How To Find & Fix Coolant Leaks

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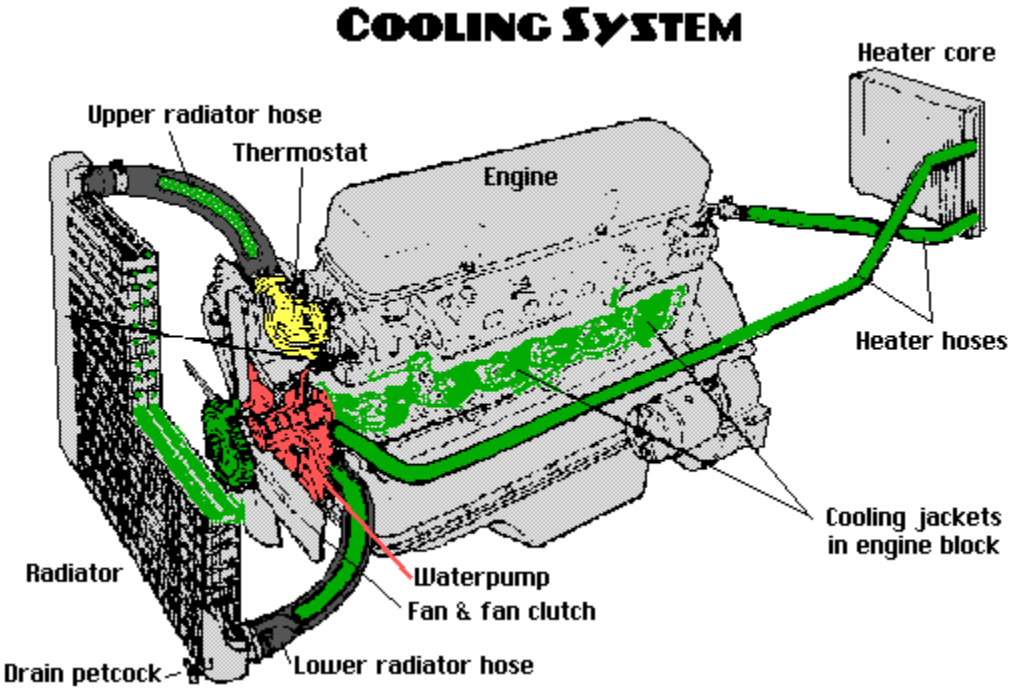
Coolant leaks can occur anywhere in the cooling system. Nine out of ten times, coolant leaks are easy to find because the coolant can be seen dripping, spraying, seeping or bubbling from the leaky component. The first symptom of trouble is usually engine overheating. But your car may also have a Low Coolant indicator lamp. If you suspect your vehicle has a coolant leak, open the hood and visually inspect the engine and cooling system for any sign of liquid leaking from the engine, radiator or hoses. The color of the coolant may be green, orange or yellow depending on the type of antifreeze in the system. You may also notice a sweet smell, which is a characteristic odor of ethylene glycol antifreeze.



The most common places where coolant may be leaking are:

 *A worn seal on the water pump shaft can leak coolant.*

Water pump -- A bad shaft seal will allow coolant to dribble out of the vent hole just under the water pump pulley shaft. If the water pump is a two-piece unit with a backing plate, the gasket between the housing and back cover may be leaking. The gasket or o-ring that seals the pump to the engine front cover on cover-mounted water pumps can also leak coolant. Look for stains, discoloration or liquid coolant on the outside of the water pump or engine.

 *This radiator is badly corroded and is not worth fixing*

Radiator -- Radiators can develop leaks around upper or loser hose connections as a result of vibration. The seams where the core is mated to the end tanks is another place where leaks frequently develop, especially on aluminum radiators with plastic end tanks. On copper/brass radiators, leaks typically occur where the cooling tubes in the core are connected or soldered to the core headers. The core itself is also vulnerable to stone damage. Internal corrosion caused by old coolant that has never been changed can also eat through the metal in the radiator, causing it to leak.

Most cooling systems today are designed to operate at 8 to 14 psi. If the radiator can't hold pressure, your engine will overheat and lose coolant.

 *Pinch hoses to check for age cracks, hardening, soft spots, blisters or bulges.*

Hoses -- Cracks, pinholes or splits in a radiator hose or heater hose will leak coolant. A hose leak will usually send a stream of hot coolant spraying out of the hose. A corroded hose connection or a loose or damaged hose clamp may also allow coolant to leak from the end of a hose. Sometimes the leak may only occur once the hose gets hot and the pinhole or crack opens up.

Freeze plugs -- These are the casting plugs or expansion plugs in the sides of the engine block and/or cylinder head. The flat steel plugs corroded from the inside out, and may develop leaks that are hard to see because of the plug's location behind the exhaust manifold, engine mount or other engine accessories. On V6 and V8 blocks, the plugs are most easily inspected from underneath the vehicle.

Heater Core -- The heater core is located inside the heating ventilation and air conditioning (HVAC) unit under the dash. It is out of sight so you cannot see a leak directly. But if the heater core is leaking (or a hose connection to the heater core is leaking), coolant will be seeping out of the bottom of the HVAC unit and dripping on the floor inside the passenger compartment. Look for stains or wet spots on the bottom of the plastic HVAC case, or on the passenger side floor. Some Chrysler vehicles have a reputation for developing coolant leaks in the heater core, and repeat heater core failures. Some have found that an aftermarket copper/brass replacement heater core lasts longer in these applications than the original equipment aluminum heater core.

Intake Manifold gasket -- The gasket that seals the intake manifold to the cylinder heads may leak and allow coolant to enter the intake port, crankcase or dribble down the outside of the engine. Some engines such as General Motors 3.1L and 3.4L V6 engines as well as 4.3L, 5.0L and 5.7L V8s are notorious for leaky intake manifold gaskets. The intake manifold gaskets on these engines are plastic and often fail at 50,000 to 80,000 miles. Other troublesome applications include the intake manifold gaskets on Buick 3800 V6 and Ford 4.0L V6 engines.

INTERNAL COOLANT LEAKS

There are the worst kind of coolant leaks for two reasons. One is that they are impossible to see because they are hidden inside the engine. The other is that internal coolant leaks can be very expensive to repair.

Head gasket damage can be traced to overheating, incorrect torque or detonation. Ensure that proper parts and procedures are used when installing the head gasket in your engines or failures are likely.

Bad head gasket --Internal coolant leaks are most often due to a bad head gasket. The head gasket may leak coolant into a cylinder, or into the crankcase. Coolant leaks into the crankcase dilute the oil and can damage the bearings in your engine. A head gasket leaking coolant into a cylinder can foul the spark plug, and create a lot of white smoke in the exhaust. Adding sealer to the cooling system may plug the leak if it is not too bad, but eventually the head gasket will have to be replaced.

If you suspect a head gasket leak, have the cooling system pressure tested. If it fails to hold pressure, there is an internal leak. A "block tester" can also be used to diagnose a leaky head gasket. This device draws air from the cooling system into a chamber that contains a special blue colored leak detection liquid. Combustion gases will react with the liquid and cause it to change color from blue to green if the head gasket is leaking.

Head gasket failures are often the result of engine overheating (which may have occurred because of a coolant leak elsewhere in the cooling system, a bad thermostat, or an electric cooling fan not working). When the engine overheats, thermal expansion can crush and damage portions of the head gasket. This damaged areas may then start to leak combustion pressure and/or coolant.

 *A cracked cylinder head can leak coolant inside the engine.*

Cracked Head or Block -- Internal coolant leaks can also occur if the cylinder head or engine block has a crack in a cooling jacket. A combustion chamber leak in the cylinder head or block will leak coolant into the cylinder. This dilutes the oil on the cylinder walls and can damage the piston and rings. If the coolant contains silicates (conventional green antifreeze), it can also foul the oxygen sensor and catalytic converter. If enough coolant leaks into the cylinder (as when the engine is sitting overnight), it may even

hydro-lock the engine and prevent it from cranking when you try to start it. Internal leaks such as these can be diagnosed by pressure testing the cooling system or using a block checker.

A coolant leak into the crankcase is also bad news because it can damage the bearings. Coolant leaking into the crankcase will make the oil level on the dipstick appear to be higher than normal. The oil may also appear frothy, muddy or discolored because of the coolant contamination.

Leaky ATF oil cooler -- Internal coolant leakage can also occur in the automatic transmission fluid oil cooler inside the radiator. On most vehicles with automatic transmissions, ATF is routed through an oil cooler inside the radiator. If the tubing leaks, coolant can enter the transmission lines, contaminate the fluid and ruin the transmission. Red or brown drops of oil in the coolant would be a symptom of such a leak. Because the oil cooler is inside the radiator, the radiator must be replaced to eliminate the problem. The transmission fluid should also be changed.

PRESSURE TESTING THE COOLING SYSTEM FOR LEAKS

There are several ways to find out whether or not your cooling system is holding pressure. One is to top off your cooling system, tighten the radiator cap and start the engine. When the engine reaches normal operating temperature, turn on the air conditioner (to increase the cooling load on the system) and/or take it for a short drive. Then check the radiator, hoses and water pump for seepage or leaks.

WARNING: *DO NOT open the radiator cap while the engine is hot!* Even if the cooling system is leaking, the coolant will be under considerable pressure -- especially if it is low and coolant is boiling inside the engine. Shut the engine off and let it sit about an hour so it can cool down. Then place a rag over the radiator cap and slowly turn the cap until it starts to release pressure. Wait until all the pressure has vented before turning the cap the rest of the way off.

Radiator pressure test kit

A special tool called a pressure tester can also be used to check your cooling system. The tool is nothing more than a little hand pump with a combination vacuum-pressure gauge and a fitting that is attached to the radiator filler neck. To check for leaks, attach

the tool to the radiator and pressurize the radiator to the pressure rating on the radiator cap. For example, if you have a radiator cap that says 12 pounds, you pressurize the radiator to 12 lbs. and wait to see what happens. If there are no leaks, the system should hold pressure for 10 to 15 minutes. If it does not hold pressure, the system is leaking. If you cannot see any visible leaks on the outside, it means the leak is inside (bad head gasket or cracked head or block). See How to Fix a Leaky Head Gasket.

A block Checker is another tool that can be used to detect a leaky head gasket. The gas-sensitive blue liquid changes color if there are any combustion gases in the coolant.

Leak detection dye can also be added to the coolant itself to make a slow leak easier to find. Some of these dyes glow bright green or yellow when exposed to ultraviolet light.

RADIATOR CAP CHECKS

The radiator cap should also be pressure tested, especially if the system has been overheating or losing coolant with no obvious external leaks. A weak cap that cannot hold pressure will allow the system to boil over. If the cap cannot hold its rated pressure, replace it.

 *The best fox for a leaky radiator is to replace it with a new or recored radiator.*

REPAIRING A LEAKY RADIATOR

If your radiator is leaking, you have several repair options:

You can try the cheap fix and add a bottle of cooling system sealer to the radiator. These products are designed to seal small leaks. They can also seal internal engine leaks. Some work better than others, but most provide only a temporary solution to your problem.

You can attempt to repair the radiator yourself. Copper/brass radiators on older vehicles can often be soldered to repair leaks. Cracks or pinholes in aluminum radiators in newer vehicles can often be repaired with epoxy glue. But if the core is severely corroded or damaged, the radiator may have to be professionally repaired at a radiator shop, or replaced with a new radiator.

HOW TO FIX A LEAKY HEATER CORE

As with a leaky radiator, you might try the cheapest fix and add a bottle of cooling system sealer to see if that will stop the leak. If the leak is small, the sealer will probably stop the leak - at least temporarily. But if the sealer does not stop the leak, you will have to disassemble the HVAC case to replace the heater core. This is a very time-consuming and difficult job that involves a LOT of labor on most vehicles. The labor to replace a heater core can often run 8 to 10 hours or more!

Some vehicles have had problems with repeat heater core failures (some Chrysler cars, for example). The problem in some cases is the design of the heater core itself, or the metal alloys from which it was made. But a common cause of heater core leaks is Electrolysis Corrosion. One fix is to attach a grounding strap on the heater core. Another is to replace an original equipment aluminum heater core with an aftermarket copper/brass heater core.

COOLANT RESERVOIR LEAKS

Another cooling system component that sometimes needs attention is the coolant overflow reservoir. The coolant overflow reservoir does more than catch the overflow from the radiator. It serves as a storage tank for excess coolant. When the system is hot, coolant will be forced out through the radiator pressure cap and into the reservoir. Then as the system cools down, decreasing pressure will draw coolant back into the radiator.

On many newer vehicles, the coolant reservoir is pressurized and is an integral part of the cooling system. The filler cap for the cooling system is located on the reservoir tank, and the tank is connected to the radiator and engine with hoses. The reservoir is transparent plastic and you can see the coolant level inside.

If the coolant reservoir is cracked or leaking, the system may lose coolant every time the engine heats up. Eventually, this can cause the engine to overheat.

Small punctures or cracks in the overflow reservoir can usually be repaired with silicone sealer. If the reservoir needs to be replaced, make sure the hoses are routed correctly between the radiator and the reservoir, and that it is free from kinks that could block the flow of coolant back and forth.

HOW TO FIX A LEAKY FREEZE PLUG

Freeze plus (also called expansion plugs) are round metal plugs that are pressed into cylinder head and engine block castings. The plug is supposed to push out and save the casting if the coolant does not contain enough antifreeze to prevent it from freezing during cold weather. Over time, the plugs can corrode from the inside and leak, causing the engine to lose coolant and overheat.

One way to temporarily patch a leaky freeze plug is to clean the surface of the plug, sand it lightly with sandpaper, and pack it solid with a high temperature two-part epoxy such as gas tank sealer or JB Weld epoxy. Let it cure overnight. This trick usually seals leaky expansion plugs that would otherwise be very difficult to replace.

To replace a leaky freeze plug, use a hammer and drift to knock out the old plug. Pounding in on one side of the plug will usually cause it to twist. The plug can then be pried out with a large screwdriver. Clean the hole, then apply a liberal coating of sealer to the hole and carefully drive in a new replacement plug. The plug must go in straight or it may not seal.

Another repair option is to replace a solid metal freeze plug with an expandable freeze plug. The expandable plugs have a rubber grommet that expands and seals against the opening when the center bolt in the plug is tightened. It's easier to install and less apt to leak than a solid plug.

HOW TO FIX A LEAKY COOLANT HOSE

Do not waste your time trying to patch or wrap a leaky radiator or heater hose. Sealers and Stop Leak products also do not work well with hoses. Replace the bad hose with a new one, and inspect all the other hoses because if one has failed the others are probably reaching the end of the road, too.

Old hoses are often hard and stick to their fittings, making them difficult to remove. Use a razor blade or box cutter to slit the old hose so it can be easily pulled off its end fittings.

It is also a good idea to replace the original hose clamps, especially if they are the ring type. Ring clamps can lose tension with age and may not hold the hose tightly. Worm drive stainless steel clamps are best. But quality brand stainless steel worn drive clamps, not the cheap plain steel ones that are made in China. They will rust and fail.

You should also inspect the inside of your old radiator and heater hoses after they have been removed to check for deep fissures or cracks caused by Electrolysis Corrosion. This type of corrosion can be caused by old antifreeze that no longer provides adequate corrosion protection, or by stray electrical currents that use the coolant as a ground path.

HOW TO FIX A LEAKY WATER PUMP

No Stop Leak or cooling system sealer product will seal a water pump that is leaking coolant past the shaft seal. Replacement is your only option. But you can save some money on the job by using a remanufactured water pump rather than a new water pump.

Replacing a water pump is not too hard a job on most engines, but on some it can be tricky. On some engines (2.8L GM V6 engines, for example), the bolts that hold the water pump also hold the timing cover in place. If you are not careful, the timing cover seal can be broken allowing coolant to leak into the crankcase. GM recommends using a special tool (J-29176 or equivalent) to hold the timing cover tight while the pump is being changed.

 *Check the fan clutch because a weak clutch can cause the engine to overheat.*

If your engine has a belt-driven fan with a fan clutch, it is also a good idea to check the fan clutch when replacing the water pump. The lifespan of both is about the same, so the fan clutch may also need be replaced. If the clutch is leaking silicone fluid, or has any wobble in the bearing, it must be replaced.

REFILLING THE COOLING SYSTEM

When refilling the cooling system after making a repair, always use a 50/50 mixture of antifreeze and water. Never use straight water because it has no freezing protection, no corrosion protection and it boils at a lower temperature (212 degrees F.) than a mixture of antifreeze and water (which protects to 240 degrees F.).

Use the type of antifreeze specified by the vehicle manufacturer, or a Universal Coolant that is compatible with all makes/models. Most late model vehicles require some type of OAT or HOAT long life coolant. GM vehicles use Dex-Cool.

On some late model front-wheel drive cars, refilling the cooling system can be tricky unless you "burp" the system by opening a bleeder vent or cracking a hose at a high point in the system to allow trapped air to escape. If you do not get all of the air out, the engine may overheat the first time you drive it.

The best way to refill the system is to add coolant until the radiator is within an inch of being full. Also add coolant to the coolant reservoir, filling it to the proper level. If the system has a pressurized coolant reservoir, add coolant until the level inside the reservoir is at the COLD FULL mark. Start the engine and let it idle with the radiator or coolant reservoir cap off until the thermostat opens and coolant starts to circulate through the engine. The heater should also be on so coolant will flow through the heater core. As the coolant level drops, continue to add coolant until the system takes no more.

Then replace the radiator cap and drive a short distance. Shut the engine off, and after it has cooled recheck the coolant level once again. If low, add as needed. Share

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