COOLING SYSTEM PROBLEMS

Troubleshoot the System Instead of Throwing Parts at the Symptom

When cooling system or belt driven components encounter problems, don't get so anxious to fix the problem that you miss the diagnosis. Nothing is worse than a customer having to return multiple times for the same repair, when a little detective work by the technician could have prevented the condition. Let's consider some simple solutions to some perplexing problems.

SERPENTINE DRIVE BELT NOISE

When it comes to underhood noises, no part takes as much blame for the condition as the accessory drive belt. If there is a squeak, rattle or chirp, it is assumed that the belt is the problem. Replacing it is often only a temporary solution. And when the customer returns with the recurring symptom, the quality of the belt previously installed is usually suspected. Another belt is installed and the technician thinks the second belt corrected the problem. Instead, out of frustration, the customer carried the vehicle to another repair shop, where the condition was properly diagnosed and repaired.

Case in point: If you service a lot of GM trucks, then you have certainly experienced belt noise complaints. Chirping or dry bearing type noises have plagued GM/GMC trucks since 1996, affecting 4.3L, 5.0L, 5.7L and 7.4L engines. Often the symptoms are misdiagnosed as being a defective bearing in the alternator.

In 1998, GM acknowledged that trucks produced from 1996-98 equipped with the mentioned engines may encounter excessive accessory drive belt noise due to belt misalignment. The power steering pump pulley may be the cause of the belt noise condition. During assembly, the power steering pump pulley was pressed onto the power steering pump shaft incorrectly, resulting in misalignment of the drive belt. The condition was corrected, only to reappear with the 2001 trucks produced at the Janesville plant between December 19, 2000 and July 23, 2001. And that's a lot of trucks with an inherent belt noise condition.

When the pump pulley is pressed onto the power steering pump shaft, the hub end of the pulley should be flush with the pump shaft. The maximum allowable variance is .010 inch, either fore or aft of the pump shaft end. This condition can be encountered with any vehicle that utilizes a pressed-on pulley arrangement. We have seen our share of Ford applications with the same condition. Often the problem is created when the power steering pump is replaced and the technician incorrectly transfers the pulley to the new power steering pump. When this condition is present, the belt will often reflect frayed edges after a few hours of operation. Proper belt alignment is imperative in minimizing belt-related noises. Always check the belt alignment following a belt driven component replacement. Correct any alignment problems prior to the vehicle leaving the shop, or else you will certainly experience a comeback.

TENSIONER ALIGNMENT

Check the belt tensioner pulley for proper alignment. With some of the GM applications mentioned, the problem is often found while making a

belt installation. While releasing the belt tension, the tensioner is often determined to be defective, as the thin wall aluminum casting that houses the spring breaks from fatigue. This is in the area where the hold down bolt secures the tensioner to the engine. The belt initially becomes misaligned and then loses tension as the condition progresses. The condition may promote belt noise, premature belt wear, or a lack of power steering assist, due to belt slippage. Any unusual noises from the tensioner warrant a complete tensioner inspection. Release the belt from the tensioner and check the pulley for freedom of movement. Cycle the tensioner its full limit of travel. Any resistance requires replacement of the tensioner. Examine the tensioner arm and spring case for metal-to-metal contact. This would indicate bushing wear, which will require tensioner replacement to prevent belt misalignment.

SERPENTINE BELT TRACKING

Ford has had its share of serpentine belt problems, too. Road splash, resulting in the drive belt tracking forward and slipping off the pulleys, has prompted Ford to make some modifications.

For the Ford Crown Victoria (police package) and Mustang GT w/manual transmission built from 12/19/00 to 9/24/01, the tensioner should be replaced with Ford P/N XR3Z-6B209-AB and a new water pump pulley P/N 3W7Z-8509-M.

The Crown Victoria (police package) and Mustang GT w/manual transmission built from 9/25/01 to 2/11/02, and other vehicles that have had the original short housing water pump replaced with a long housing water pump and a flanged pump pulley, should only receive a new tensioner P/N XREZ-6B209-AB. Do not replace the water pump or pulley.

For the Crown Victoria, Grand Marquis, Lincoln Town Car, Mustang Cobra w/manual transmission and the Mustang GT w/auto transmission built from 12/19/2000 to 2/11/02, replace the water pump pulley with P/N 3W7Z-8509-AA and the tensioner with P/N XR3Z-6B209-AB.

When performing the pulley or tensioner installation, check the integrity of the belt and replace accordingly. Without this information from the vehicle manufacturer, our efforts to keep the serpentine belt on the pulleys would be futile.

WATER PUMP WEEPAGE

When a customer complaint involves coolant leakage from the center of the engine, we usually go for a visual on the water pump weep hole first. Some wetness should be considered normal. The purpose of the weep hole is to allow the seal to breathe, and any coolant seepage a path to expel externally, rather than to accumulate and damage the bearing.

GM has logged many consumer complaints on 1996-1998 Buick Skylark/Olds Achieva, 1996-2002 Chev Cavalier, 1996-2001 Pontiac Grand AM, 1996-2002 Pontiac Sunfire, 1997-1999 Chev Malibu, and 1999-2001 Olds Alero vehicles equipped with the 2.4L engine. The customer drives their vehicle, parks it, and then notices a droplet of coolant on the pavement. The normal assumption is a leaking water pump, and it is replaced. When the condition reoccurs, the customer expects the technician to replace the water pump under warranty, and we usually do that. Unfortunately, the problem will likely repeat itself. GM states that replacing the water pump for this condition is not recommended, as the condition will likely reoccur. To address this concern, GM recommends the installation of a coolant collector, which was designed to trap normal weepage from the water pump. The coolant collector (P/N 12573729) is a collar that snaps around the neck of the water pump and absorbs normal coolant weepage. Its capacity to absorb is limited and will not withstand the volume of leakage occurring with a defective water pump seal. Pressure-test the cooling system, if a leaking water pump seal is suspected. While this

solution may seem like a band-aid approach, it may be the only alternative. After all, how many pumps are you willing to install under warranty?

ENGINE COOLANT

Engine coolant is a vital but often neglected part of engine maintenance. While most vehicle owners are conscious of the freeze factor and possibly have heard about the boil over protection, few understand that the coolant actually wears out, losing its corrosive inhibitors. We can't expect them to get too excited about the coolant, when most vehicle owners don't get concerned with checking the crankcase oil until the low oil pressure/level light illuminates.

Coolant exchangers are recommended by most vehicle manufacturers. The process has some benefits over the traditional drain and fill procedures.

1) It reduces the amount of waste involved with the traditional flush and fill procedure.
2) It eliminates hazardous chemicals being dumped and contaminating the ground water.
3) The exchange and transfusion type devices add new coolant and push the old from the system. These systems have a higher exchange rate, thus eliminating trapped air in the system. The typical drain and fill technique may require 100 miles of driving to completely purge the air from the system.
4) The system is a time saver when compared to the flush and fill procedure, which requires thermo-cycling the engine to top off the radiator.
5) The drain and fill procedure only removes 50% of the coolant, resulting in an improper coolant concentration. When this occurs, the mixture of antifreeze to water may be less than a 50/50 mix. This results in improper levels of corrosion inhibitors and lubricants.

For overheating conditions and loss of coolant, make certain that the radiator cap is functioning properly and in accordance with its PSI rating. Many of the newer vehicles are fitted with radiators that incorporate composite radiator tanks. It is not uncommon for the filler neck to fail to properly seal with the radiator cap, due to imperfections in the composite material. When this condition occurs, the imperfections can usually be removed with light sanding. Attach a piece of 400 grit sandpaper to a sanding block or a flat piece of wood. Polish the filler neck sealing surface in a circular motion.

ELECTRICAL PROBLEMS CAN PROMOTE COOLING SYSTEM PROBLEMS

When you encounter vehicles that repeatedly experience heater core or radiator failures, the condition may be due to a problem in the electrical system. Some are hesitant to test the cooling system for excessive voltage, but this should become a part of your cooling system diagnostics.

Electrolysis

Marine technicians and boat enthusiasts are familiar with the effect of electrolysis. If you are not familiar with the condition, you have probably observed the effects of electrolysis without knowing what you were looking at. Do you recall seeing an outdrive unit on a boat that had the appearance of excessive corrosion, often displaying a deep crater effect that consumed the aluminum housing? If the boat was a fresh water vessel, the condition was likely due to electrolysis. When boats are at port in a marina, they are usually hooked up to shore power. Under these conditions, electrolysis is very common due to improper wiring or bad grounding. Electrolysis can consume submerged components such as propellers, rudders, propeller shafts, outdrives and the bottom of steel hull boats.

To protect the components, sacrificial zinc anodes are installed on the mentioned components to protect them from electrolic corrosion.

Electrolysis is also becoming a very common occurrence with the newer vehicle designs. The systems incorporate lightweight metals, ungrounded plastic tank radiators, and a myriad of electronic systems and accessories. Many of these are consumer add-ons with insufficient grounding. The effect of electrolysis occurs when the current takes the path of least resistance and travels through the engine coolant, seeking a ground. The engine coolant is not the best choice of a ground return circuit. When this condition occurs, the coolant becomes electrically charged and basically becomes an electrolyte. The softer metals, such as the aluminum radiator or heater core, succumb to the electro-chemical reaction. This can be recognized by a white, black or green crusty deposit forming around the solder joints, and eventually resulting in coolant leakage. Pinholes may also occur in the heater core or radiator. While a poor engine component ground, such as a starter motor, may result in a defective radiator or heater core in a matter of a few weeks, an improperly grounded electrical accessory may take months to destroy the same components. Adding a ground to the radiator or heater core is not the best solution and could actually complicate the problem. A ground may eventually have to be added, but finding the component or accessory with the improper ground is the key to solving the condition. Electric cooling fans, or any electrical accessory grounded in close proximity to the radiator, are likely candidates, but the problem could be anywhere in the electrical system.

Some measurable voltage may be detected in any cooling system, as the different metals in the system react with the coolant. This voltage should not exceed 0.1 volts. The electrolysis test is simple to perform. With a digital voltmeter set on the 12 volt DC scale, attach the negative lead directly to the negative post of the battery and the positive lead should be placed into the radiator coolant. Do not allow the test probe to make contact with the filler neck or radiator core. Two readings are preferred, one with the engine off and the other with the engine running at approximately 2,000 rpm, with all electrical accessories on. Take the necessary precautions, as the cooling system may be hot and under pressure. A voltage reading in excess of 0.3 volts confirms electrical leakage into the cooling system. If the condition is present, flush the system, install new coolant and re-test. If the condition is still present, a thorough ground inspection must be performed.

The process of elimination will pinpoint the problem. Individually turn all electrical accessories off, one at a time, while observing the voltmeter reading. When the voltage drops below 0.1 volts, you have identified the problem circuit. Check and if necessary add a ground to that circuit. If the excessive voltage continues after turning off all electrical accessories, pull the fuses individually, while observing the voltmeter. This will isolate the problem circuit. Now you must isolate the component feeding off that fused circuit. Refer to a wiring diagram to identify the circuits that get power from that fuse. To check the starter circuit, crank the engine while observing the voltmeter. A poor starter ground can consume the radiator or heater core in a very short time. Intermittent problems can be elusive. For example, some components, such as an electric cooling fan, may not function until the engine reaches a given temperature. Always go for the add-on electrical accessories first. This is usually where we identify poor ground returns.

These basic checks and observations can save you and your customer time and expense. Nailing and fixing the problem on the initial attempt enhances the shop's reputation.

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TECHNICAL SERVICES