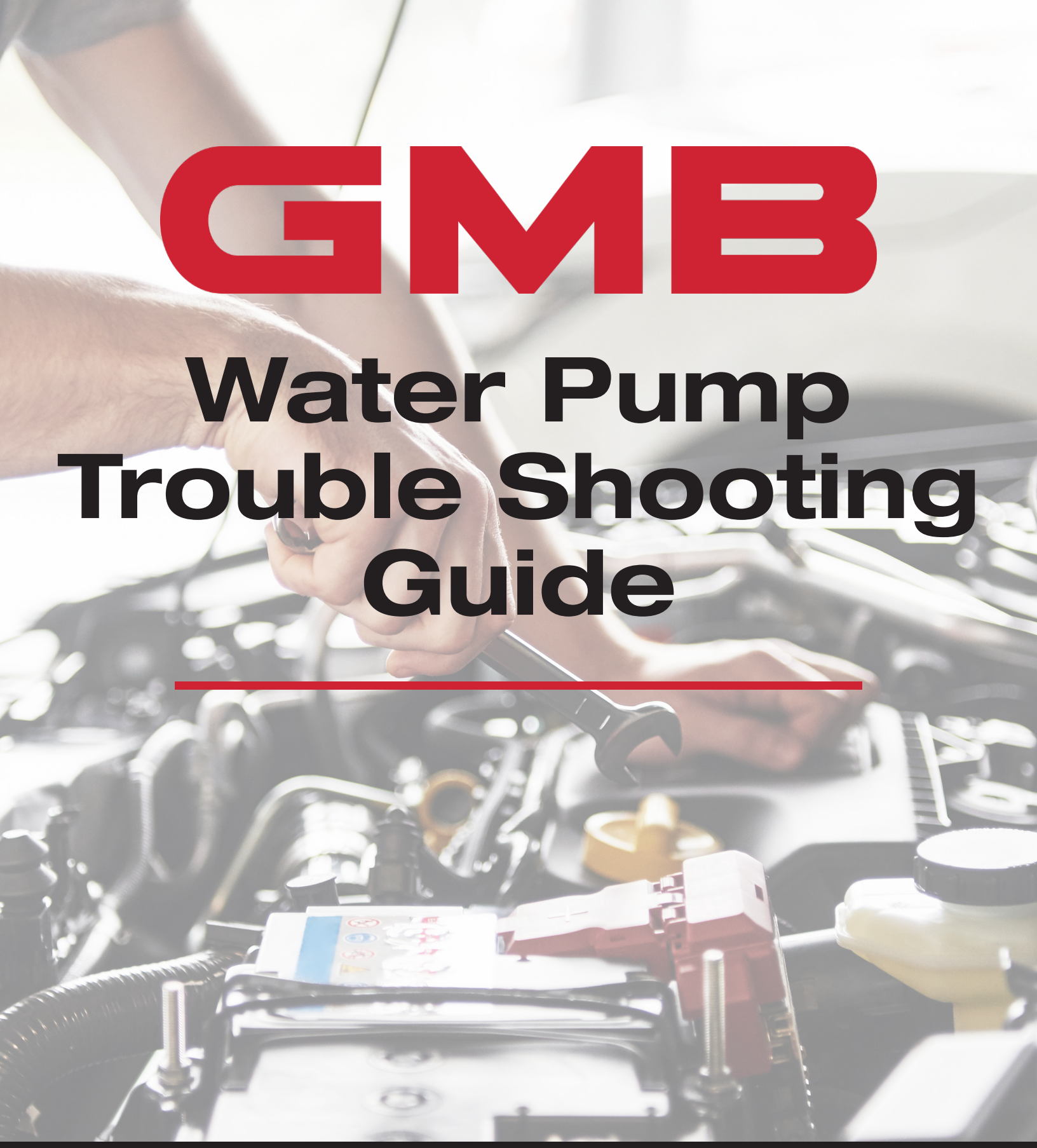


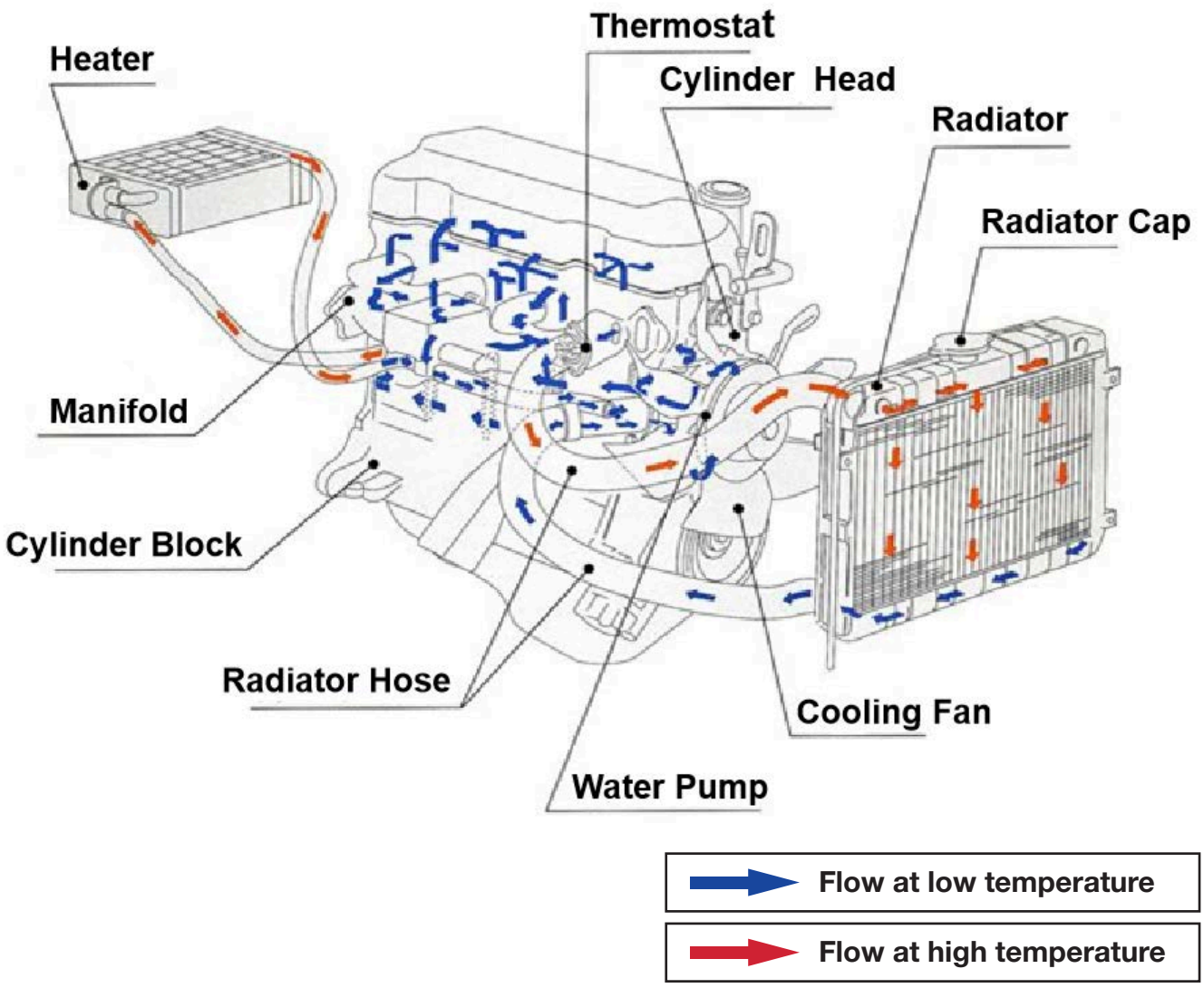
GMB

Water Pump Trouble Shooting Guide

A COMPLETE GUIDE TO DIAGNOSTICS, PREVENTION, AND INSTALLATION

1. The Function of the Water Pump

COOLANT FLOW

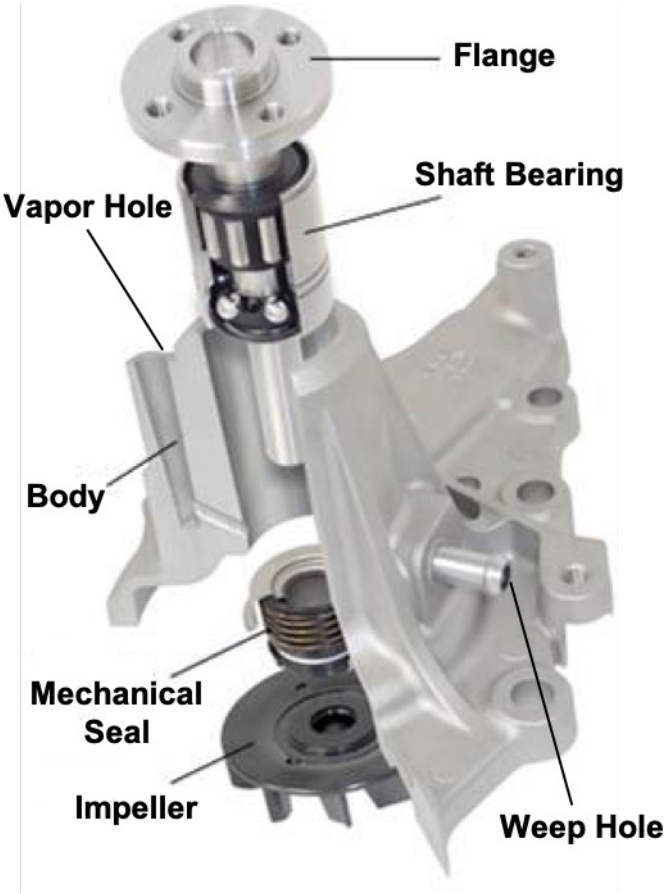


The water pump is an integral part of the cooling system and has an important role to circulate the coolant through the engine block water jacket and radiator.

High temperature coolant heated by the engine is cooled off through the radiator and circulated into the engine block water jacket.

The water pump is located between the engine and the radiator. It is driven by a belt pulley system, timing belt or fan belt to circulate coolant forcibly.

2. Structure and Mechanism of Water Pump



Flange (Hub)	Pulley and/or fan clutch are mounted on a flange.
Shaft Bearing	These are Ball/Double Ball/Roller types.
Body	Aluminum with Die-Cast, Gravity-Cast, and Cast-Iron
Mechanical Seal	Maintain rotor being closed tightly
Impeller	There are either pressed steel, cast-iron or resin type

- Crank Shaft rotary power drives impeller rotation through the water pump pulley and bearing shaft.
- The impeller rotation drives coolant into the water jacket, using centrifugal force and makes coolant circulate.
- Coolant has filled pump room and water pump bearing is isolated by mechanical seal.
- The mechanical seal is a dynamic rotation seal type and is always required to rotate in lubricated condition. The approached and lubricated liquid turns into vapor. The weep hole in the body has a mechanism to discharge the vapor out of the hole.
- While the engine is running, the water pump flange belt or timing belt continues to drive the bearing shaft at higher RPM than engine RPM. Therefore, high durability is required for the water pump.

3. Precaution in Replacing Water Pump

REPLACEMENT SHOULD BE HANDLED BY A SPECIALIST

If handled by a non-specialist, it may cause failure of the water pump itself and also other failures apart from the water pump.

PLEASE BE SURE OF WATER PUMP CAR MODEL, PRODUCTION YEAR, OE PARTS NUMBER

Installing a water pump of a different part number causes failure or overheating.

DO NOT SHOCK THE WATER PUMP

The water pump is composed of precision parts of bearing, mechanical seal etc. If the water pump is struck by a hammer or is dropped, it may cause leakage or damage to the bearing.

DO NOT INSTALL THE WATER PUMP WHILE ENGINE IS HEATED

If heated coolant flows out it may cause burns or injury. Install the water pump after the engine is cooled down completely.

DO NOT REFILL COLD WATER OR COOLANT WHILE ENGINE IS HEATED

Sudden temperature change will damage the mechanical seal and engine parts.

DO NOT START ENGINE WITHOUT COOLANT

Mechanical seal will be damaged and can cause leakage.

WHILE ENGINE IS RUNNING, DO NOT STAND CLOSE TO FAN COUPLING OR IN ROTATIONAL DIRECTION OF FAN

While engine is running and if rotating parts such as the fan were damaged, those parts will scatter around and could cause serious injury.

BE SURE THERE IS NO LEAKAGE IN OTHER PARTS OTHER THAN WATER PUMP; RADIATOR, RADIATOR HOSE, HEATER CORE ETC.

Leakage can also occur in other parts.

CHECK FAN, FAN COUPLING, PULLEY FAN BELT, RADIATOR CAP, THERMOSTAT ETC.

Abnormal noise and failure in the cooling system can arise in parts other than the water pump.

WHEN YOU REPLACE THE TIMING BELT DRIVEN TYPE OF THE WATER PUMP, REPLACE THE TIMING BELT AND TENSIONER BEARING AT SAME TIME

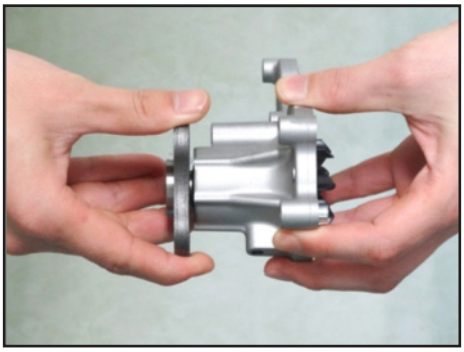
Abnormal noise and failure in the cooling system can arise in parts other than the water pump.

4. Precautions in Replacing Water Pump

1. DO NOT DRY TURN THE WATER PUMP

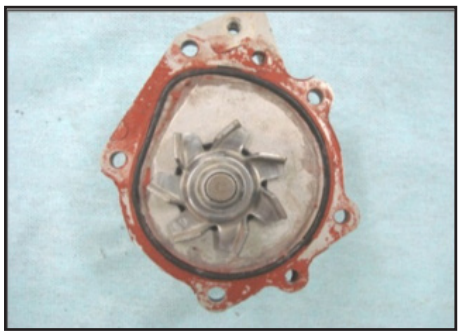
Do not turn the flange or pulley while mechanical seal contact surface is in dry condition. Turning in dry condition may cause damage to carbon and make a squealing noise.

In dry condition, it may make a squealing noise but it will stop when coolant lubricates contact surface of mechanical seal after the water pump is installed to the engine.



2. DO NOT APPLY LIQUID SEALANT TO O RING

By applying liquid sealant for O ring type seal, excess amount of liquid sealant mixes with coolant inside the water channel and intrudes into the mechanical seal contact surface which will cause leakage.



3. INSPECTION ON BELTS

When replacing the water pump, inspect and adjust the pulley belt and the timing belt. Abnormal noises are likely to be produced if the belt is cracked or foreign material or oil is adhering to the belts or belt tension is insufficient.

5. Installation Procedure

1. Flush the radiator and the engine, replacing the coolant. Remove dirt and rust deposits out of the cooling system in installed condition of old water pump

Foreign material intrudes into mechanical seal and it causes leakage

2. Remove the old water pump and completely clean remaining gaskets or dirt from mounting surface.

If cleaning is incomplete, it causes leakage from the mounting surface.

3. Apply liquid sealant lightly and evenly on both sides of the new gasket. Do not apply sealant for O Ring or Metal Gasket.

Excess sealant usage allows seal agent to enter into coolant. It causes leakage in early stage.

4. Install new water pump and tighten mounting bolts in a diagonal pattern with car manufacturer's specified torque evenly.

Excessively tightening of the bolts causes mounting bolt hole damage and causes leakage.

5. If the water pump is the type to be assembled with the fan clutch, and you find installation wobbling or damage, replace the parts.

Increased vibration causes fracture on the bearing, body and or flange

6. Install belt on the water pump pulley and adjust tension to the specified value by car manufacturer.

If excessive load is applied, the water pump body and bearing will have excess load which leads to early stage fracture.

7. Refill the radiator with new coolant and ensure there is no leakage. Do not recycle old coolant. Use new coolant with concentrations and volume specified by car manufacturer.

Using poor quality coolant causes cavitation, abnormal wear of the mechanical seal and impeller corrosion.

8. Bleed the air completely to ensure the radiator and its reservoir tank are filled with coolant volume specified by car manufacturer. At the end, check there is no leakage or abnormal noise in any places. Now the replacement is complete.

If you start the engine with insufficient coolant, it will cause water circulation failure and abnormal wear of the mechanical seal.

6. Failure Cause & Prevention

FAILURE MODE: LEAKAGE

LOC.	SYMPTOM	CAUSE
BODY WEEP HOLE	Rough contact surface of the mechanical seal	· Coolant degradation · Foreign material (dirt or sludge) intruded
	Foreign material adhering to contact surface of mechanical seal	· Coolant degradation · Excess liquid sealant application allows sealant to enter into the water channel and mix with the coolant causing it to intrude into the mechanical seal
	Mechanical seal fractured, burned	· Driving with insufficient coolant
	Mechanical seal fractured	· Pulley run-out · Insufficiently and unevenly tightened bolts
	Early stage matching of the mechanical seal contact surface	· Internal pressure difference causes drip and generates vapor

Vapor generated in early stage of Installation will stop after matching on contact surface of mechanical seal

PREVENTION	
· Regular coolant maintenance	· Refill coolant
· Fully flush when replacing coolant	· Tighten mounting bolts evenly in an diagonal pattern
· Apply appropriate amount of liquid sealant evenly	· Install belts with proper tension

6. Failure Cause & Prevention

FAILURE MODE: LEAKAGE

LOC.	SYMPTOM	CAUSE
MOUNTING SURFACE	Foreign material adhering to mounting surface	· Contamination on engine mounting surface caused foreign material to intrude
	Liquid sealant is not applied for supplied gasket	· Liquid sealant is not applied
	Improper installation	· Chip, deformation on mounting surface · Tightening torque failure · Applied sealant on O ring, metal gasket
	Gasket fractured, deformed	· During transportation or handling

PREVENTION
· Clean engine mounting surface of any remaining gasket/sealant without causing damage on mounting surface · Apply liquid sealant on both sides of supplied gasket (Apply liquid sealant lightly and evenly on both sides of our supplied paper gasket) However, do not apply liquid sealant for O ring, metal gasket · Tighten mounting bolts with manufacturer specified torque evenly in an diagonal pattern

6. Failure Cause & Prevention

FAILURE MODE: ABNORMAL NOISE

LOC.	SYMPTOM	CAUSE
WATER PUMP AREA	Bearing noise [Rumbling]	· Coolant intrusion due to mechanical seal failure · Excess Belt Tension · Vibration by run-out of pulley/fan
	Mechanical seal noise [Whining]	· Seal contact area is dry
	Belt noise [Squeaking]	· Belt degradation, tension performance degraded

PREVENTION

- Regular coolant maintenance
- Regular maintenance of belt tensioner
- Regular check for belt degradation

LOC.	SYMPTOM	CAUSE
BODY FRACTURED	Corrosion due to cavitation	· Corrosion due to coolant deterioration (oxidation etc.)
	Mounting bolt hole fractured	· Bolts were tightened with excessive torque

PREVENTION

- Regular coolant maintenance
- Fasten mounting bolts with manufacturer specified torque evenly in an diagonal pattern

6. Failure Cause & Prevention

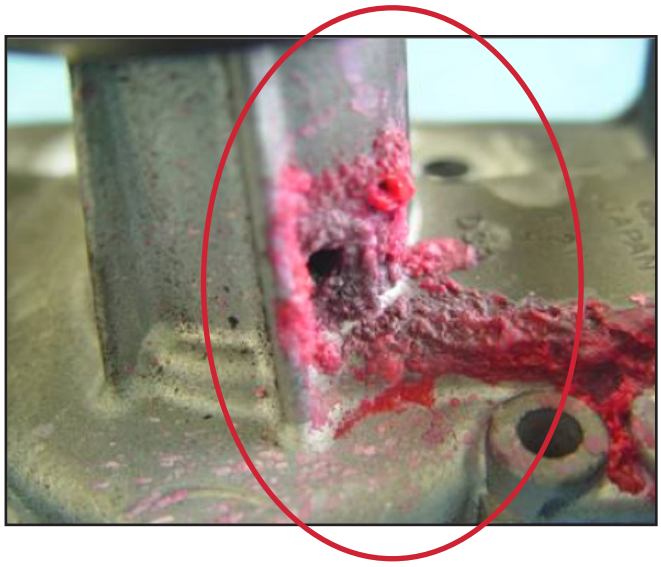
FAILURE MODE: OVERHEAT

LOC.	SYMPTOM	CAUSE
OVERHEAT	Impeller idling	· Coolant Frozen
	Impeller broken, corroded	· Corrosion by coolant deterioration (oxidation)
	Corrosion by cavitation	· Corrosion by coolant deterioration (oxidation)

PREVENTION
· Use specified and suitable coolant for cold districts · Regular coolant maintenance · Adjust belt tension to the specification · Replace degraded belts

7. Specimen Problems

I. LEAKAGE OUT OF WEEP HOLE

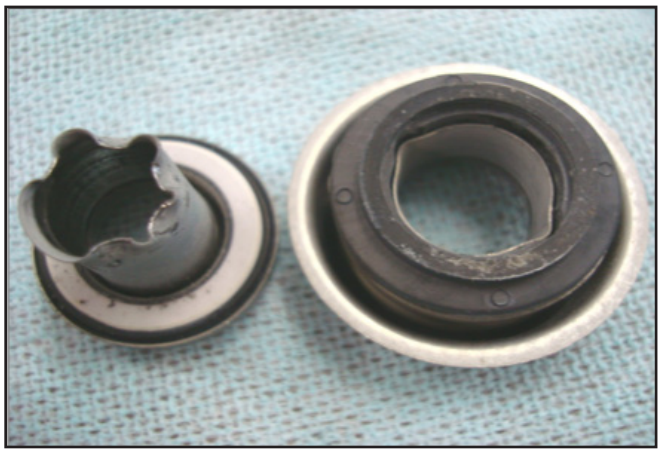


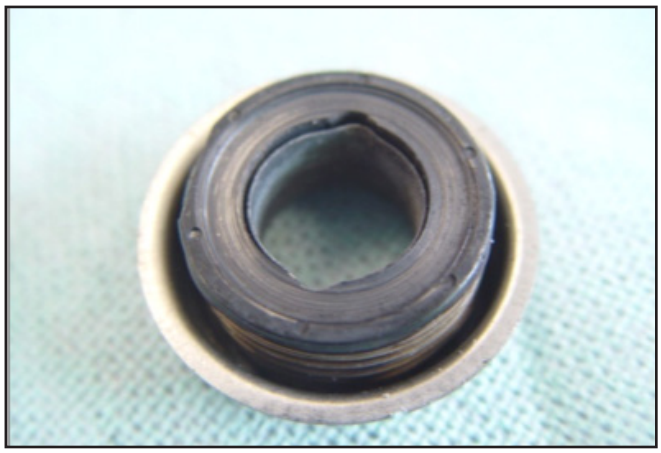
CAUSE 1: WEAR BY COOLANT

Resulting from sludge or rust from metallic corrosion carried by coolant intruding into the mechanical seal surface and abrading sealing surface so sealing performance decreases

PREVENTION

- Coolant needs regular maintenance
- Cooling system should be flushed completelyat replacement.





7. Specimen Problems

I. LEAKAGE OUT OF WEEP HOLE

CAUSE 2: USAGE OF EXCESS LIQUID SEALANT

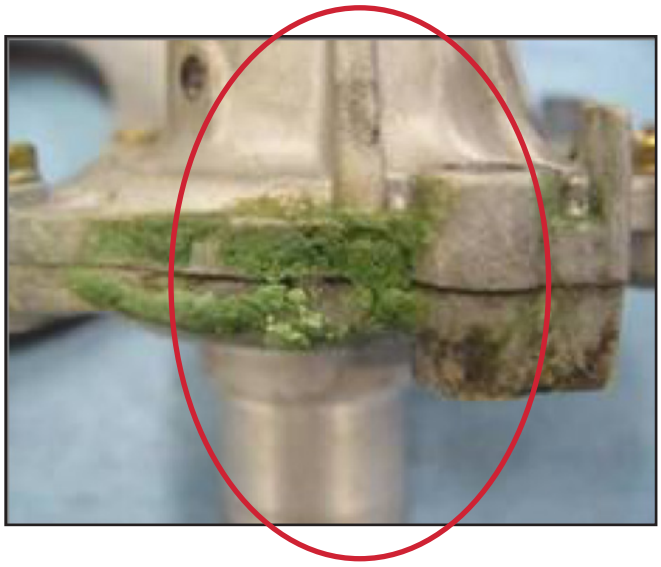
Excess amount of liquid sealant mixes with coolant and intrudes between opposing sides of the mechanical seal, stopping full seal being made and causing leakage

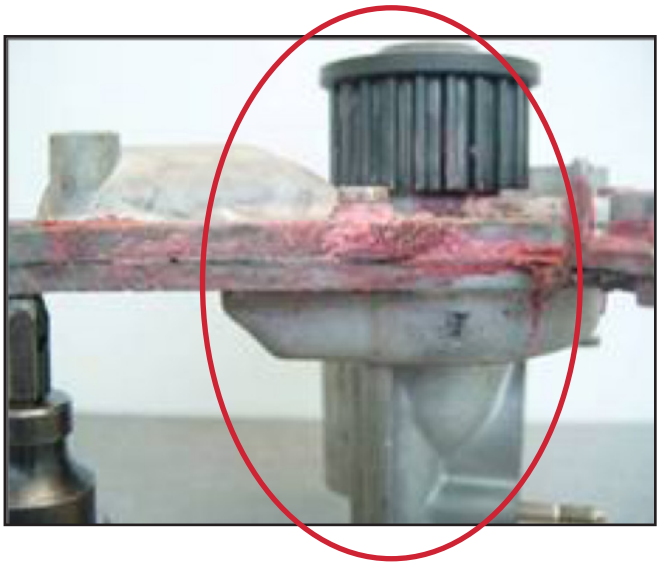
PREVENTION

- Liquid sealant must be applied evenly to water pump gasket surface. However, do not apply liquid sealant for O ring and metal gasket

7. Specimen Problems

II. LEAKAGE FROM MOUNTING SURFACE

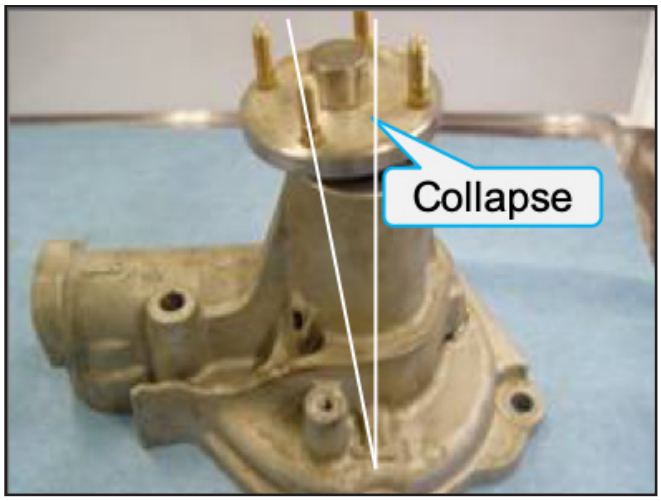




CAUSES	Contamination on mounting surface (Sealant grime etc.)	· Ensure mounting surface is free from remaining gasket /sealant without causing damage on mounting surface	PREVENTION
	Liquid sealant is not applied	· Apply sealant on both side of supplied gasket	
	Applying sealant on supplied O ring, Metal gasket	· Do not apply liquid sealant on O ring type seal.	
	Improper installation	· Tighten mounting bolts using manufacturer's specified torque evenly in a diagonal pattern	

7. Specimen Problems

III. BEARING NOISE



Fan clutch bearing blocked - breakage

CAUSE	Mechanical seal failure causes coolant to intrude into the bearing	· Regular coolant maintenance	PREVENTION
	Excess vibration by other installed parts (pulley/fan)	· Fully check abrasion condition, run-out of pulley/fan and replace them if found abnormal	
	Excess belt tension	· Keep belt tension within the values specified by car manufacturer	

7. Specimen Problems

IV. OVERHEAT

Impeller Corrosion

Bottom plate corrosion

CAUSE	Frozen coolant	· Use coolant specified and suitable for cold districts · Do not recycle used coolant · Use a good quality coolant with concentration corresponding to respective area climate
	Corrosion due to coolant deterioration (oxidation etc.)	
	Prolonged use of coolant exhausts the rust preventive chemicals and ethylene glycol which are main element of antifreeze turns into formic acid	· Regular maintenance of coolant. Before replacing water pump, replace coolant in radiator and engine block water jacket and fully flush.
		PREVENTION