in its tracks.

MORE CAUSES

One of the more unusual causes of intermittent stalling we've heard about is a defective vehicle speed sensor. When the vehicle stops moving, the PCM may not engage the idle speed motor (carbureted engines) or idle air bypass motor (fuel injected engines) so the engine will idle normally.

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We've also heard of faulty automatic shut down (ASD) relays on some older Chrysler products suddenly killing the ignition and fuel pump for no apparent reason. Replacing the relay usually cures the problem.

Another cause of stalling that is often overlooked is bad gas. Moisture sometimes finds its way into underground fuel tanks, and engines don't run very well on water. Sometimes alcohol additives may not be properly mixed, or may separate from the gasoline in the presence of water. Bad gas can cause an engine to run rough or stall. If you suspect bad gas, drain the tank and refill it with fresh gas. If the problem goes away, your diagnosis was correct.

Sometimes an engine will experience a stalling problem when the A/C compressor is engaged. Normally, the PCM should increase the idle speed to compensate for the added load on the engine when the A/C is on. But if the A/C signal fails to reach the PCM because of a communications glitch between the A/C module and PCM, the PCM may fail to increase idle speed causing the engine to lug or stall.

According to Ford TSB 04-21-13, a cold stalling problem with 2003-2004 Ford Focus models with 2.0L SPI engine during extremely cold weather can be caused by a faulty PCV valve that sticks open, allowing too much air to be sucked into the intake manifold.

Ford has also issued a recall (04S13) for 2001-2003 Ford Escape sport utility vehicles with 3.0L V6 engines for an intermittent stalling problem. The stalling typically occurs while decelerating at speeds below 40 miles per hour. The problem is caused by the calibration of the idle air control valve and evaporative emissions system. The fix here is to reflash the PCM with updated information.

The National Highway Traffic Safety Administration (NHTSA) is currently investigating reports of sudden stalling with Toyota Prius hybrid electric cars. For reasons which have yet to be explained, the engine will suddenly shut down at speeds of 35 to 65 mph. In some cases the vehicle can still be driven in the electric mode, but in others everything goes dead and the car has to be towed. No word yet from Toyota of the cause, but it will probably turn out to be a PCM programming issue.

DIAGNOSTIC STRATEGIES

One strategy for diagnosing a stalling problem that only occurs intermittently is to wait until the problem gets worse before you attempt to diagnose it. It's always easier to find a part that has failed than to find one that works most of the time and only acts up occasionally.

One time saving step that may allow you to zero right in on the cause is to check for any Technical Service Bulletins (TSBs) that might have been published by the vehicle manufacturer. It may be a situation where there's a pattern failure and the manufacturer has already figured out the problem and posted a fix. The few minutes you invest in doing a TSB search can save you hours of frustration and wasted diagnostic time. And with many late model vehicles, the cure is often a PCM reflash rather than replacing something.

The next thing you should always do is hook up a scan tool and check for codes even if the Malfunction Indicator Lamp (MIL) is not on (the lamp may be defective). Look for history codes or pending codes that may shed light on the problem. Also, look at the sensor inputs to the PCM when the engine is idling (both after a cold start and when it is warm). You should also look at short term and long term fuel trim. Is the engine running unusually rich or lean? That would tell you something is amiss.

Another basic check that should always be made is to check battery voltage and charging voltage. A low battery, weak alternator or over-voltage condition can all play havoc with onboard electronics. Solenoids and relays all require minimum voltages to function properly, so if the battery or charging system are not within normal specifications you may have found the root cause of the problem.

If a problem has left no tracks (no trouble codes or odd readings to steer you in a particular direction), is there a pattern? Does the engine only stall when it is cold or hot? Does it only occur during wet weather (might be bad spark plug wires)?

A CASE EXAMPLE

A recent example of my own attempt to diagnose an intermittent condition occurred with my daughter's 1998 Saturn SC2. The car had less than 40,000 miles on the odometer and was well-maintained (thanks to me). The engine ran great, idled smoothly (for a Saturn) and passed the state emissions test. But every now and then, the

engine would not restart after a short trip. The engine would not stall, it just would not restart. It would crank normally but would not start until it sit for half an hour or so. Then it would start and run fine. This happened maybe once every couple of weeks.

When I hooked up my scan tool to the Saturn's PCM, I found no codes. I checked all the basics. The battery was at full voltage. The spark plugs were in good condition and properly gapped. The plug wires, coils and crank position sensor were all within specifications. Fuel pressure was within range. The sensor data on my scan tool all seemed to be normal and I could see no obvious problems that might prevent the engine from starting. Everything appeared to be normal.

To make matters worse, the car wouldn't act up for me. The starting problem would only occur when my daughter was driving the car -- and when she was at least 10 miles or more away from home. She'd call for help, and by the time I'd get there the engine would start right up and run fine.

I quizzed her about her starting technique. Was she pumping the gas pedal? That's a no-no with fuel injected engines. Was the gear selector in park or neutral (bad safety switch maybe)? Was she doing anything unusual that might prevent the engine from starting? No.

After living with this problem for several months, it began to occur more frequently. Now the car was not starting every couple of days. We had lost all confidence in the car's reliability, so I loaned her my car to drive and started driving her car to see if it would misbehave for me.

My initial hunch was that the car had a failing fuel pump (or pump relay), or a quirky ignition module. Finally one day it refused to start for me. Fortunately, I had some tools with me just in case. When the engine refused to start, I pulled a plug wire off and hooked up a spark plug tester to see if there was any spark. Sure enough, when I cranked it there was no spark. That was good news because I didn't want to drop the fuel tank and install a new $300 fuel pump! When I cranked the engine again, it suddenly started. Now I knew the problem was ignition-related and was probably a bad ignition module.

The Saturn 1.9L engine has a "waste spark" distributorless ignition system. Two ignition coils are mounted on a module block that is bolted to the front of the engine. Coil #1 fires cylinders 1 and 4 simultaneously, while coil #2 fires cylinders 2 and 3. I used a DVOM to check the primary and secondary resistance of both coils, voltage to the module (key on, engine off and at idle), and the ground circuit. I also checked for a loose or corroded connector at the module. All the voltage readings were right on the money. There was no problem found. So I concluded the problem was inside the ignition module. I bought a new $180 ignition module from Saturn, installed it and considered the problem fixed.

Guess what? The next day the car wouldn't start again. The problem was the same as before, no spark. Could the new module I just installed be faulty? It was possible but unlikely. Obviously, I had misdiagnosed the fault and bought a module I didn't need (sorry, no returns on electronic modules once they are installed).

I checked the car again with my scan tool and again found no codes or clues that would tell me what was wrong. Then I did what I should have done in the first place and went online to www.alldata.com. There, I searched for any technical service bulletins that might pertain to this problem. I found one (TSB 98-T-49A) that seemed to fit, but the diagnostic charts in the TSB only lead to dead ends because everything tested within specifications.

I then posted my problem on the International Automotive Technician's Network (www.iatn.net). I received back about a dozen responses from other technicians who had run into similar problems with Saturns, and they all offered the same advice: replace the crank position sensor.

But how could it be the crank sensor? I had checked it already and it tested fine -- or so I thought. The problem was that I was testing the sensor at room temperature, not when it was hot. The spec said the crank sensor should read between 700 and 900 ohms. It read 780 ohms.

I removed the crank sensor, placed it in a pan of hot water and hooked up my DVOM to watch the sensor's resistance as it warmed up. Sure enough, when the sensor got hot the resistance shot up and it suddenly went open. It remained open until it cooled back down, then it began to read normally again. That would explain the no start problem when the engine was hot. The crank sensor would absorb heat when the engine was shut off, go open and fail to produce a signal when the engine was cranked. That explained the no start after a short drive.

The problem should have set a crank sensor code, but it did not. So had it not been for the shared expertise of other technicians who had encountered the same problem, I'd still be trying to figure out the problem. Thanks iatn.

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