Belt failure

Joseph Pandolfo
joeboy@ptd.net
570 350 3359
PAPA 2016

- Squealing sound: Belt slipping
- Chirping sound: Misalignment of an accessory drive pulley
- Frayed belt edge: Misalignment of an accessory drive pulley
- Polished belt edges: Belt slipping
- Glazed belt grooves: Belt slipping
- Fluid contamination: Oil, power steering, or coolant leak
- Excessive cracking: Other than severe old age, defective tensioner

- Whirring sound: defective bearing in tensioner pulley or idler pulley
- Rhythmic noises occurring at engine speed: Delaminating belt backing, chunking of belt ridges,
or foreign object embedded in belt groove
- Grinding sound: damaged bearings in driven accessory
- Belt coming off: Pulley misalignment, belt misalignment on pulley, defective tensioner, or bearing wear in tensioner, idler or driven accessories

Belt noises can be diagnosed with a spray bottle of water.
With the engine running and the sound audible, lightly mist the grooved side of the belt with water.
If the noise disappears or lessens,
but then shortly returns,
the problem is probably a misaligned pulley.
If the noise immediately increases after the belt is misted,
the belt is slipping.

Another diagnostic trick
is reversing the belt:
take it off and put it back on so that it travels
in what would have been its backward direction
as originally installed.

If the noise goes away or

gets much softer,

the problem is a misaligned pulley.

This diagnostic works

because flipping the belt

changes the direction of the misalignment

from the belt’s perspective.

If reversing the belt does not temporarily

eliminate the noise,

the problem is something other than misaligned pulleys.

Glazing at the edges of a serpentine belt,

or on its ridges or in the grooves,

results from the belt slipping.

It indicates that friction between the belt and

the accessory drive pulley(s) created by slipping

has overheated the belt.

Fraying at the edge of a belt indicates pulley misalignment.

The edge frays because it is scraping on the top edge of an accessory drive pulley side as the belt feeds into it.

Fluid contamination attacks the rubber surface of the belt. All of the automotive fluids that can leak onto a belt—

oil,

power steering fluid,

coolant—

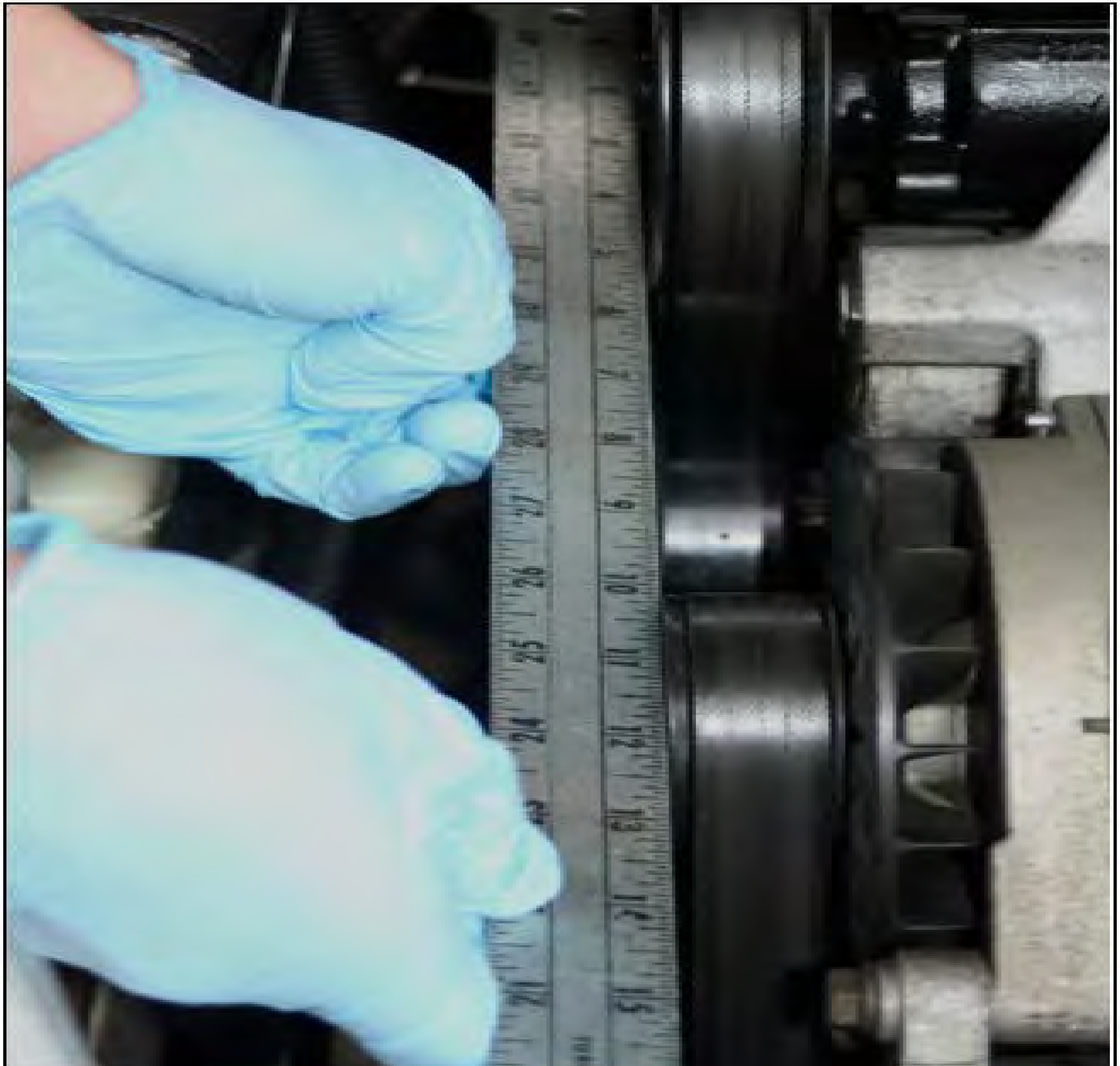
are petroleum based and will attack rubber.

Once on the belt,

any of these fluids will be distributed over the pulley groove surfaces,

making them slippery and

attracting dirt.



Normal Belt Wear and Failure

A failure that occurs when a belt reaches its ultimate tensile cord fatigue life,

after running for a period of two to three years

may be considered to be normal.

Belt tensile failure due to cord fatigue

after a long running

period is considered to be ideal.

Common Causes of Belt Failure

Identifying the cause of belt failure can be challenging.

In this section,
we’ll define,
illustrate and diagnose
some of the most common culprits,

so you’ll be prepared to correct the problem and
take preventive
measures in the future.

a jagged 45-degree

belt fracture that is typical of

tensile cord

at the end of its fatigue life.

Synchronous belt teeth can also fail,

but that is considered to be a non-ideal type of belt failure.

After a long period of service,

belt teeth may appear to be worn,

although they should retain their original size and form.

Protruding fibers from the jacket

may give belt teeth a fuzzy appearance,

A “crimp” type belt failure

often resembles a straight tensile failure

A straight type of break like this may occur

When belt tensile cords

are bent around an excessively small diameter.

A sharp bend may result in

large compressive forces within the tensile members

causing individual fibers to buckle or crimp,

reducing the overall ultimate tensile strength of the belt.

Belt crimping damage

Is most commonly associated with belt mishandling,

inadequate belt

installation tension,

sub-minimal sprocket diameters,

and/or entry of

foreign objects within the belt drive.

Belt crimping due to mishandling

can result from improper storage practices,

improper packaging,

and belt handling

prior to and during installation.

Belts operating in an under tensioned condition
may allow belt teeth to ride out of the sprockets
until an acceptable belt tension level is achieved.

This phenomenon is called “self-tensioning.”

Self-tensioning can be most clearly observed
at the point of lowest dynamic belt span tension,
or where the belt teeth are entering the driven sprocket
grooves.

When a belt is self-tensioning,

the belt teeth ride up out of the sprocket grooves

until increased span tension from the approaching tight side

tension forces the belt teeth back down into the sprocket grooves.

The point at which the belt teeth are forced back down into the

sprocket grooves often results in a sharp,

momentary point of bending that can result in belt tensile cord

damage.

This point of tensile cord damage is referred to as a crimp.

If the tight side tension does not force

the belt teeth back down into the sprocket grooves,

the belt will ratchet.

Belt ratcheting can also result in tensile cord crimp

and belt tooth

damage.

Subjecting belts to sub-minimal bend diameters

can also result in belt tensile cord damage,

or crimping.

This can be caused by sprockets or

flat backside idlers in sub-minimal sizes,

or even hand bending a belt too sharply

Foreign objects

located between the belt and sprocket

can also result in belt crimping.

They can lift the belt away from the sprocket at a sharp angle,

creating a point of tensile cord crimp.

Tools used to force belts onto sprockets,

such as screwdrivers or bars,

can also cause belt cord crimp damage.

Belts subjected to foreign objects or

improper use of

tools during installation

may not fail immediately after being damaged;

however,

the overall belt life will be reduced.

Shock Load

Shock loading in belt drives occurs when higher than normal intermittent or cyclic torque loads are generated by the driven equipment.

These shock loads result in higher than normal belt stresses and can act as a catalyst for belt failure.

While conventional V-belt drives may exhibit intermittent slip

under peak torque load conditions,

synchronous belt drives must transmit

the entire magnitude of the peak loads.

root cracks caused by shock loading

Can propagate through the teeth.

Cracks forming at the tooth roots

sometimes move towards the tooth tips.

Teeth containing multiple

cracks may then shear,

leaving only a portion of the tooth behind.

The shock loads generated by the driven equipment
may be an inherent part of system operation or
may result from an occasional
harsh condition such as jamming.
If the drive shock loads cannot be eliminated,
the belt tensile strength may need to be increased or
the synchronous belt drive replaced
with a more forgiving V-belt drive system
capable of intermittent slip.

Improper Belt Installation Tension

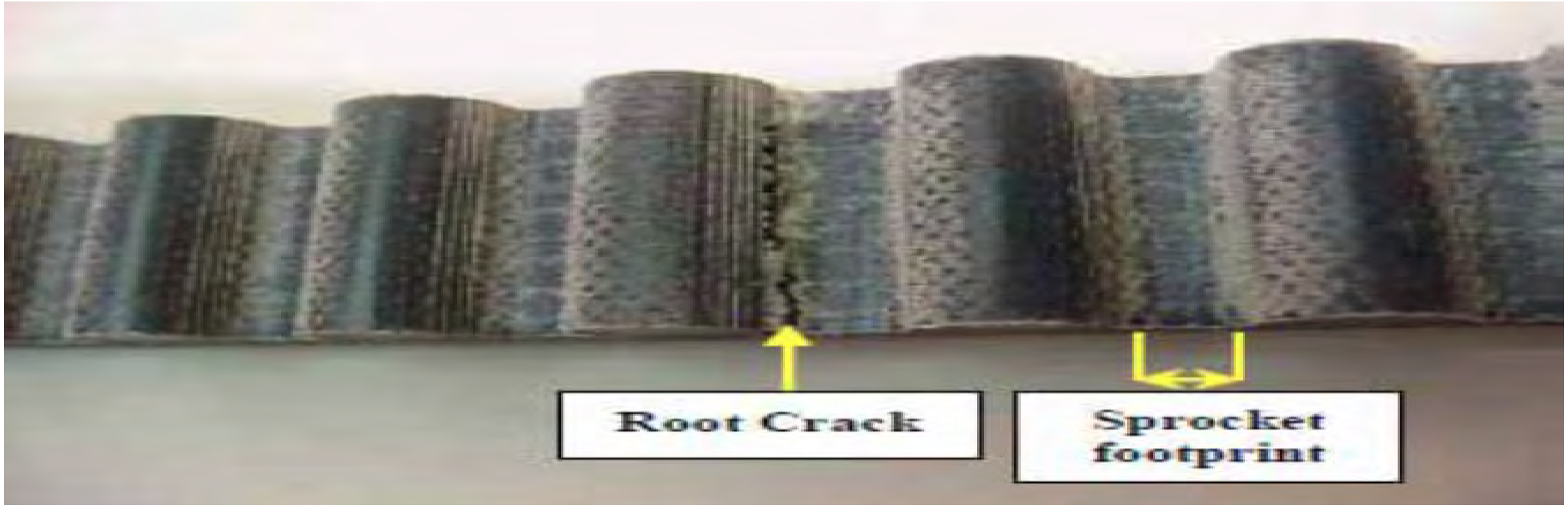
the effects of improper belt tensioning –

from applying excessive installation tension to insufficient tension –
to
help prevent premature belt failure.

High Belt Installation Tension

Applying excessive installation tension
to a synchronous belt may result
in belt tooth shear
or even a tensile break.

Many belts that have been
excessively tensioned show visible signs
that sprockets have worn
the belt land areas.



a belt with crushed land areas

and a crack that formed at the root of the belt tooth.

A root crack will

often propagate down to the tensile member and

travel to the next root crack.

Individual belt teeth will then separate from the body of the belt

and often fall off.

a belt that had been over tensioned on large sprockets.

High belt land pressures caused excessive belt land area wear,

ultimately revealing individual tensile cords.

In order to prevent belt wear problems like these,

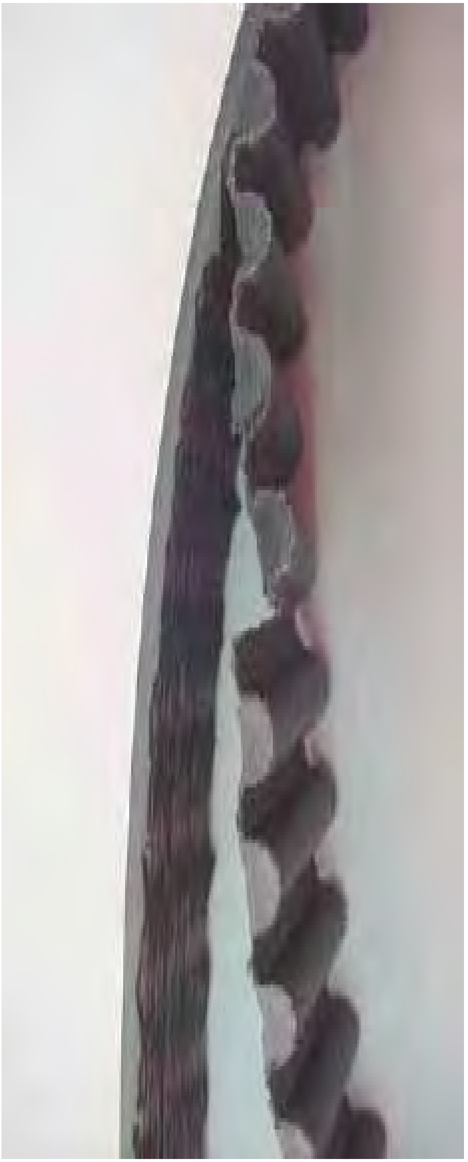
proper belt installation tension

levels must be determined and set accurately.

Low Belt Installation Tension

Applying insufficient installation tension to belts
operating on moderately to heavily loaded drive systems
may also result in premature failures.

A common belt failure mode
resulting from insufficient belt installation tension is referred to
as tooth rotation.
Belt tooth rotation can occur as
belt teeth climb out of their respective sprocket grooves (self tensioning)
and drive loads are no longer applied at their roots.



Drive loads applied

further down the belt tooth flanks

cause the belt teeth to bend

(like a diving board) and

“rotate.”

Belt tooth rotation can result in rubber tearing

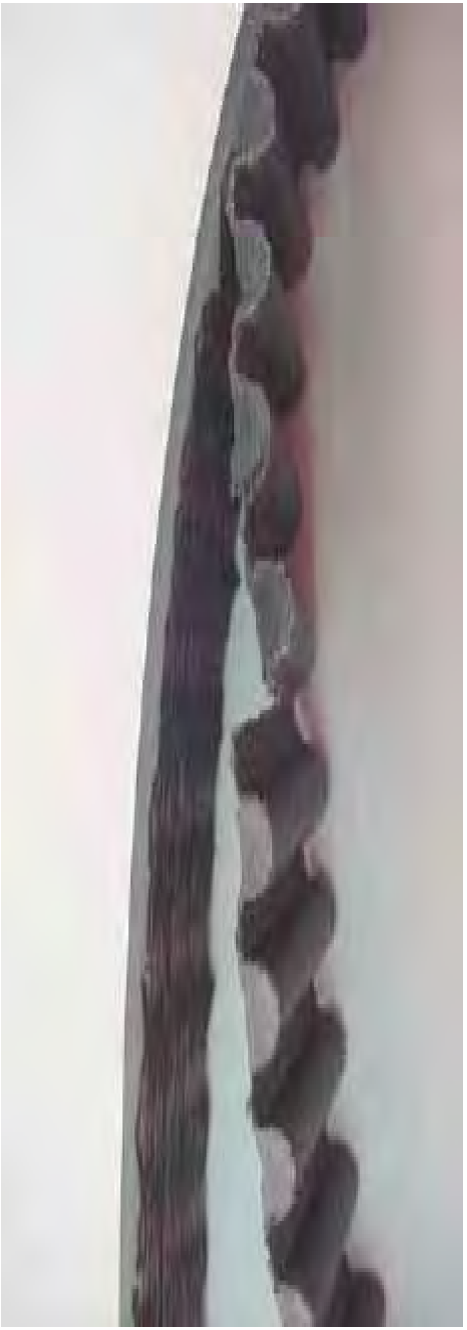
at the base of the belt teeth along

the tensile member.

As rubber tearing propagates,

belt teeth often begin to separate

from the belt body in strips



Failures due to excessive tooth rotation

may resemble failures caused by insufficient rubber

adhesion to the tensile cords.

Unlike tooth rotation failures,

failures from insufficient

rubber adhesion leave the exposed tensile members clean

where the belt teeth were once located.

As belt teeth climb out of their respective sprocket grooves

to self tension,

belt ratcheting or

tooth jumping may occur before rubber

tearing and belt tooth separation occurs.

Belt tensile cord damage

resulting from ratcheting

can cause premature belt tensile failures.

These tensile failures may resemble crimp type breaks

(straight and clean)

as well as shock load type breaks

(jagged and angled).

If belt ratcheting does not occur and

belts continue to operate while self tensioning,

excessive belt tooth wear often occurs.

This tooth wear is referred to

as “hook wear” and

results from improper belt tooth meshing with the

sprockets, Hook wear type belt failures result from

insufficient belt installation tension and

from weak drive structures that

allow center distance flexing

while the drive system is under load.

Increasing belt installation tension levels

generally prevents premature

belt failures due to tooth rotation and hook wear.

If increasing the belt installation tension level

does not prevent this type of failure,

the drive structure may not be rigid enough

to prevent deflection.

Added structural support may be necessary to

improve belt performance.

If it is not practical to increase belt installation tension levels,

increasing the sprocket diameters

will allow higher drive loads to be transmitted

With less belt tension.

Belt Drive Hardware Problems

Let’s examine the negative effects

that problems with belt drive hardware

have on the operation and

life of your belts.

Sprocket Misalignment

Belts operating on drives with angular shaft misalignment or tapered

sprockets often exhibit an uneven wear

pattern across the belt tooth flanks and

uneven compaction in the land areas

(in between belt teeth)

due to the uneven application of load to the belt.

Belt failures often occur from tooth root cracks or

tears initiating on the side of the belt

that is carrying the highest tension and

propagating across the belt width,

ultimately resulting in tooth shear.

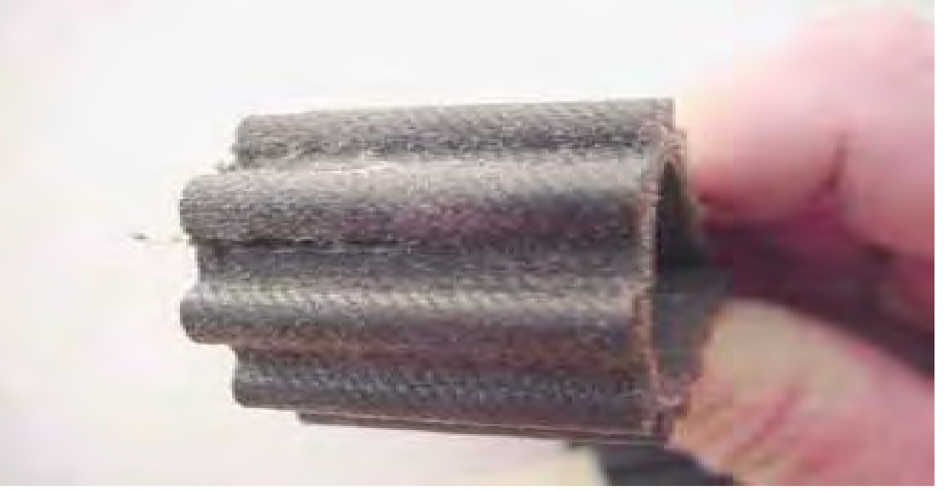
One edge of the belt may also

show significant wear

due to high tracking force and

may even roll up or

attempt to climb the sprocket flange



Belts operating on flanged sprockets with parallel misalignment
(off set sprockets) may exhibit excessive belt edge wear
on both edges if the belt is pinched between opposite flanges.
Belt failures may then occur
by tooth root cracks or
tears initiating from both edges of the belt.
These tears may eventually extend across
the entire width of the belt,
resulting in tooth shear.

Belts operating on a combination of both flanged and non-flanged sprockets

with parallel misalignment may walk or

track partially off of the non-flanged sprocket(s).

The portion of the belt remaining engaged with

the non-flanged sprocket(s)

will carry the full operating load and

may develop a concentrated area of wear

after running this way for a period of time.

shows concentrated wear across the majority of the

belt tooth face with a portion relatively unworn.

A root crack has also developed below the worn area.

This may ultimately result in premature

belt failure due to either tensile or tooth fatigue.

Sprocket(s) Out of Specification

Premature belt failures resulting from sprockets either

manufactured or

worn outside of design specifications are difficult to recognize.

This is partly due to the fact that sprockets

are rarely inspected closely when a belt fails.

Premature belt failures are

often assumed to be the fault of the belt alone.

Belts operating on sprockets

that are out of dimensional specification

often show a high degree of tooth flank wear

with the jacket flank

exhibiting a fuzzy or

flaking appearance,

A higher rate of sprocket wear
may occur from belts that have been installed with excessive installation tension.
Belts that have been in operation for a long time
have sometimes had the tooth facing or
Jacket completely worn away.
Belts in this condition
indicate that significant sprocket wear may have also occurred.
Belts worn to this point
also sometimes allow belt tensile members to contact the sprockets
Resulting in a grooved wear pattern
around the outside circumference.

Curvilinear (HTD and GT) belts

operating on sub-minimal sprocket diameters usually fail by land disintegration,

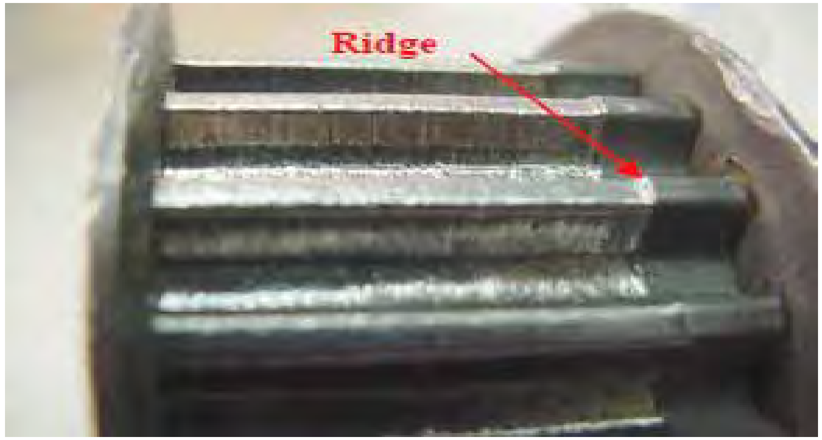
and tensile breaks.

Trapezoidal (XL, L, H) belts

will usually fail by tooth root

cracks and tooth shear;

however, tensile breaks are not uncommon.



A good indication of sprocket wear

is when a ridge along the tip of sprocket teeth becomes visible,

Use caution:

severely worn surfaces on sprocket faces may become very sharp.

It is best to use a screwdriver or

other tool to feel for the ridge in order to prevent finger cuts.

When a ridge on the sprocket face is detected,

the sprockets should be replaced.


LOW-TEMP

The most rapidly and severely worn sprockets

are most commonly found in abrasive atmospheres.

Severely worn sprockets often exhibit

groove wear as well as a reduction in the outside finish diameter.

A typical belt failure on worn sprockets exhibits polished land wear and

may have teeth worn to the point of serious dimensional distortion (hook wear).

Sprockets plated with a hard chrome finish can be used to

extend the sprocket life in abrasive atmospheres.

Another indication of severe sprocket wear is

when replacement belt life is noticeably reduced from previous belts.

When this occurs,

sprockets

should be examined closely for excessive wear.

Belts subjected to significant cyclic peak tensions

exhibit land areas with a crushed appearance.

Crushed land areas and tooth shear are both visible in

Extreme tooth wear from worn sprockets

A crushed land area condition may appear similar to belts

operating on moderate size sprockets under excessively high tensions.

Belts subjected to extreme cyclic belt tension variations

often fail from either tooth shear or tensile break.

Negative Effects of Environmental Conditions

Looking at the environmental conditions –

abrasive

atmosphere,

heat degradation,

chemical degradation,

and foreign

objects –

that can negatively impact your belts.

Abrasive Atmosphere

Belts operating in abrasive atmospheres

on applications like foundry shakers,

taconite processing equipment,

and phosphate mining conveyors often exhibit

a high degree of belt land and

tooth flank wear.

Worn areas frequently have a polished appearance.

Heat Degradation

When rubber belts operate at elevated temperatures

(greater than 185°F) for prolonged periods of time,

the rubber compound gradually

hardens resulting in back cracking due to bending.

These cracks typically remain parallel to the belt teeth and

usually occur over land

areas (in between belt teeth),

Belts generally

fail due to tooth shear,

which often leads to tensile cord fracture.

High-temperature rubber belt constructions
are available for belt drives
that must operate in high-temperature environments.
These special belt constructions help to improve belt service.
The body material used in urethane belts such as Poly Chain® GT® Carbon® belts is thermoplastic, meaning it has a melting point.
When subjected to environmental temperatures
in excess of 185°F, the teeth may begin to soften and deform.

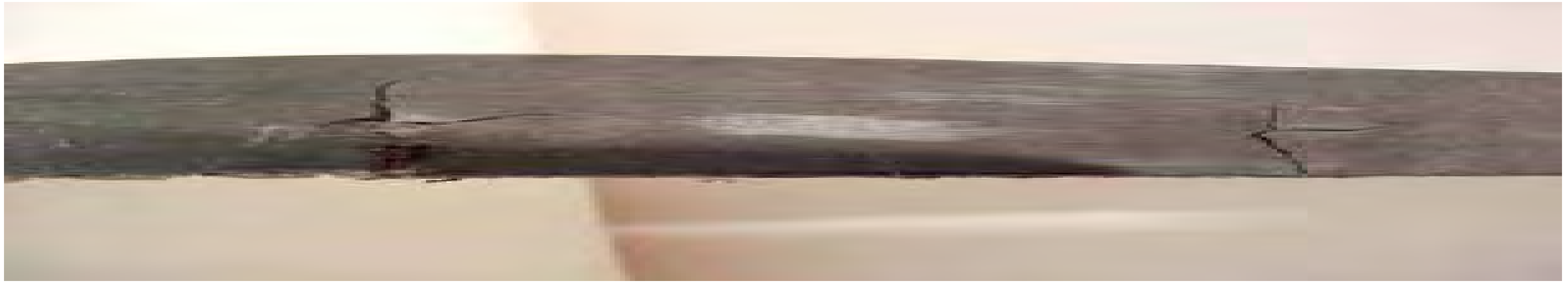
Chemical Degradation

Rubber belts subjected to either organic solvent vapors or ozone will resemble belts that have been subjected to high environmental temperatures.

The rubber compound will harden and belts will exhibit back cracking.

The cracking pattern will differ, though, in that the compound hardening occurs mostly at a surface level allowing cracks to form in both lateral and longitudinal directions.

A “checkered” appearance may result.



Foreign Objects

The introduction of foreign objects

between a belt and sprocket often

damages both belt teeth and tensile cords.

Tensile cords often fracture internally or fail later due to crimping,

Once a portion of the tensile cords have fractured,

the remaining tensile strength of the belt has been reduced considerably.

How do you know if a V-belt is failing prematurely?

By examining the clues.

In the same way that physical symptoms in the body reflect an underlying disease, the physical signs on a V-belt and sheaves reflect underlying problems with the drive system.

Finding and correcting the cause relieves the symptoms.

The resulting benefits include:

- Better drive performance
- Longer belt life
- Improved drive efficiency
- Energy cost savings
- Reduced maintenance

What Is “Normal” Failure for a V-belt Drive?

The frequency of belt replacement depends on the speed,

load, and

hours of operation of the drive.

This interval can vary significantly.

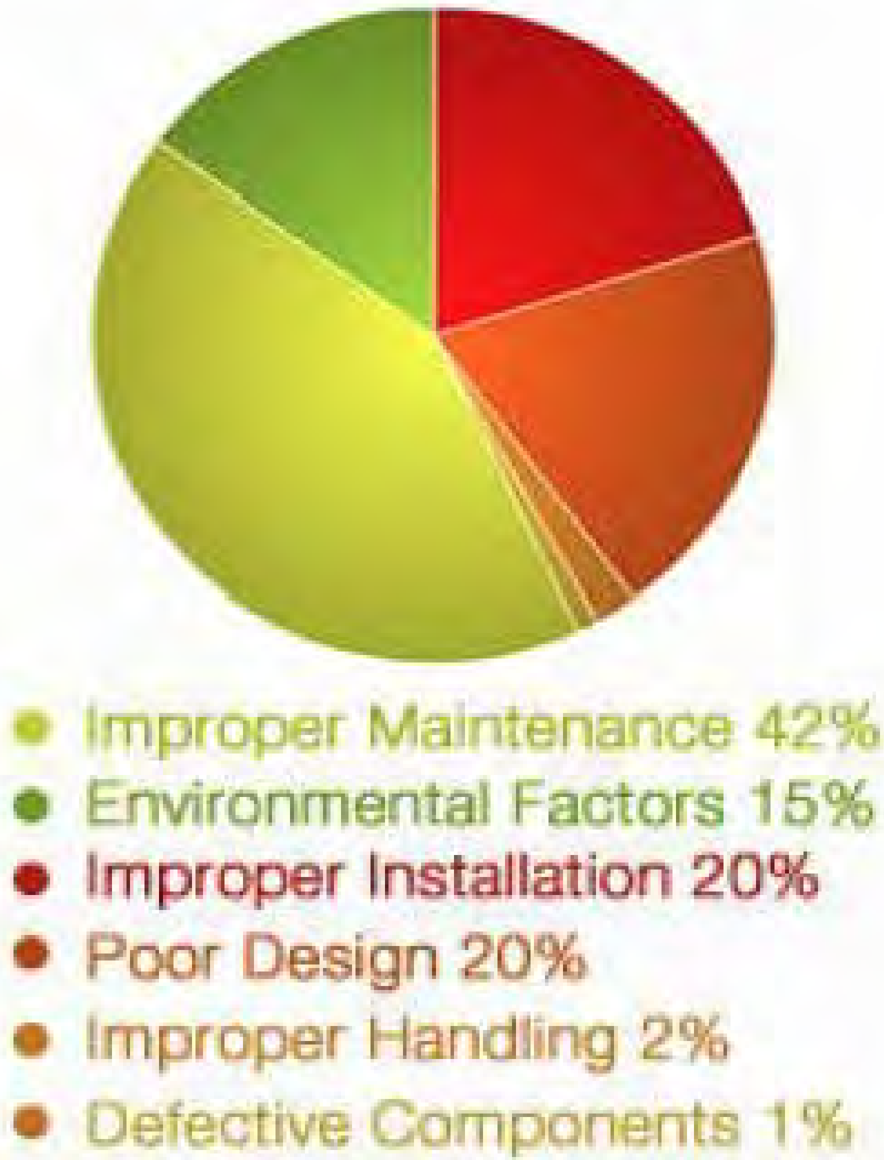
The V-belt on a well maintained drive

could deliver up to 3-5 years of service.

In harsh conditions,

the life of a belt might be reduced to one

year or less.


Improper Maintenance 42%
Environmental Factors 15%
Improper Installation 20%
Poor Design 20%
Improper Handling 2%
Defective Components 1%

This type of break can also occur for other reasons.

The drive couldbe under-designed,

subject to extreme or

cyclical shock loading, or

contaminated by debris.

Or, the belt may have experienced damage to the tensile cords.

Time is the key differentiator.

If the belt is failing more often than expected,

the cause is abnormal wear.

If it fails in this manner after

years of service, consider it “normal” failure.

Factors Affecting V-belt Life

Improper Maintenance

Poor maintenance is the major cause of premature V-belt failure.

To transmit power efficiently,

V-belts need a large surface area of contact,

a high coefficient of friction (grip),

and tension.

A drive that has been

properly designed for the application,

installed correctly with new components,

tensioned properly, and retensioned after a run-in period

will meet these requirements.

Time and neglect, however,

can compromise these principles.

Too much or too little tension,

worn pulleys (sheaves) and misalignment

are key indicators of improper maintenance.

Poor Design

Poor drive design accounts for 20% of early V-belt failures.

The drive may not have been designed properly for the original equipment.

Or changes could have been made by the end user

that increased the load or

the speed of the equipment.

Improper Installation

Another major cause that can lead to premature V-belt failure is improper installation.

V-belt drive performance depends on applying

and maintaining recommended installation tension levels.

The ideal level is the lowest tension at which belts will not slip under peak loads.

These levels are established by belt manufacturers and published in

their design specifications.

In addition to having proper tension, the drive must be properly aligned. Misalignment causes belt instability and shortens V-belt life.

Common causes of misalignment include the following:

- Driver and driven shafts are not parallel (both horizontal and vertical planes)
- Sheaves are not located in line axially with respect to one another on the shafts.
- Sheaves wobble or tilt while running due to improper mounting

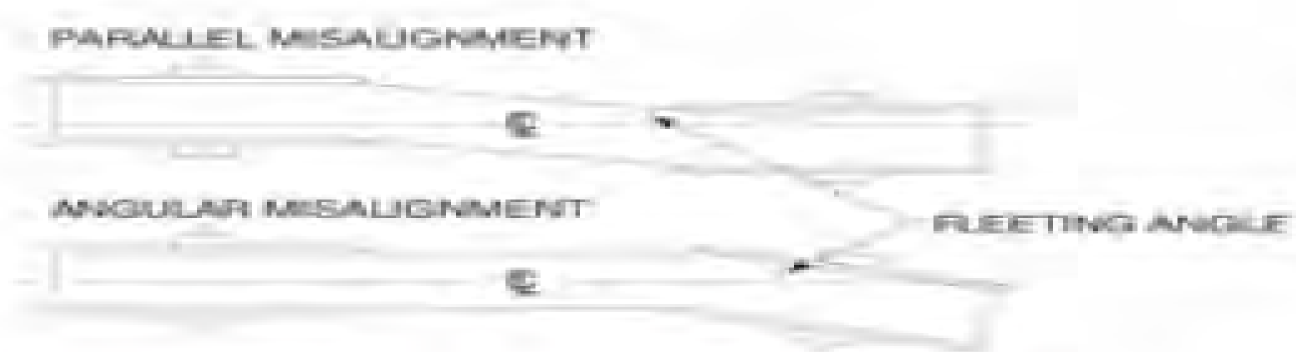


Figure 3 - Misalignment between belt and sheave is a major cause of abnormal V-belt wear.

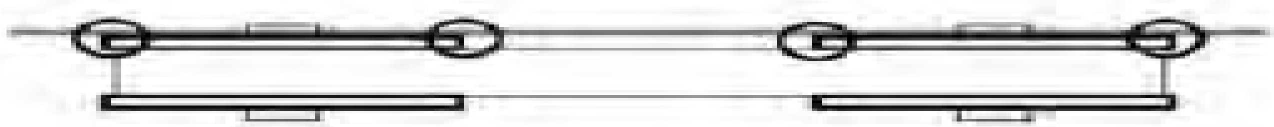


Figure 4 - Properly aligned V-belt drive with four points of contact.

Environmental Factors

Excessive heat and

contamination are two additional major causes of

abnormal V-belt wear.

The ideal operating temperature for a V-belt is approximately 140°F (60°C).

Standard construction V-belts typically can withstand ambient

temperatures up to 165°F (74°C) without sustaining appreciable damage.

Gates V-belts with Ethylene construction are specified to go up to 230°F (110°C).

Beyond these temperatures, every 18°F (8°C)

increase in internal belt temperature can reduce V-belt service life by half.

Improper Handling and Defective Components

There's a right and wrong way to store

a V-belt until it is ready for use.

Where possible,

belts should be stored

on a flat surface to avoid crimping.

Hanging V-belts on hooks,

especially large and heavy belts,

can cause crimping and shorten life.

When mounting a V-belt,

avoid prying

or

rolling the belt onto the sheave.

Doing so can damage tensile cords

and reduce belt life.

You should also avoid storing belts in an excessively hot environment. Excessive heat also shortens belt life.

Always check sheaves for wear and damage

before mounting a V-belt.

Nicks and sharp edges can damage belts.

So can worn sheaves.

Using a plastic groove gauge

is a simple method to check for wear

If the clearance between the sheave and groove gauge

exceeds **1/32 inch**,

replace the sheave.

Recognizing Problems

A belt that squeals or chirps,

makes a slapping,

rubbing or

grinding sound,

or even an unusually loud drive is a sign of trouble.

So is unusual or excessive vibration or a belt flopping in the sheave.

A belt that is hot to the touch is another warning sign.

Further diagnosis involves inspecting the belt.

Any sign of unusual

wear points to a potential problem with the drive.

Check for uneven wear patterns,

cracking in the back,

undercord or

notches,

frayed covers,

burned spots,

swelling and

hardening.

Any sign of unusual

wear points to a potential problem with the drive.

Check for uneven wear patterns,

cracking in the back,

undercord or

notches,

frayed covers,

burned spots,

swelling and

hardening.

Premature V-Belt Failure

When a V-belt fails prematurely it may

break

delaminate, or

slip to the point where it can't carry the load.

Another type of premature failure

is edge cord failure due

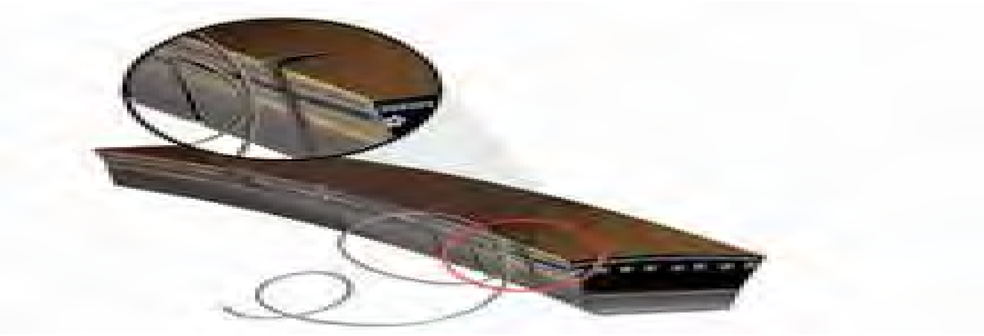
to sheave misalignment or

a damaged tensile member.

Correcting this problem involves checking and correcting the

alignment, and

following correct installation procedures when installing a new belt.



Severe or Abnormal V-Belt Wear

When inspecting a V-belt,

look at these locations for signs of unusual wear:

- Top surface
- Top corners
- Belt sidewalls
- Bottom corners
- Bottom surface
- Undercord cracking
- Sidewall burning or hardening
- Belt surface hard or stiff
- Belt surface flaking, sticky or swollen

Top surface wear

might be caused by the belt rubbing against the guard,

or by a malfunction of the idler.

Check these locations, and

repair or

replace

the guard and/or idler to correct the problem.

Wear on the top corners of the belt may indicate that the belt is too small for the groove in the sheaves.

Excessive wear along the belt sidewalls

could be caused by several factors.

The belt could be slipping due to incorrect tension.

If so,

retention the drive until the slipping stops.

Another potential problem is sheave misalignment,

which requires realigning the drive.

In this case,

replace the sheaves.

Or the belt may simply be

the incorrect size and

needs replacement with the correct size.

Wear on the bottom corners of the belt

could be due to worn sheaves or

an incorrect fit between belt and sheave.

Check the sheaves for wear and

replace them if necessary,

or find the correct belt/sheave match.

Bottom surface belt wear could be caused by

debris in the sheaves,

sheave wear,

or the belt bottoming out against the sheave grooves.

Bottoming out is caused by an incorrect match

between belt and sheave,

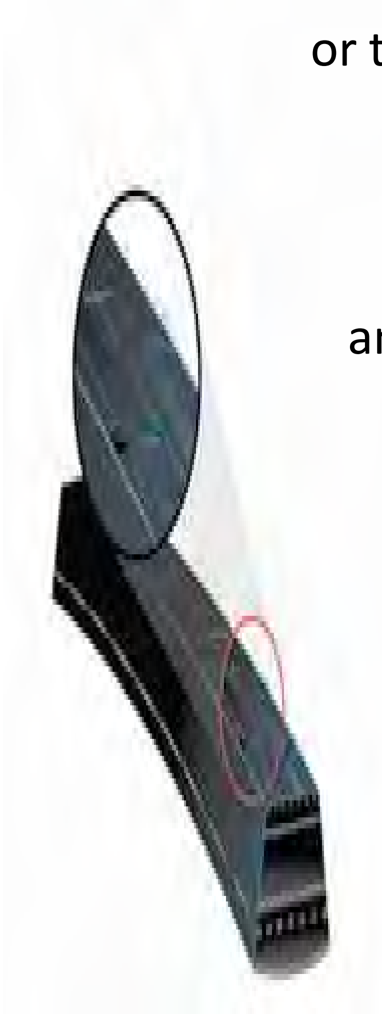
and can be corrected by finding the proper match.

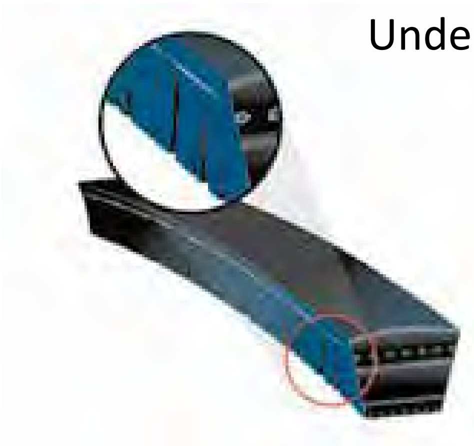
If the sheaves are worn,

replace them,

and if debris has gotten into the sheaves,

clean them.





Undercord cracking may be due to a number of factors.

Environmental conditions (excessive heat or cold) or

Improper storage could be to blame.

Solutions involve controlling the belt drive environment and

following proper storage and

handling procedures.

Another cause might be belt slip, corrected by retensioning the belt to the manufacturer’s recommendations. A sheave that is too small for the belt section, causing the belt to wrap too tightly around the sheave, could crack the undercord. Replacing the small sheave with a larger one could correct the problem. Similarly, a backside idler with too small a diameter could be the problem, fixed by increasing the size of the backside idler.

Another cause might be belt slip,

corrected by tensioning the belt to the manufacturer's recommendations.

A sheave that is too small

for the belt section,

causing the belt to wrap too tightly around the sheave,

could crack the undercord.

Replacing the small sheave

With a larger one could correct the problem.

Similarly,

a backside idler with too small a diameter could be the problem,

fixed by increasing the size of the backside idler.

Sidewall burning or hardening

is a sign of belt slip,

worn sheaves,

an under-designed drive or

shaft movement.

A slipping

belt should be retensioned to the manufacturer’s recommendations.

A worn sheave should be replaced.

If the drive is under-designed and can’t carry the load, redesign it to the

manufacturer’s recommendations.

Shaft movement might be caused by changes in

the center distance between the sheaves,

and should be checked and adjusted.

If the belt surface is hard or stiff

it might be due to an excessively hot environment or

to belt slip.

Correct the problem by

providing more ventilation to the drive

or adjusting belt tension.

A belt surface that is flaking,

sticky or swollen

may have become contaminated by oil or chemicals.

Eliminate the

source of the contamination,

and never use belt dressing.

Banded (Joined) V-Belt Problems

(multiple belts with a common cover that serves as a tie-band)

may exhibit signs that point to a drive problem.

The following symptoms call for investigation:

- Tie-band separation
- Top of tie-band frayed, worn or damaged
- Banded belt comes off sheaves repeatedly
- One or more belt ribs run outside the sheave

Tie-band separation might be the result of improper groove spacing.

Check the sheaves to ensure that they have been manufactured

to industry specifications.

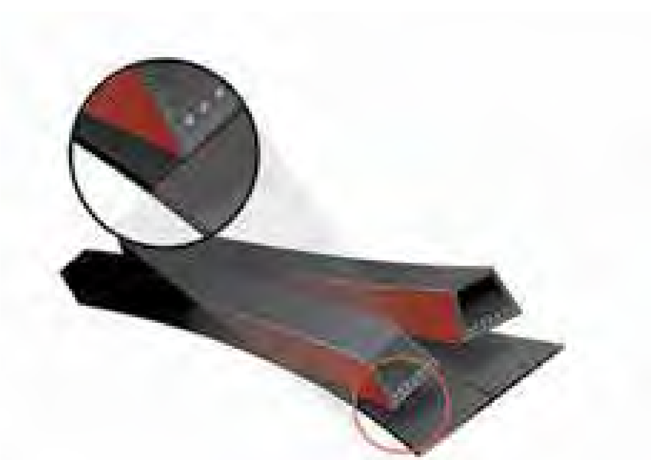
Another cause might be worn or incorrect sheaves,

which requires replacing the sheaves.

Also check to see if the sheaves are misaligned,

which could force a separation of the tie-bands.

Realign the drive to correct the problem.



If the top of the tie-band is frayed,

worn or damaged,

determine if the belt is interfering with the guard and

adjust

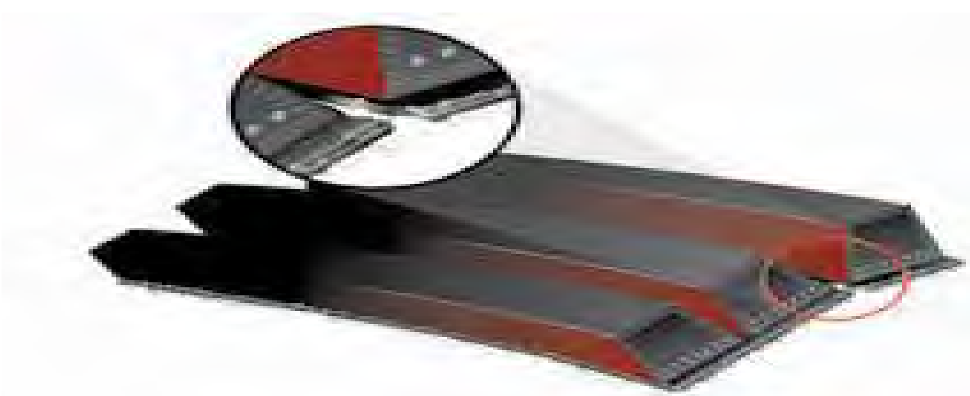
the guard as needed. Another possible cause is worn or

incorrect

sheaves. Replace the sheaves to fix the problem. Debris in

the

sheaves might also damage the tie-band, so clean the



A belt that has one or more ribs

running outside the sheaves

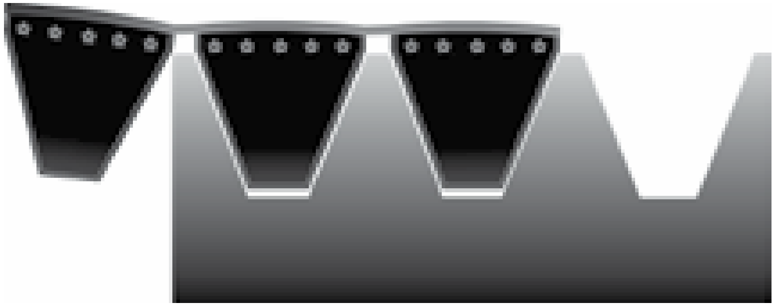
could be undertensioned.

Check the manufacturer's specifications and

retension the belt.

Another possible cause is sheave misalignment.

Realign the drive to correct the problem.



Problems Common to Single and Multiple V-Belts

Two problems common to both single V-belts and multiple V-belts

include belts turning over or

coming off the sheave

and belts stretching beyond the available take-up.

There are a number of probable causes and corrective

actions for

single or multiple V-belts turning over

or coming off the sheave:

When a single V-belt (or multiple belts) stretches evenly beyond the available take-up, check for the cause and corrective action:

Table C

Probable Cause	Corrective Action
Insufficient take-up allowance	Check take up; use allowance specified by manufacturer
Grossly overloaded or under-designed drive	Redesign to manufacturer's specifications
Broken tensile members	Replace belt or entire belt set and install properly

Sheave and Other Drive Component Problems

Broken or damaged sheaves,

severe sheave groove wear,

bent or broken shafts,

and extremely hot bearings

are also problems that impact V-belt life.


68cal

It seems improbable that a rubber V-belt

could wear out a metal sheave,

but it’s a fact Many users replace V-belts

several times without bothering to check the sheaves for wear.

Signs of sheave wear include groove sidewall cupping and/or

a polished groove sidewall with ridges.

Use a sheave gauge

to detect excessive sheave groove wear,

and replace sheaves

immediately when worn.

A broken or damaged sheave

also decreases belt life.

Sheave damage could result from incorrect installation,

such as over tightening the bushing bolts.

Or the belt may have been pried onto the sheave,

causing the damage.

Another probable cause of sheave

damage is debris falling into the drive.

Install a drive guard to correct the problem.

Bent or broken shafts could be caused by a number of factors, including the following:

- Extreme belt overtension
- Overdesigned drive
- Accidental damage
- Machine design error
- Sheave mounted too far away from outboard bearing

Probable Cause	Corrective Action
Shock loading or vibration	Check drive design; use banded (joined) belts
Foreign material in grooves	Shield grooves and drive
Sheave misalignment	Realign drive
Worn sheave grooves	Replace sheaves
Subminimum diameter sheave	Replace sheaves with correct diameter

When multiple V-belts stretch unequally beyond the available take-up, the probable cause and corrective action could be:

Table B

Probable Cause	Corrective Action
Misaligned Drive	Realign drive and retension belts
Debris in sheaves	Clean sheaves
Broken tensile member or chord	Replace all belts, install properly
Mismatched belt set	Install matched belt set
Belts from different manufacturers	Replace all belts with belts made by the same manufacturer