



KEEPS YOU GOING.

**DRIVE BELT
GUIDE
KEEP YOUR
ENGINE
RUNNING**

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01. DRIVE BELTS: WHAT, HOW AND WHERE?

WHAT IS A DRIVE BELT?

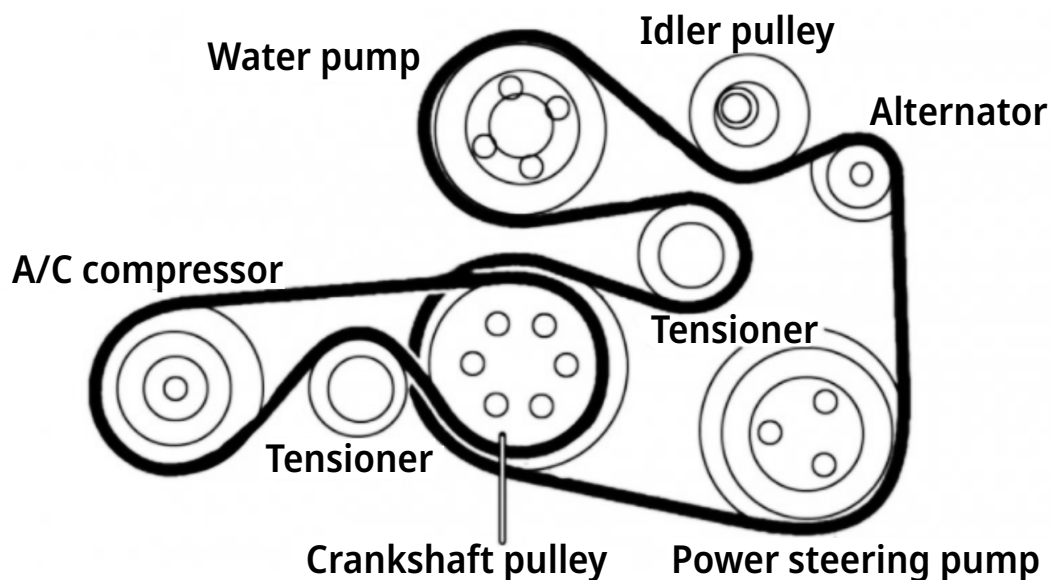
Drive belts are found in all kinds of machines. Mopeds, office printers, industrial saws, light aircraft, sewing machines, tape recorders and of course, vehicles and machines that use engines. The drive belt in a kitchen blender is different to the drive belts used in industrial equipment like forklifts, sweepers and MEWPs (Mobile Elevating Work Platform). This whitepaper primarily focuses on drive belts used in industrial equipment that connect to engines.



Is there a reason we have dedicated a whitepaper to drive belts? A very simple one: the drive belt is a **critical part of an engine**. It delivers power to different engine parts such as the alternator and water pump, bringing them into motion and therefore, into operation. You may even have several drive belts in your machine, each serving or connecting to different components.

The primary **drive belt connects to a pulley** on the crankshaft of an engine. When the engine is running, the crankshaft turns and as such, the pulley turns as does the drive belt around it. In doing so, the drive belt **drives the various other engine system components** it's in contact with; the oil pump, hydraulic pumps, fan, and anything from the alternator and the water pump to the air conditioning compressor and power-steering pump. It all depends on which components your machine has.

As these components begin to turn, the inlet and outlet valves open and close. The engine is lubricated. There is pressure built up to **pump hydraulic fluids and supply hydraulics**. And as such, the different components of the engine begin to function, pumping oil or water, creating an electrical charge, turning the fan that creates the airflow that cools the engine, or performing whichever function they are there to perform.



As some of these components are critical, it is **vitaly important to install the correct drive belt** and keep it in optimal condition.

02. DIFFERENT TYPES AND HOW THEY ARE MADE

TYPES OF DRIVE BELTS

Your drive belt has contact with pulleys or gears that are attached to the crankshaft of the engine or to the engine components. The **type of pulleys or gears will determine the type of drive belt** your machine uses. What kinds of drive belts are there?

FLAT-BELT SYSTEMS



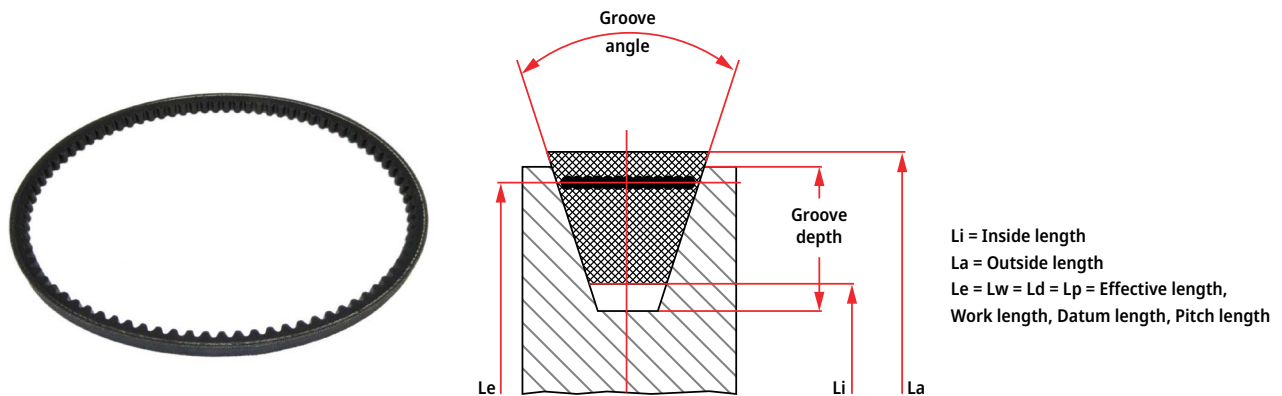
Flat-belt systems are simple, inexpensive, flexible and durable. However, slipping and creeping are known issues, especially at high speeds. As they tended to creep towards the higher side of the pulley, modern pulley grooves often **have a slight curve or crown**. This helps to eliminate creeping, evens out wear, and distributes tension evenly.

TOOTHED BELTS



Toothed belts do not rely on friction to turn pulleys in quite the same way that many other types of belts do; more often than not, the teeth on the belt are **designed to fit into the negative spaces** on sprockets. The belts will not slip as long as the correct tension is maintained. The teeth typically run perpendicular to the direction the belt runs.

V-BELT SYSTEMS



V-belt systems are particularly **common on forklifts** and other equipment. The belts are **wider on the outer side and narrower on the inner side** of the belt, giving them a '**V**' shape. It is possible to have a single 'V'. However, most V-belts now have more than one. The V-shaped section of the belt slots into grooves on the smaller pulleys and usually, but not always, on the larger pulley. These grooves run in the same direction as the belt is travelling. They increase the amount of contact the belt has with the pulley, thus reducing the chances of slipping, even at higher speeds. In fact, as the load increases, the V-section tends to wedge even further into these grooves, resulting in even greater surface contact.

V-belt systems are most commonly used when there is a smaller distance between engine components. They are commonly used on compressors, agricultural machinery and lawnmowers.

ROUND BELTS



Round belts are cylindrical, like a tube, although they're not always hollow. They are used with pulleys with a **U-shaped groove**; the roundness of the belt increases the area in which the belt and pulley touch each other, and as such, it increases the amount of friction. Round belts must be stretched to operate efficiently.

02. DIFFERENT TYPES AND HOW THEY ARE MADE

MATERIALS USED IN THE CONSTRUCTION OF DRIVE BELTS

Drive belts are made in two ways. As loops, called endless belts, or with a beginning and an end, called ending belts. There are different types of belts, each of which come in different widths, lengths, shapes and sizes. They are made of tension cords that are embedded in a rubber compound. The **materials used often influence the quality** of the belt and the conditions in which it is able to perform. If you're working in a dusty, dirty or muddy environment, it's worth investing in a belt made from materials that will take a beating.

Tension cord materials include:

- Aramid
- Kevlar
- Canvas
- Fibreglass
- Steel wire

Different rubber compounds are used. The most common are:

- NR: Natural rubber
- PU: Polyurethane
- CR: Chloroprene rubber
- HRS: Heat-resistant rubber mix with Teflon
- HRV: Heat-resistant rubber mix with a reinforced tension cord
- NBR: Nitrile butadiene rubber
- SBR: Styrene-butadiene rubber
- HNBR: Hydrogenated acrylonitrile butadiene rubber
- EPDM: Ethylene propylene diene monomer rubber

In some cases, a drive belt may have a **third material added**, for instance a Teflon surface. Or it can be completely wrapped with a fabric cover vulcanized in rubber. This adds to the price, but also to the strength, reliability and quality.

DRIVE BELT CODES

It's important to use the correct drive belt. But with so many different types of drive belts, how do you tell one from another? The **technical details** for a drive belt are represented in a **code**. For example:

- SPZ1250Lw
- SPA1250Lw
- XPZ1250Lw
- 8PK1500



This is a code system used for a V-belt. Each of the different sections refer to an aspect of the fitting; the width, length, number of teeth or even the colour (which indicates the type of materials the belt is made from).

The code for a belt is usually **printed on the drive belt itself**. Always double-check the code when you're about to install a replacement drive belt.

02. DIFFERENT TYPES AND HOW THEY ARE MADE

HOW DO YOU FIND OUT WHICH DRIVE BELT YOU NEED?

To be sure you're installing the correct drive belt, you need to know which belt is the correct one. How do you find out which one you need?

- **Check what the engine manufacturer recommends.** The best place to look is the parts manual the manufacturer created for your engine, vehicle or machine. This will be given as a part number or **drive belt code**. If you don't know where your user manual is, or you never had one, there's no need to stress. A huge number of user manuals are now accessible online.
- If your search for a user manual proves unsuccessful, **check which drive belt you previously had** on your engine. Keep your fingers crossed and you'll hopefully find the product number, or the size and type, printed on the belt. We recommend using this as a guide rather than gospel truth; a belt that's been damaged or that's worn out may not have been the correct belt after all.
- Still no luck? No worries. **Give TVH a call.** Our experts are almost always able to chase up the exact drive belt you need. You'll need to know a few details, such as the make and model of your machine and whether you have, for example, air conditioning or power steering. The more information you give us, the more quickly we will be able to find the belt you need.



CONTACT US

**What if you have doubts?
It's better to be safe than sorry.**

The wrong drive belt may easily result in damage or extra downtime.

A quick call to an expert like TVH will give you peace of mind and possibly avoid a catastrophe.



03. HOW DO YOU MAINTAIN AND SERVICE A DRIVE BELT?

Drive belts are prone to wear. Every time it passes around a pulley, it bends, flexes and produces heat because of the friction. As a result of this, the rubber will harden and **might even crack over time**. If the belt is loose or slipping, it will accelerate the damage.

Proper servicing and maintenance minimise wear and tear on your drive belt. This extends the lifetime of your drive belt, reduces downtime and helps you avoid damage to your engine and engine components. The manufacturer of your machine, vehicle or appliance will provide advice on the frequency for maintenance and servicing. Manufacturers usually stipulate how frequently a drive belt should be replaced.

STORAGE OF DRIVE BELTS

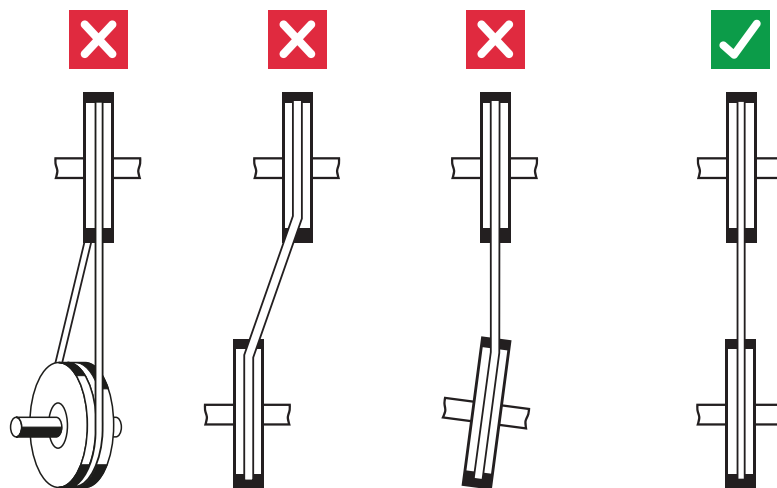
The health of your drive belts begins here. Keep any spare drive belts away from excessive dust, direct sunlight or UV rays, fluids and moisture. Store them in an area where the temperature remains at a reasonably **constant 18°C**. Finally, make sure your drive belt is **not kinked or bent**.



BEFORE YOU START THE ENGINE

Perform the following checks with the vehicle in neutral gear and the ignition turned off:

- **Look for oil leaks, fluids, dirt, rust bleeds and any contact with foreign objects** that might damage your drive belt or the rubber compound. They might be visible on the belt or embedded in the rubber, on the pulleys or on surfaces near the drive belt. They may also indicate other issues that need to be checked.
- **Check your drive belt for signs of wear and tear.** Look for fraying around the edges of the belt, grooves, cracks, slick or weak spots, or peeling rubber.
- Rubber that is wearing away unevenly, split or wearing abnormally may indicate problems. If your belt has a crack, missing teeth or chunks of rubber that are missing, it's time to replace it. If this is occurring frequently, **check for the different reasons that belts usually fail** (as described later in this article).
- **Visually check** the pulleys and engine components for cracks, fluid leakage, rust bleeds, etc.
- Make sure the belt is **correctly aligned on the pulleys**. There should not be any awkward corners or angles as these can cause twists in the belt.



- You may notice the inside of your belt is struggling to fit into the pulley groove – even though it's the correct size. Your belt may have become impregnated with oil or grease. This causes the rubber to swell. Don't stop at replacing the belt and wiping up any leaks. **Find out where the leaks have come from and what caused them.** There might be issues with an engine component, and these may be related to belt tension.

03. HOW DO YOU MAINTAIN AND SERVICE A DRIVE BELT?

- Another problem is excessive heat. It will weaken the material your belt is made from. **Check whether the heat is caused by a mechanical problem.**
- Double-check that the material your belt is made from is **suitable for the working conditions** it is being exposed to.
- Does your machine use a **belt tensioner**? A belt tensioner regulates the amount of tension placed on the belt, ensuring it stays on the pulleys. If it's too loose, your belt might slip. If it's too tight, you risk damaging the bushes and pulley, or the shaft bearings of the engine components they attach to. A spring-force tension gauge or an electronic sonic tension meter will give the most accurate results.



CHECKS WITH YOUR ENGINE RUNNING

It's now safe to start the engine and perform the following checks:

- **Listen for any squealing** from the belt or pulleys when the engine is running. The most common cause is poor pulley alignment. However, it's also possible there is too little tension in the belt or the belt is by accident in contact with an external object.
- If you hear a **chirping sound**, it may indicate a worn-out belt or pulley.
- You may also notice **whining or growling** when the engine reaches a certain speed. This may indicate a worn-out tensioner, resulting in the belt slipping.
- Is there a lot of **vibration**? This may indicate a worn-out tensioner and pulley bearings. It may also be noisy.
- Is there steam or vapour coming from the engine? Or any other **signs of overheating**? This may indicate issues with the drive belt. For example, although it may look like it is functioning, the drive belt may be slipping. As a result, the water pump may not be cooling the engine.
- Check that the **battery light on the dashboard is not lit** when the engine is running. If your battery is failing to charge, it may be due to drive belt issues. For example, although it may look like it is functioning, the drive belt may be slipping. As a result, the alternator may not be charging the battery.
- Does your machine or vehicle have **power steering or air conditioning**? If they are not working, it may be a sign that the drive belt is too loose and is slipping.
- Check the **belt tension** using a tension tool. The tensioner regulates the amount of tension placed on the belt to make sure it stays on the pulleys. If the tension is loose, the belt might slip and the engine components may not function. If there is too much tension, the belt will pull too hard on the pulleys, ruining the bushings and even the bearings. If the tension is incorrect, make sure you also carefully examine the belt tensioner for wear and damage, and ensure it is correctly aligned.

We discuss problems and solutions in chapter five of this whitepaper.

04. REPLACING A DRIVE BELT

It's not possible to repair a worn or damaged belt. If you have found signs of wear or damage, it's best to replace the belt. A belt may be damaged even though you're unable to see any signs. It may appear to be in excellent condition. But inside, the tension cords may be separated and on the verge of failure. This is why you should also replace your belt at the intervals recommended by the manufacturer, regardless of the condition the belt appears to be in.

Replacing a drive belt is not so simple. When in doubt, we recommend checking the manufacturer's user manual at every step to ensure you have the right part and are doing exactly what needs to be done. Use our recommendations below to help guide you on your way.

REMEMBER: safety always comes first. Only use the correct tools, and parts that are supported by the manufacturer. If you have any questions, contact professionals for help.

STEP BY STEP: REPLACING YOUR DRIVE BELT

01. SAFETY

Make sure your ignition is turned off and that your vehicle is in neutral, parked on a safe, secure, flat surface. Disconnect your battery by removing the contact attached to the negative pole. Only use the correct, prescribed tools when you are removing or replacing a drive belt. Make sure the engine is cool to the touch before you begin working on it.

02. LOOSEN TENSION AND REMOVE THE OLD DRIVE BELT

Loosen the tensioner; this will allow you to slip the drive belt off over the pulleys. Your tensioner may be spring-loaded to maintain tension. If so, pull back on the tensioner and remove the belt.

03. INSPECT THE DRIVE AND PULLEYS

You're looking for cracks, splits, excessive rust or rust bleeds, as well as any signs of damage or wear to the pulleys or the components they are attached to. Spin the pulleys by hand to check that the bearings rotate smoothly and freely. Check there is no lateral movement. If you suspect a component is damaged, it is often best to replace it. The pulleys should all be perfectly aligned; your belt should not be twisted when it runs from one pulley to the next.

04. INSTALL YOUR NEW DRIVE BELT

Double-check your new belt is not kinked, bent or folded. Next, make sure you have the correct drive belt, as specified in the manufacturer's user manual or in line with the recommendations given earlier in this whitepaper.

It's also common practice to compare your new belt to your old one. In theory, they should look the same. However, you may find the old one looks slightly thinner, longer or narrower.

This is all entirely understandable; the old belt may have stretched or warped over time, causing this effect. If the new belt looks thinner or longer, please check again that it is the correct belt.

Be careful not to bring your new belt into contact with dirt and dust, grease or oil. They will damage the belt. Install the new belt over the pulleys. Again, you may need to move a spring-loaded tensioner in order to slip the belt over the top of the pulley.

05. REPLACE OTHER DRIVE BELTS

What if your system has multiple drive belts running from the same pulley? Always replace all these belts at the same time. This is the only way to ensure the correct tension is maintained.

ALSO REPLACE THE WATER PUMP

Water pumps wear out over time, just like drive belts. It saves time and money to replace your water pump when you replace your drive belt. To get a more detailed overview of how to replace the water pump, read our [water pump whitepaper](#).

TIP

06. MAKE SURE THE DRIVE BELT TENSION IS CORRECT

If your machine has a spring-loaded tensioner, it should set the tension itself. If not, you'll need a pry bar to pull the tensioner into a position where your belt is neither too loose nor too tight.

Once you believe you have the correct tension, use a belt tension gauge to double-check. We advise doing this even if your machine uses a spring-loaded tensioner. When you are satisfied your drive belt is correctly tensioned, manually run it through a few turns.

07. START YOUR ENGINE

It's time to start your engine. Are there any unusual sounds? Vibrations? Any signs of overheating or operating problems? Make sure you respond straight away.

08. DOUBLE-CHECK

We recommend running in newly installed belts. Start the drive and run it under a full load, stopping periodically to check and if necessary, re-tension, to keep the belt at the recommended tension.

Once any belt has been installed and has been in operation for about 24–48 hours, it's important to double-check everything again. Look for all the usual signs of wear and damage, plus check the tension is still correct. If a replacement drive belt shows signs of damage or excessive wear soon after being replaced, this indicates problems that need to be addressed.

05. THE MOST COMMON CAUSES OF DRIVE BELT FAILURES AND THEIR SOLUTIONS

A drive belt is a moving part. Wear and tear over time is inevitable. But drive belts often suffer damage for other reasons. What are these problems? And how do you correct them?

PROBLEMS WITH DRIVE BELTS

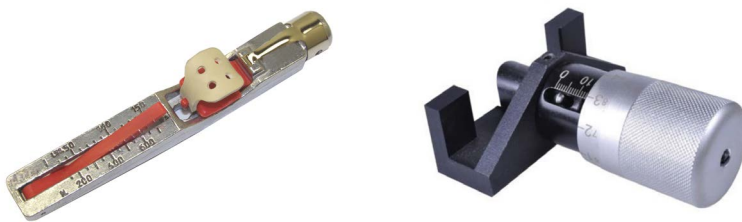
01. INCORRECT TENSION

If your belt tension is correct, you'll eliminate about 90% of the problems that cause belt failure. With the engine and ignition turned off, **periodically check the tension** of your belt. Start by looking for glazed or hard sidewalls on the belt; they indicate the belt is slipping. You may also find heavy wear on the fabric surface of belt teeth.

The correct tension range for a belt will depend on the drive components, the load and speed of the drive. Always follow the recommendations of the manufacturer to calculate the correct installation tension values. We believe the ideal tension for a V-belt drive is the **lowest tension at which the belt will not slip at the highest load condition**. For synchronous belts, the ideal tension is the lowest tension at which all belts are properly seated in the drive sprocket on the slack side.

Testing for the correct tension means **using the correct tools**. There are spring-force tension gauges that measure belt tension when your belt is not moving. We also recommend electronic sonic tension meters that measure the frequency at which the belt vibrates.

- **Mechanical belt tension gauges:**



- **Electronic belt tension gauge:**



02. POOR ALIGNMENT

Excessive wear on the sidewalls of the belt is often caused by misalignment. You may also notice your belt seems to be unstable, or that you're replacing the belt more often than is normal. Damaged teeth on a belt, stretching and excessive noise may also indicate misalignment.

Alignment should be checked before and after belt tensioning. The initial check helps ensure you install the belt correctly. The check after installation is advised because the tensioning process will potentially move components, especially if excessive tension has damaged them.

Use a straight-edged piece of metal, such as a ruler, or even use a length of string that has been pulled taut, to check the face of the pulleys. There should not be any gaps. Check for tilting on the pulleys themselves with a spirit level.

Always check pulleys, pulley brackets and shafts for any signs of bending, breakage or damage, including excessive oil, grease, moisture or anything that might indicate damage.

03. HANDLING

Another major cause of problems? Mishandling of the belts themselves. Never crimp, fold or twist belts. Doing so damages the tension cords inside.

When installing a belt, **never force them** or stretch them onto pulleys, as this is likely to damage or break the internal tension cords or the outside of the belt. Release the tensioner or idler and retighten it to the correct tension once the belt has been slipped over the pulleys.

Store belts in a cool, dry place away from direct sunlight.

04. HARDWARE

Just like your drive belt, pulleys, sheaves, bushes and bearings are prone to wear and tear. This is most commonly accelerated by abrasive foreign particles such as iron filings and even dust. If your drive belts are wearing out increasingly quickly, it is a sign that the pulleys or sheaves are damaged. Replace them as necessary.

05. ENVIRONMENTAL FACTORS

The rubber material in a drive belt is prone to damage when exposed to extremely high or low temperatures, high humidity or excessive sunlight. Foreign matter, including everything from dust and grime to chemical vapours, lubricants and fluids, will also damage a drive belt. It is important to check your machine is operating in conditions that are suitable for it and for your drive belt.

05. THE MOST COMMON CAUSES OF DRIVE BELT FAILURES AND THEIR SOLUTIONS

PROBLEMS WITH ENGINE COMPONENTS

Your drive belt also impacts the pulleys it turns, as well as the components these pulleys operate. If it is not properly installed and maintained, your drive belt has the potential to cause considerable damage. What should you look for?

TENSION

Start by checking for the correct tension. The **rule of thumb test**, in which you push on your belt with your thumb to check there is no more than one or two centimetres of give, is simply not adequate when you're looking at the potential for damage. A belt-tension gauge will give you peace of mind by showing whether you have the correct tension or not.

CRACKED BUSHINGS

If your belt is too tight, it will pull on the pulleys, potentially damaging the bushings. Look for splits and cracks in the bushings, especially if you have registered excessive tightness in the belt. Replace the bushings and pulleys as required.

DAMAGED BEARINGS

A belt that is too tight will keep pulling when the bushings are damaged. This exerts pressure on the bearings. Over time, the bearings will wear down. How do you know if this has happened? Look for grease and fluid leaks near the bearings, as well as possible rust bleeds. Also turn the pulley by hand; if it feels like it is grinding, you will need to check, replace and possibly repack the bearings.



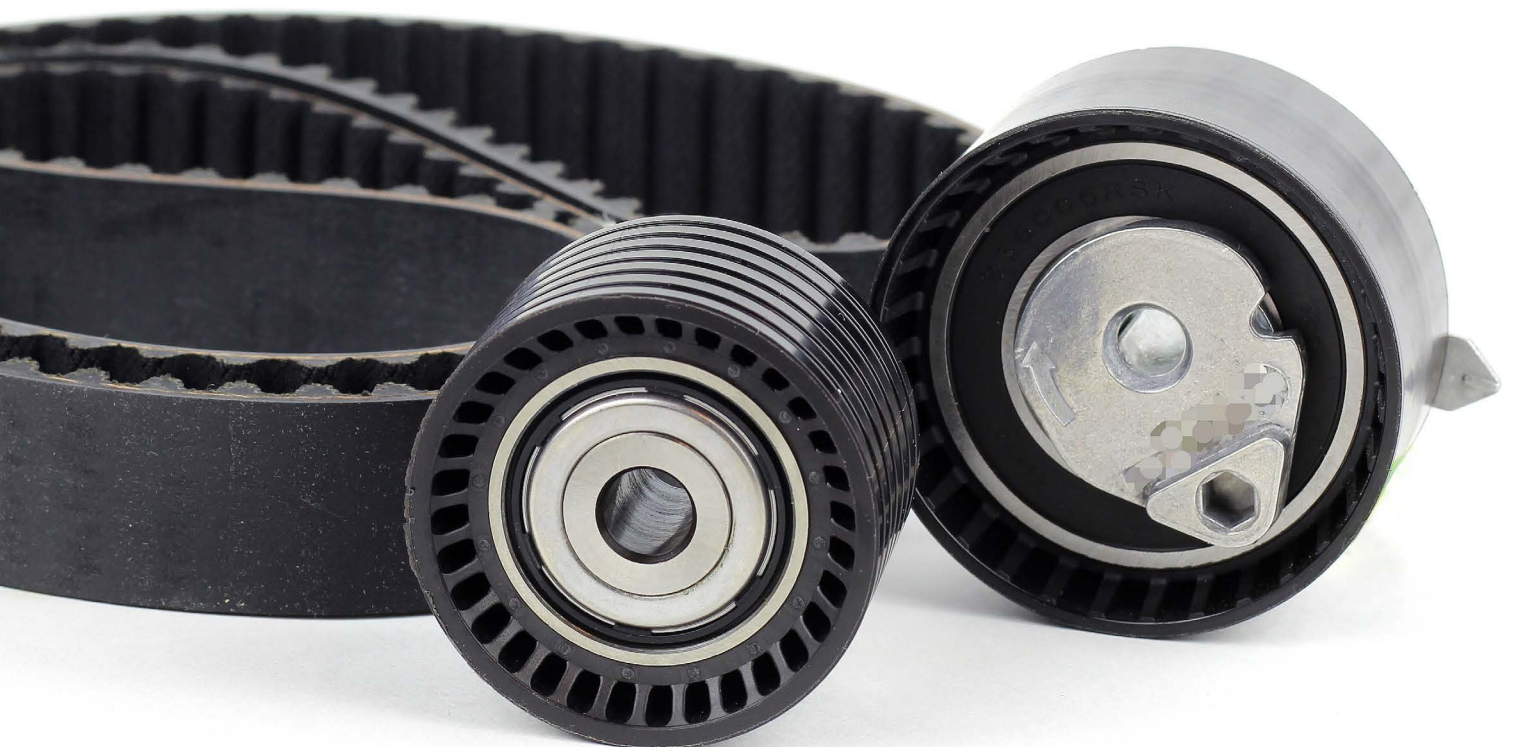
DAMAGED ENGINE COMPONENTS

The **best indication** that an engine component is damaged is **its failure to operate**. A drive belt is not the only reason this might happen. But it is one to keep in mind.

Whenever you replace one of these engine components, you should always replace the pulley and drive belt, checking the tension is correct. This should solve the problem, but it is best to keep an eye on the issue after the replacements have been made.

Do you have other drive belt issues? Do you have questions about drive belts, their maintenance or how to replace them? **Always put safety first**. Ask professionals for help.

At TVH, we pride ourselves on our concise knowledge of parts for countless machine makes and models. If you are unsure of which part your machine needs, please consult our website, give us a call or email us. We are always happy to help.



NOTES



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