



TECHNICAL SERVICE BULLETINS

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EXTEND TYRE LIFE

Many years ago, Punctureseal R&D developed an anti-aging additive and incorporated it into its manufacturing process to reduce the detrimental effects related to heat build-up in tyre casings. In the past, the U.S. Military had experienced excessive dry-rotting in many tyres, primarily in desert environments. After installing Punctureseal, careful monitoring showed that treated tyres had significant reduction of incidences of dry rot as compared to untreated controls.

Punctureseal's proprietary ability to retard dry rot and maintain the casing's resilience is a remarkable achievement considering dry rot is typically caused by outside contaminants and UV radiation.

Punctureseal cannot restore an old tyre that has lost elasticity, however, it will inhibit and retard subsequent casing degradation.

Re-treading is a major cost saving for fleets. The more times a casing can be re-treaded, the lower the cost per mile. This represents a substantial savings. Plus, re-treading reduces the environment impact by reducing the number of casings being recycled.

Punctureseal will enhance the tyre casing in many ways. In new tyres, as well as re-treads, Punctureseal virtually eliminates porosity and air migration, lowers heat and significantly reduces the occurrence of tread, belt and zipper separations.

Tyre industry magazines, trade associations, tyre manufacturers and the Re-tread Industry all agree under inflation is the number one cause of premature tyre failure. It is a proven fact that Punctureseal virtually eliminates under inflation caused by air migration, porosity and punctures.



TYRE SIZES, APPLICATIONS & SITUATIONS TO AVOID

Applications and Situations Not Recommended for Punctureseal Usage

Punctureseal will provide its many benefits to the vast majority of tube and tubeless tyres, however, there are a few applications or tyre conditions where installation is not recommended.

Punctureseal is not recommended for:

- 1) Extreme high performance vehicles (sports cars, roadsters).
- 2) Low profile tyres (45, 40, 35 series and lower).
- 3) Passenger vehicles (including sport utilities) fitted with oversized rims and tyres. In many cases these void vehicle manufacturers' warranties and contribute to harsh or nervous ride capable of damaging suspension components prematurely.
- 4) Heavy equipment tyres containing water or calcium chloride.
- 5) Any tyre or vehicle with previously known vibration issues that is to be operated at motorway speed.
- 6) Automobiles or light trucks fitted with tyres with mismatched brands, sizes or running tyres that were purchased used. Often these tyres have undetected defects or casing damage that can induce unacceptable vibrations once treated with Punctureseal.
- 7) Any tyre with badly worn tread, characterized by cupped, scalloped or saw-toothed distortions. This is a general indicator for shocks, struts, steering and/or suspension components in need of repair or replacement.

CAUTION: If you intend to treat a tyre that you suspect has been run flat, there is a high degree of probability that it has sustained damage. While Punctureseal can often slow the rate of air loss, it cannot correct damage sustained to the tyre's belts, cords and structure.



TUBE-TYPE TYRES

Tubes can be found in almost every conceivable application, from personal mobility equipment, such as wheelchairs, bicycles and motorcycles, to giant mining machines. Tubes present particular and unique challenges not present in tubeless tyres. Tubes tend to squirm inside a tyre as the tyre rotates and the constant flexing caused by the roughness of the road surface will increase the chances of tube failure. As speed increases so does the squirming of the tube. This condition is magnified if the tube is underinflated. To minimize this, inflate the tyre to the maximum recommended air pressure indicated on the tyre's sidewall.

Installing Punctureseal in a tube will provide substantial puncture protection and enhanced air retention. Because Punctureseal is not coming in direct contact with the tyre, it cannot enhance the casing or protect the internal structure of the tyre.

When a tyre sustains a puncture, the puncturing object penetrates the tyre and tube and Punctureseal will seal around the puncturing object, holding the air within the tube. If the object rips the tube, or rocks as the tyre rotates, Punctureseal can only slow the air loss. This is often the case when the object is of an irregular shape or the wound is too large.

At earliest opportunity, remove the puncturing object, then rotate the tyre or drive the vehicle allowing Punctureseal to re-enter the wound. This is best performed where an air source is available. If a large object has punctured the tyre, leave it undisturbed and take the vehicle in for tyre repair or replacement as required.

It is recommended that a tyre inspection program be initiated for vehicles with tube tyres traveling over public roads (over 35 mph).

Whenever possible, use radial tubes. Radial tubes are thicker, more durable and provide for better Punctureseal compatibility and performance.

Punctureseal is somewhat less effective in tube-type tyres as compared to tubeless applications.



MOUNTING SOLUTIONS

Compatibility with Punctureseal

The majority of mounting solutions are soap-based compounds, often derived from the combination of various oils, saponified with an alkaline material, usually sodium or potassium hydroxide and sometimes a lithium soap (possibly a stearate) mixed with carbon to further enhance lubricity.

Independent testing has established that the vast majority of chemicals used in mounting solutions are compatible with Punctureseal. Punctureseal's formulation can absorb a small amount of this material without degradation of performance. The amount of solution that is required to adequately lubricate a tyre bead will not affect Punctureseal's balanced formulation.

Possible Interactions

When using a tyre mounting solution with Punctureseal please note:

- a) Some mounting solutions are in a concentrated form which must be mixed with water. If an excessive amount of water is used, it can promote rust and corrosion on the rim. Always follow manufacturer's recommendations.
- b) Using an excessive amount of solution in the tyre will degrade Punctureseal's balanced formula. This can also adversely affect tyre balance.
- c) Avoid using extreme amounts of mounting solution as it can migrate to the tread area where it can contaminate the Punctureseal. This can severely diminish Punctureseal's sealing capabilities. Additionally, it may form a wet and slippery film that can seep through pores or puncture sites and eventually into the belt package where it can cause corrosion and possible separations.

Note: Mounting solutions are a major source of moisture and sometimes contain incompatible substances. Whenever possible choose pre-mixed products. This helps avoid issues arising from poor quality water and improper mixing. Some water-based products do not contain rust inhibitors. Insist on one that contains rust and corrosion inhibitors.

OUT-OF-ROUND CONDITION

Checking For An Out-Of-Round Condition

To check for an out-of-round condition, secure a pointer tool so that it will be perfectly steady. Bring the tool to the object (tyre or wheel) to be checked. As it touches the object, back off a slight amount. This will provide a uniform distance between the tool and the closest portion of the object being tested. If the distance between the two opens and closes visually, this indicates an out-of-round condition. The more the distance opens and closes, the more out-of-round the object is.

Pointer Tool

You may utilise any object as a pointer tool. It is not necessary to use a sharp object. A sharp point may actually hinder visual inspection of the distance between the tool and the portion of the tyre being checked.

Always spin the tyre on a high speed spin balancer.

Tyre

The out-of-round condition is usually more pronounced in the tread area. Using the pointing tool as described above, check the outer edge of the tread, then the centre of the tread and finally the inner edge of the tread.

Wheel

A wheel can be bent or out-of-round and may cause one kind of problem or aggravate another kind of problem. Using the pointer tool as described above, check the wheel both on the front edge for in and out movement and again on the edge closest to the tyre for up and down movement.

AVOIDING VALVE CORE PROBLEMS

CLEARING VALVE AFTER PUNCTURESEAL INSTALLATION

After installing Punctureseal, blow a small amount of air through the valve to clear any remaining Punctureseal residue. This is the time to set correct air pressure according to manufacturer's specifications.

CHECKING AIR PRESSURE

If checking air pressure where an air source is available, momentarily connect air hose to allow a small blast of air to clear any sealant that may have travelled into the valve. Connect your gauge as normal to take reading. Reset air pressure if required.

If checking air pressure away from an air source, use a sharp object to momentarily depress the valve pin causing a small amount of air to be released, clearing any sealant from the valve. Connect your gauge as normal to take reading. Reset air pressure if required.

Following these procedures will avoid the possibility of clogging or impeding the proper function of your gauge. If a valve core show signs of clogging, simply remove, inspect for damage and rinse in clean water. Reinstall and reset correct air pressure.

NOTE: Occasionally, a valve core is clogged prior to performing an air pressure check or installing Punctureseal. This is often due to a missing valve cap allowing debris to become lodged in the valve. Remove and clean or replace as required.

OUT-OF-BALANCE CONDITION

REMEMBER! Always balance tyres and check for out-of-round wheels and tyres prior to installing Punctureseal .

Tyre balance is most critical in high speed passenger vehicles and light trucks. Small front wheel drive passenger vehicles and light trucks are known to transmit more road, wheel and tyre vibrations into the passenger compartment.

A vehicle with good wheels and tyres, when balanced, should take an average of three quarters to one and one half ounces of weight per tyre. The need for an excessive amount of weight indicates a problem. Perform any corrective procedures prior to installing Punctureseal . In this case, Punctureseal cannot correct the problem and, in fact, may amplify and increase vibration.

Always visually inspect the tyre for even and consistent tread as this is a common source of vibration. A simple method is to run the flat of your hand over the top of the tyre tread (from front to back). If you feel an excessive amount of unevenness (saw tooth), then this tyre is susceptible to vibration. This condition is often due to worn shocks and suspension causing the wheels to be out of alignment.

Older tyres that appear weather checked can absorb a little more Punctureseal than the average tyre. In rare cases, slightly more Punctureseal should be installed (no more than 10%). It is not uncommon to experience a slight vibration between 65 and 70 mph during the first five miles driven after Punctureseal installation. This is normal and will subside within a few miles.

Punctureseal's proprietary component "Thixogel" allows it to cling to the inner surface of a tyre. Punctureseal resists adverse forces that attempt to pull it away and exaggerate any small vibration. Always balance tyres PRIOR to installing Punctureseal.



VIBRATIONS

What to look for when vibration is a problem!

Installing the recommended amount of Punctureseal will not create a vibration or balance problem. Pre-existing balance or vibration problems should be corrected prior to the installation of Punctureseal, as they may be amplified.

Excessive wheel vibrations can pull Punctureseal off the inner tread surface and may actually increase the intensity of the vibration.

It is important to recognize that not all vehicle vibrations are related to tyre balance. Many originate from other sources such as steering, suspension, shock absorbers and tyre irregularities. Below are some causes for...

Excessive Vibration (Up-down movement)

Check for the following:

- Out-of-round tyre or rim
- Excessive flat spots on tyres
- Worn-out shock absorbers
- Shifted belts
- Tread separation

Excessive Lateral Movement (Side-to-side wobble)

Check for the following:

- Loose or worn out front-end components
- Improperly adjusted/loose or damaged wheel bearings
- Shifted belts
- Bent wheels/rims and axles

RUST AND CORROSION

Rust and corrosion form when there is moisture present in the air within a tyre/wheel. As the vehicle is driven, the tyre gets hot and the moisture will vaporize. Some will migrate through the pores of the tyre, while the majority will condense onto the wheel possibly forming rust and corrosion. This repeated vaporizing and condensation action will eventually concentrate on the wheel. Most people do not realize that moisture migrating through the tyre will cause the steel belts to rust.

It is very important to drain water from all air sources (compressors and lines) as a daily routine procedure. These are the main sources of moisture in a tyre. If possible, an air dryer should be attached to all air hoses. Make sure the tyre is dry and free of debris prior to mounting.

Mounting solutions are a major source of moisture and often contain incompatible substances. Whenever possible choose pre-mixed mounting solutions. This helps avoid issues arising from poor quality water and improper mixing. Some water based products do not contain rust inhibitors. Insist on one that contains rust and corrosion inhibitors.

One of the most important attributes of Punctureseal is that it contains a highly effective and proven rust inhibiting formula to protect all types of alloys and steel found in wheels and steel belts. Punctureseal has the ability to prevent the formation of rust and will inhibit any existing rust and corrosion. Punctureseal protection begins on the inside and protects throughout. Additionally, Punctureseal prevents outside contaminants from entering a tyre through a puncture site due to the sucking effect caused by tyre flexing.

Note: Even a small amount of water in a tyre can dilute and reduce the effectiveness of Punctureseal.

AVOIDING POTENTIAL TREAD SEPARATIONS & ZIPPER RUPTURES

A Zipper rupture is a circumferential rupture in the mid-sidewall of a steel-cord radial truck tyre. These are particularly dangerous as they are unpredictable and often occur with little or no warning to alert the driver or tyre service provider. They are frequently accompanied by a deafening blast with the explosive force of a pound of dynamite leaving a 10" to 36" zipper rupture in the sidewall. If this occurs while the tyre and wheel are removed from the vehicle, but not yet in a cage, it can be life-threatening. Fortunately, it's avoidable.

How They Occur

Steel-belted radial truck tyres utilize steel cord sidewall plies to maintain the strength and integrity of the tyre structure. They support the chamber, containing the air that carries the load. A puncture, leaking valve or any source of air migration (slow leaks) can lead to substantial, though not always apparent air loss. Tyres that are under-inflated or overloaded will experience increased flexing and heat buildup. This produces severe bending of the steel cords.

Consider that a truck tyre rotates hundreds of times per mile and thousands of times per hour under a heavy load. According to ITRA (International Tyre and Rubber Association), now TIA (Tyre Industry Association), any tyre known to have run at less than 80% of recommended air pressure could possibly have permanent steel cord fatigue. Quite often a pressure check reveals that one or more tyres are substantially below this 80% threshold and could legally be considered to have run flat. This is the major cause of tread separations and zipper ruptures.

New Tyres

There are as many tread separations in new tyres as in re-treads. This is again attributable to air loss and air migration beneath the tread. The incidence of manufacturing defects in new and re-tread tyres having been found to be the cause is generally low.

Retread Tyres

The repair, preparation and inspection of used casings are critical to the performance and longevity of the finished product. The smallest amount of air or improper adhesion between the cap and casing will expand as heat increases from deflection and road surface friction and can lead to delamination, tread separation and blowouts.

Prevention

The number one cause of tread separation is porosity and air migration. Punctureseal provides a uniform fluid/fiber coating that prevents air migration by sealing porosity and punctures as they



occur. Additionally, Punctureseal draws heat from the tread and transfers it to the wheel and sidewall where it is more efficiently radiated to the outside. Heat and centrifugal force developed within the rotating tyre will not pull Punctureseal from the area beneath the tread or degrade its composition. This is a proprietary process, unique to this product. For maximum benefit, install Punctureseal into new or newly re-treaded tyres prior to placing them into service.



QUALITY CONTROL

Batch Quality Control

Each master batch of Punctureseal is tested for quality, performance and reliability prior to being shipped from our manufacturing facility. A sample is analyzed for quality and consistency and undergoes 5,000 miles of factory dynamometer testing to ensure that the batch meets Punctureseal's stringent requirements for:

- 1) Extending air pressure retention within a tyre and casing (must retain air pressure to within one p.s.i. of initial factory recommended setting).
- 2) Puncture sealing. Seal punctures up to 1/4" in diameter and up to 1/2" diameter with Extra Heavy Duty (XHD -- OTR applications only) formula.

(Performed on dynamometer under simulated vehicle load with alternating periods of high speed rotation and rest).
- 3) Coating. Tyre interior coating consistency within the tread area checked at 1,250 mile intervals, 5,000 miles total.
- 4) Chemical formulation. Test for consistency and stability.

Dynamometer/test wheel conforms to U.S. Government specifications. All master batch samples retained for five years.

Manufacturing Facility

Punctureseal International owns and operates its manufacturing facility and only produces a complete range of tyre sealing and cooling products thus eliminating the possibility of contamination.



PUNCTURE DOES NOT SEAL

When a Puncture does not seal properly, check for the following:

Installing the recommended amount of Punctureseal will not create a vibration or balance problem. Pre-existing balance or vibration problems should be corrected prior to the installation of Punctureseal, as they may be amplified.

Excessive wheel vibrations can pull Punctureseal off the inner tread surface and may actually increase the intensity of the vibration.

It is important to recognize that not all vehicle vibrations are related to tyre balance. Many originate from other sources such as steering, suspension, shock absorbers and tyre irregularities. Below are some causes for...

- a) Improper tube size for tyre.
- b) Lack of Punctureseal product in the tyre.
- c) Puncturing object has been in tyre for over a month.
- d) Puncturing object or puncture itself is larger than 1/4" (6.5mm) diameter.
- e) Rips, tears or cord damage inside tyre.
- f) Shifted belts.
- g) Sidewall puncture.
- h) Stretched rubber, sometimes found in over-inflated tyres.
- i) Tread separation (inside tyre).
- j) Valve leaks.