USMW
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SUCCESS IN COOLING

ENGINE WATER PUMPS

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COMMON FAILURE MODES & CAUSES

WATER PUMP SEAL FAILURE

Like any other mechanical part, the water pump seal will eventually wear out. Even with the best maintenance schedule, parts have a limited service life. A common failure will begin with the appearance of a small amount of coolant from the weep-hole. This may go unnoticed until the fluid appears on the ground or the smell of burning fluid becomes apparent.

Poorly maintained or contaminated cooling systems is the other major contributor to seal failure. Rust and loose particles will eat away at the water pump seal.

The water pump seal can also be subject to conditions that reduce its service life or damage the component rather quickly. Imbalance in the system is the number-one contributor to rapid seal failure. Reinstalling the old fan clutch onto a new water pump can stress the seal and bearing as can a damaged fan blade or belt tensioners. Adding cold water to a hot radiator or over-heated cooling system can fracture different components including the water pump seal because of thermal expansion. Always wait for a cooling system to cool down before attempting any work or opening the radiator.

BEARING FAILURE

The same imbalance that causes seal failure will eventually or immediately cause bearing failure. If the seal fails and coolant makes it to the bearing, the fluid will wash away the bearing grease and cause total bearing failure. This will seize the bearing and could lead to a snap of the bearing shaft. Over tensioned belts or faulty tensioners, along with a faulty fan clutch or broken fan will produce the necessary stress to damage or destroy the water pump bearing.

Notice in photo 03, the pulley is tilted at a slight angle, a sign that indicates bearing failure.


02


03

DID YOU KNOW?

A commonly overlooked cooling component is the fan clutch. The fan clutch usually is found mounted to the water pump. A worn-out water pump will have the same miles as the fan clutch. Reinstalling the original fan clutch onto a new water pump is a poor decision that will lead to premature failure of the water pump. Replace both at the same time.

LEAKING WATER PUMP

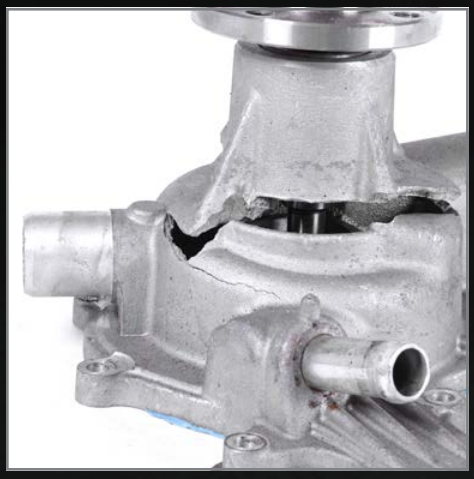
A water pump leak can originate from other areas besides the weep-hole. Incorrect tightening of mounting bolts, use of gasket sealant, or pinching of mounting gaskets and seals all can contribute to a leak. If addressed quickly, water pump failure can be avoided. If left unattended, a cooling system failure can result in overheating and engine damage.
A quality water pump will include the proper sealing devices required for the water pump replacement. Reputable water pump manufacturers do not recommend the use of further sealant items.

DID YOU KNOW?

The use of gasket sealant is not required on most water pump replacements and should only be used where the OEM design calls for it. Unless used in extremely limited amounts and precisely, any excess, exposed material will harden, become loose, and enter the cooling system causing blockage. This hardening can also cause voids in the sealing area and coolant will find its way out and appear as a faulty water pump.

BREAKAGE

Water pumps are in most cases metal; either aluminum, cast iron, or steel. A water pump is a strong, rugged engine component built to last many years and miles. A break in a water pump is usually associated with major imbalance in the rotation dynamics of the water pump. Fractures are caused by over tensioning of, or faulty belt tensioners, over tightening of the mounting bolts, reuse of the original fan clutch, or incorrect tension of a new fan clutch, and misalignment of the mounting or belt systems. Incorrect tools used to install the water pump such as pry bars and hammers have led to this condition. Bearing seizure can also contribute to destructive failure.



COOLING SYSTEM PROBLEMS:

ELECTROLYSIS

Electrolysis is the result of electricity flowing through the cooling system and causing an electrochemical charge on certain metals. This charge can cause damage throughout the cooling system and cause discoloration, corrosion and flaking of metals, and pinholes. The cause of electrolysis is a loose or damaged ground on any electrical source or poor coolant pH balance.

HELPFUL TIP

If the water pump that is to be replaced has these features, check the electrical system and review other accessible cooling system components for material discoloration or pitting. Never use the radiator as a ground. Poor cooling system maintenance can cause a coolant PH imbalance producing chemical electrolysis.

FAILURE FROM CAVITATION

Cavitation is voids in the coolant filled with super-heated vapor that can erode both plastic and metal. Incorrect coolant and water mix is a major cause of cavitation. Restrictions in the coolant flow can cause the voids as well because of vapor pressure and suction generated by the pump.

A pressure test of the cooling system will reveal any leaks in the system and proper coolant mix or properly formulated coolant will help avoid cavitation.

HELPFUL TIP

If the water pump that is to be replaced has these features, check the entire cooling for restrictions and inspect the entire cooling system including a pressure check, checking the radiator and radiator cap for leaks, and replacing all hoses and the thermostat.

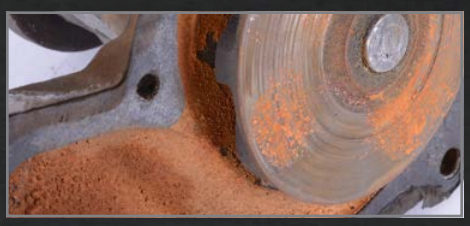
CONTAMINATED SYSTEM FLUID

A coolant change at water pump replacement is an important, and often overlooked step in a water pump replacement.

Contaminated coolant can appear rusty if contaminated from oxidation or the consistency can become thick possibly from mixing different types of coolant. Leaks in the cooling system can introduce air into the coolant and cause degradation of the coolant and cavitation. Not using enough or using too much water mix can damage engine components and regular tap water can leave deposits of minerals that can clog the system and erode materials. The water used in a cooling system should be distilled. The type of coolant used is also an important factor in today's vehicles as different OEM's are using specific formulas as part of the engine design.

DID YOU KNOW?

Today, multiple coolant types exist for different vehicles. Using the correct blend recommended by the OEM is critical for the health of the cooling system. These blends should not be mixed, such as OAT based formulas with IAT formulas. This practice can turn the coolant into sludge because of chemical reactions, reduce the boiling point, or raise the freezing point temperatures.



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