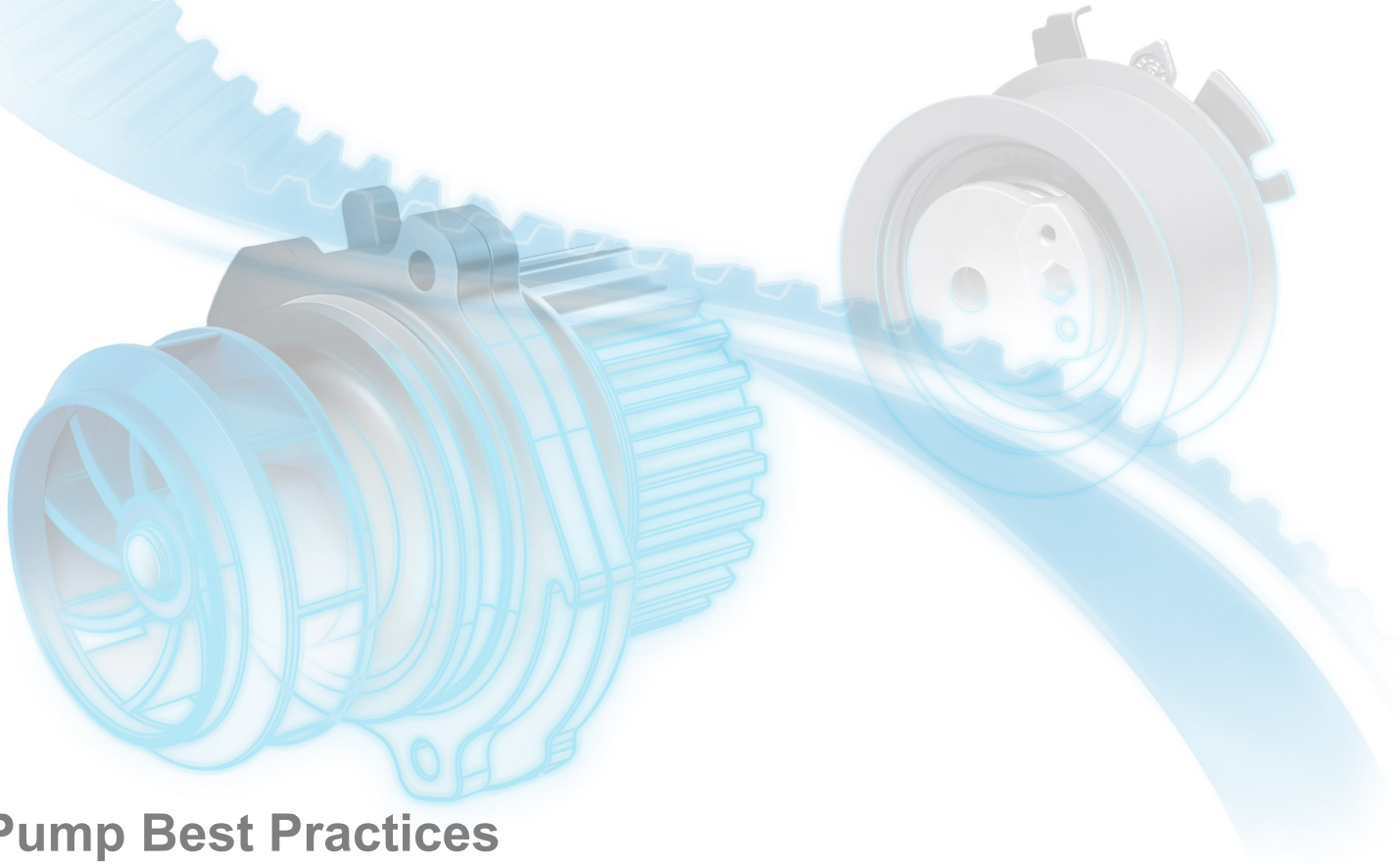




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Water Pump Best Practices

TECHKNOW SERIES
by DAYCOSM



The Water Pump's Purpose

The water pump's role is to push coolant through the vehicle's engine block, radiator and hoses to help pull the engine heat away from the system.

- The **pump** is operated by the **engine's** drive belt or timing chain – as the belt or chain turns, the **pump** turns. The coolant that gathers between the impeller blades travels outward using centrifugal force, and suction draws the coolant into the water pump from the radiator.
- After the coolant enters the water pump, it goes through the whole engine, where it absorbs the heat that the combustion process produces, and then it goes to the radiator, so the heat can exit to the outside air.

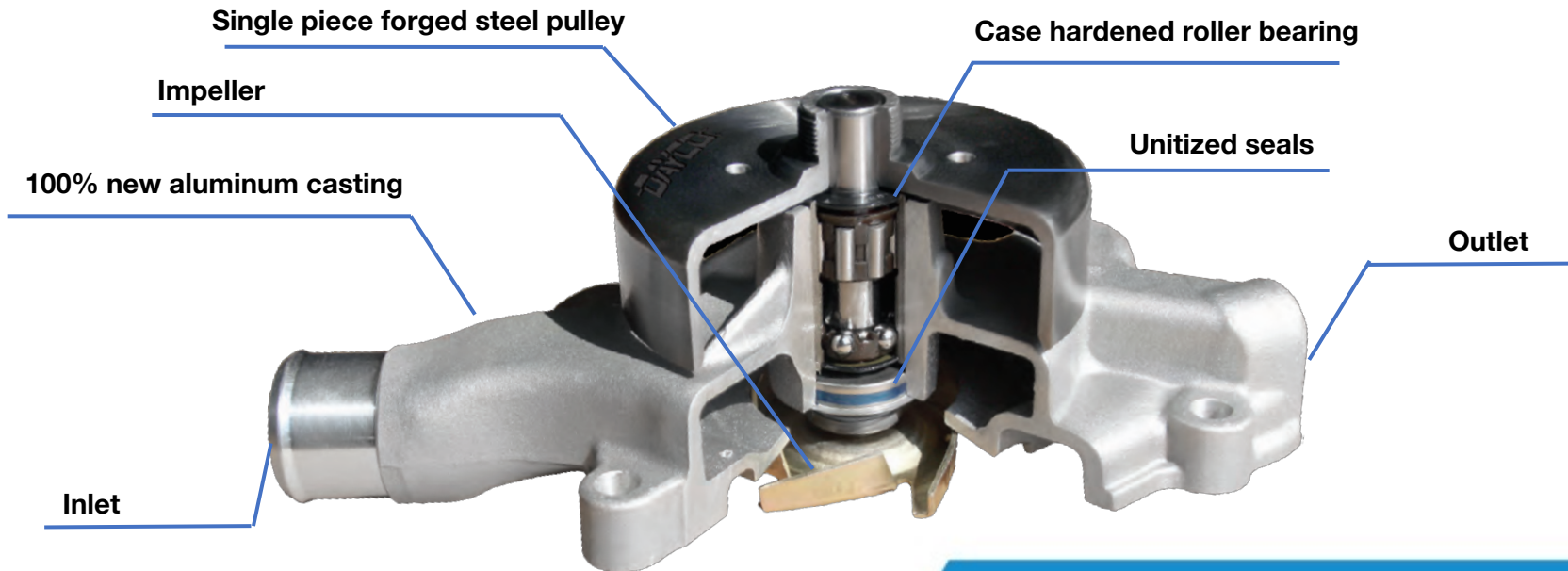




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Water Pump Design

- **Inlet** – This comes from the cool side of the radiator feeding coolant into the pump.
- **Outlet** – Cooled water is pushed through the engine to absorb heat.
- **Hub** – This may be a smooth pulley or a hub that a pulley can be bolted to.
- **Bearings and shaft** – The hub end bearing is a case-hardened roller bearing. Dayco uses roller bearings for excellent durability. A case-hardened ball bearing is used on the impeller end.
- **Impeller** – Designed to flow a precise amount of coolant through the system. Dayco's are frequently designed with upgraded material.
- **Seal** – A silicon/carbide seal keeps the pump leak free.





The Importance of Bearings

Many low-cost pumps will use hardened ball bearings on both ends. But on new vehicles, higher quality pumps – such as Dayco's – will use the more robust case-hardened roller bearings on the hub end to carry the larger loads. Using only ball ball for lower cost on newer water pumps could lead to premature bearing failure. We do not sacrifice quality for cost – we improve it.

Ball Ball Design



- Used for high-speed rotating water pumps, and water pumps that have little or no attachments.
- Ball ball design does not have a high load rating for HUB Side of water pump.

Ball Roller Design



- Used where the HUB LOAD is severe, such as all heavy duty and agricultural applications.
- Our case-hardened design allows some flexibility without damaging the pump or bearing.



The Role of the Fan Clutch

Some vehicles' cooling systems will use a fan clutch. The fan clutch uses a viscous coupling that lets the fan run full bore at low engine speeds and allows the fan to slip at high speeds for fuel economy. These units are very heavy and require a roller bearing water pump.

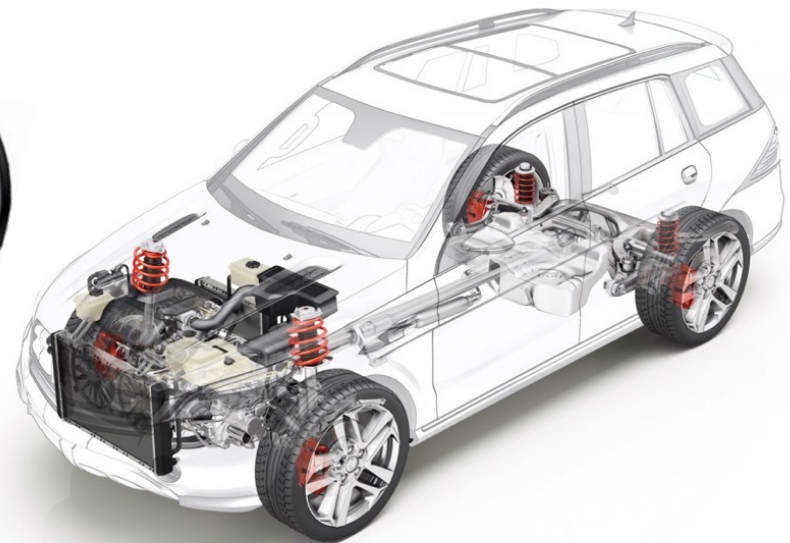
The fan clutch should always be replaced with the water pump on these types of vehicles. Dayco provides a tag on each water pump where it is necessary to replace the fan clutch to validate the warranty.



**Fan
Clutch**



**Cooling
Fan**





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The Benefit of Unitized Seals

Today's water pumps feature a modern seal design that is one-piece or unitized. Unlike earlier ceramic two-piece designs, they are typically made of a silicone, carbide composite.

- Unitized seals provide **less contamination risk** and in the case of Dayco's design, **prevent leaks for well beyond the life of the expected warranty.**
- Older style seals are lower in cost and many are not compatible with today's modern organic acid coolants.





The Hub Design and Purpose

- Does the heavy work as there can be multiple pulleys and/or a big heavy fan clutch mounted on it.
- Dayco takes extreme care to make sure the hub is pressed on the shaft to stop vibration or “wobble”. This kind of vibration can destroy a new pump very quickly. Each hub has to be pressed to the exact perpendicularity of the shaft to ensure no “wobble” under high RPM rotation. This is important in controlling the run-out specification of the hub – Vibration can be the death of a bearing and it stems from a misaligned hub and worn attached components.
- Press fit requirements are SKU specific. For instance, later model design pumps that have additional attachments that bolt to hub such as a simple pulley to a fan clutch with fan.

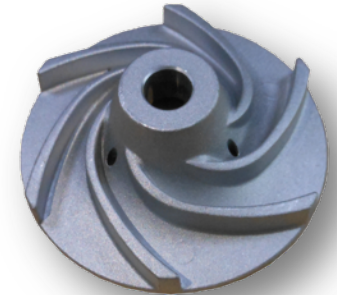




Impeller Function and Facts

- Impeller material – along with engine requirements – is key for specific applications. **Dayco matches the OE impeller material in most cases.**
- Impellers are typically cast iron (A), die cast aluminum or stamped steel (B). **Cast iron and die cast are most durable**, but more costly and most often used with heavy duty vehicles. **Stamped steel is durable but is susceptible to deformation.**
- **Dayco always mimics the OE impeller material design with the exception of plastic due to high failure rates.** Dayco builds those specific pump applications with a metal impeller to alleviate that issue.
- Cooling system maintenance is critical to long impeller life. Poor cooling system maintenance can cause cavitation and ultimately lead to impeller failure. Impeller C pictured has **cavitation damage** and will not perform properly. The cavitation damage was caused by air bubbles in the coolant. These bubbles hit metal parts in the engine at extremely high pressure resulting in metal corrosion.

A



B



C



Castings – Key Facts



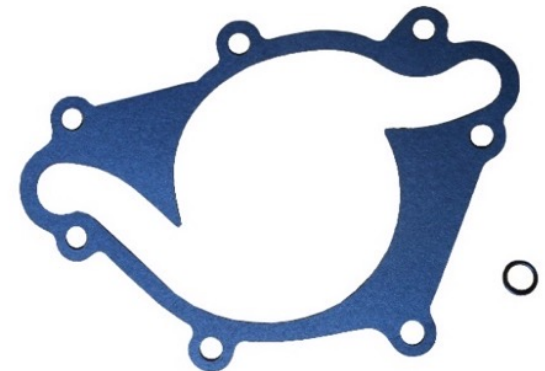
- The casting is the body of the water pump. It must be **machined to exact specifications from the bearing bore diameter to the sealing surface** of the engine block.
- **Dayco will always use the same material as OE for its water pump castings**, specifically cast iron for iron and cast aluminum for aluminum.
- A very precise CMM machine is used to be sure the design is an exact replica of the OE part.
- **Every mounting hole is verified** based on bolt pattern of the engine prior to machining for exact fit.
- The bearing bore measurement is 100% verified.



Gaskets



- Dayco pumps come with all gaskets, seals and O-rings needed for installation. Making life simple for technicians and shop owners, everything needed to install the pump is included in the box.
- We use the highest quality gaskets made from HBNR rubber O-rings, silicone impregnated gaskets that are just like or better than the OE product.
- All Dayco water pump premium quality gaskets include:
 - 8902 interface material
 - HNBR rubber material (O-ring)
 - Upgraded MP-15 sealing material





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The Importance of Kits

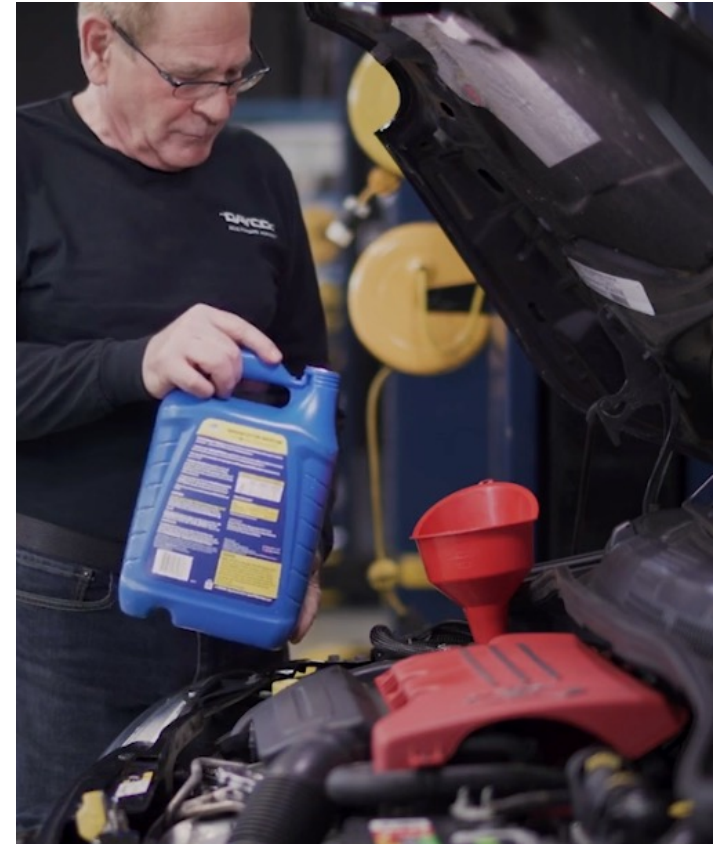
- Dayco's timing belt kits with water pumps are designed for the most popular applications with **99% coverage**.
- The kit ensures technicians or DIYers have all the parts needed to perform a complete repair job, so they can change out all worn components and eliminate possible comeback issues.
- The pulleys, timing belts and tensioners mirror Dayco's OE solutions and each of the water pumps is assembled using Programmable Logic Control (PLC), providing quality data during the manufacturing process.
- Additionally, **each water pump features 100% new cast aluminum or iron material** and meets TS16949 quality standards.





Cooling System Maintenance

- Flush and refill the cooling system with the OE recommended coolant when changing a water pump to avoid any type of premature part failure. The seal in the pump is designed only to work with this chemistry! This is the #1 cause of new water pumps leaking.
- ***Coolant has changed dramatically in the last 20 years.*** All modern vehicles started using **OAT** (Organic Acid Coolants) in 1996 with GM DexCool. Most all other automakers adopted OAT coolants after that.
- Silicate coolant still accounts for nearly 60% of all antifreeze sales when the numbers should be 20%.





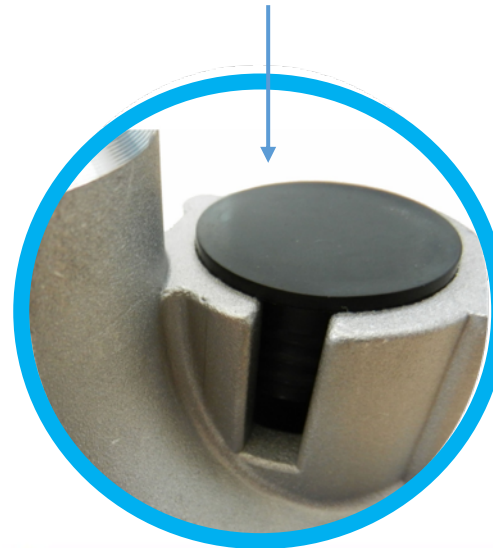
Weep Hole Design

The first design at left below is called a weep hole design. It is used to allow small amounts of coolant to pass through, which lubricates the bearing shaft. When the water pump begins to fail, the weep hole will begin to leak coolant. OEMs have upgraded the weep hole design to an “accumulator design” due to ZERO MILE leakage at shop level, causing returns that are not real or legitimate defects.

Weep Hole Design



Accumulator Design





Signs of Failure

Water pump failure can be brought about by fluid contamination, the No. 1 cause of premature seal failure, among other causes:

- Vehicle temperature fluctuation during operation
- Small leakage of coolant
- Squealing or noise during operation

Contamination occurs when abrasive items come in contact with the pump, leading the shaft seal to fail prematurely. Improper coolant mix or pure water in the radiator can cause the steel and cast impellers to show signs of rust. This rust contaminates the entire cooling system and can cause multiple product failures including the water pump. In addition, the leaking fluid can also create cavitation damage as it literally eats away at the metal components.





Replacement Schedule

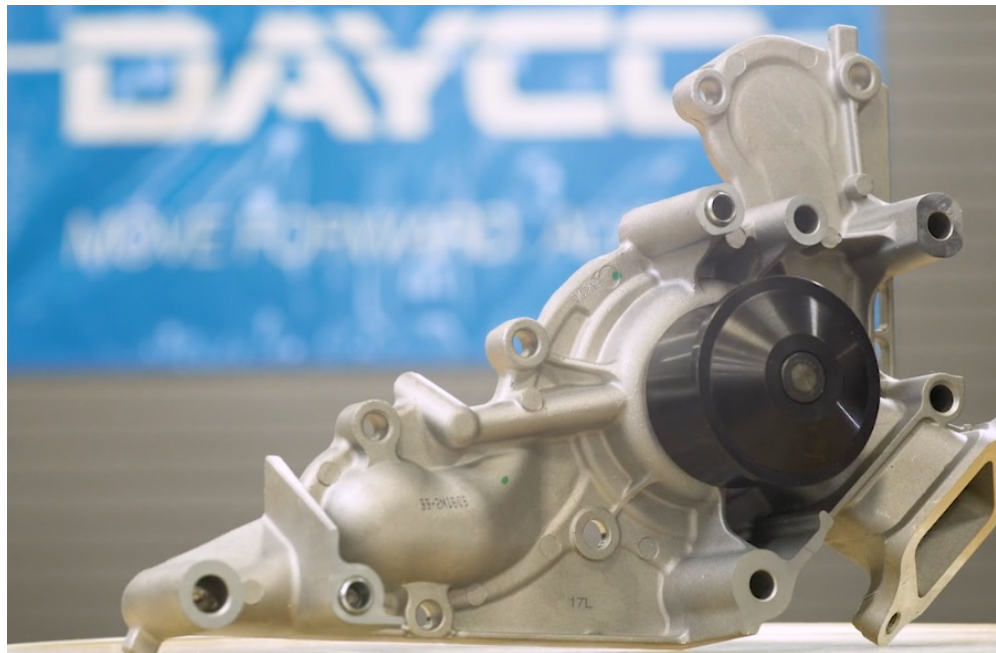
- Follow OEM guidelines for standard replacement intervals per application or vehicle make and model. **The automaker provides the best guideline for water pump replacement** if no warning signs are present.
- Dayco highly recommends changing all worn front end drive accessory components and timing belts when a water pump installation is deemed necessary. **A systems approach is critical to component longevity.**
- A good technician will also replace the water pump when performing a timing belt change because the pump is inexpensive and **90% of the pump replacement labor is done during the timing belt replacement.**





About Dayco Water Pumps

With 98% coverage and more than 1,000 skus, Dayco Water Pumps meet or exceed OE specifications for fit, form and function. The highest quality standards are upheld with TS16949 certification. Single source manufacturing allows us to control every quality aspect of product from RAW material out of the ground to your completely new water pump.





Unique Features

- **Impellers** have been improved from OE PPS plastic material to die cast aluminum which increases durability and provides a longer life. It can cost a few dollars more, but it is a superior product.
- On many popular applications, the pulleys have been upgraded to a **single piece forged pulley**, meaning we machine the pulley from raw steel. We do not weld the pulley together because the weld is the weakest part and can break under the pressure of the belt.
- All water pumps **feature new aluminum**, with absolutely no recycled material. We compile digital readings during the casting process to verify material composition during part production.
- **Dayco uses only case-hardened bearings** per OE design. The outside is hardened, but inside allows for some flex without breaking the bearing.
- Dayco offers an industry leading 125,000 mile warranty on all of its standalone water pumps as well as on its timing belt kit with water pump.



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Finding the Right Part, the First Time

Use the Dayco Parts app or website to search for the right part:

- VIN lookup
- License plate parts lookup
- Product specifications
- Interchange search
 - Competitors
 - OEM





Test Your Knowledge

1. The water pump's main purpose is to

- a) Pull heat away from the engine
- b) Help circulate the coolant through the system
- c) Both A and B

2. What type of bearing does Dayco use in its water pumps?

- a) Ball ball design
- b) Roller ball design
- c) Ball roller design

3. What is the No. 1 cause of premature water pump failure.

- a) Leaky seals
- b) Contamination
- c) Bad bearings

4. Poor cooling system maintenance can lead to

- a) Impeller failure
- b) Cavitation
- c) Both

Go to the next page for the correct answers.



Test Your Knowledge Answer Key

Question 1 - c) Both A and B

Question 2 - b) Roller ball design

Question 3 - b) Contamination

Question 4 - c) Both



Thank you

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