

PneumaSeal™

The Original Tire Sealant

TECHNICAL PRODUCT OVERVIEW

Kor-Chem, Inc.

Setting Limits By Probing The Impossible

The PneumaSeal™ Technical Product Overview was written to provide you with in depth knowledge and benefits of PneumaSeal use. We hope you find this guide helpful. In the event you have questions or to locate your Authorized PneumaSeal™ Dealer please call 1-800-752-6627.

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PneumaSeal™ Technical Product Overview

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PNEUMASEAL™ OVERVIEW

PneumaSeal™ The Original Tire Sealant

Patented. Tested. Proven. PneumaSeal is a patented tire sealant that virtually eliminates flat tires. PneumaSeal has been thoroughly tested by various independent laboratories, including Smithers Scientific Services Inc. of Akron, Ohio. Smithers is a well known and respected independent tester of tires, chemicals and related products for the tire industry. Proven in millions of tires worldwide every year, PneumaSeal is the original answer to costly tire repairs and downtime.

Worry-Free Protection. PneumaSeal provides constant security on and off the road. It virtually eliminates flat tires caused by porosity, beak leads, rim leaks and tread area punctures. PneumaSeal is an important part of any maintenance program, the scientifically designed formulations reduce tire-related breakdowns and keep you rolling on schedule. Now that's peace of mind.

Guaranteed For The Life Of The Tire. When a puncture occurs, PneumaSeal is instantly pushed through the punctured area. The patented technology contains a mixture of particulants, liquid bonding agents, and solid fibers that fill the hole, forming a durable and permanent seal. PneumaSeal seals to the maximum point manufacturers say tires can be safely repaired, a ¼ inch tread area puncture.

The Thixotropic Advantage. The unique thixotropic chemical composition of PneumaSeal is extremely important. It thins when a tire is in motion but rapidly thickens when the motion ceases, thereby maintaining an even layer of PneumaSeal on the tire inner liner. PneumaSeal will not separate, freeze or ball up. Its adhesion properties provide continuous coating action that maintains proper air pressure within tires. This protects tires from under-inflation, the number one tire killer. By maintaining proper air pressure, PneumaSeal improves fuel economy and reduces heat generated by a tire's normal flexing and friction.

Easy Installation. PneumaSeal is installed quickly and easily through the valve stem (average installation time is just minutes per tire). PneumaSeal is compatible with and will not react or otherwise harm, the tire composition, the rims on which the tire is mounted or the valves in the tires. PneumaSeal is water dispersible, so clean up is simple, just rinse with water.

Market Assessment

PneumaSeal was invented to help drivers avoid pain, realize safety, security convenience by preventing flat tires and increasing tire performance. There is a large, virtually untapped market for PneumaSeal, a tire product that works! Approximately 10% of automobile drivers experience the inconvenience and frustration of flat tires each year. Even though cars and tires are more reliable than ever before, motorists eagerly join automobile clubs and purchase cellular phones for road side emergencies.

Flat tires are the number one cause of vehicle immobilization, according to the United States Department of Transportation. The Department of Transportation National Highway Safety Board reports that the primary cause of tire failure is underinflation. In fact 80% of the trucks on the road today are running on tires with low air pressure, a recent industry study reported.

PneumaSeal solves inflation and flat tire problems. PneumaSeal coats the tire inner liner. This coating eliminates porosity (slow leaking of air from the tire's sidewall and tread area), bead and rim leaks. This helps maximize tire tread life, improve gas mileage and create less wear on engines. It also seals punctures quickly and permanently.

PneumaSeal™ Features and Benefits

- **Prevents flat tires** by quickly and permanently sealing tread area punctures from object up to ¼ inch in diameter while vehicle is in operation.
- **Reduces fuel costs** by maintaining the recommended tire pressure which increases fuel efficiency and reduces premature tread wear. Underinflation of tires can decrease gas mileage by 3% to 5%.
- **Prevents underinflation** due to slow leaks caused by porosity, rim and bead leaks that can lead to air loss.
- **Continuously coats interior casing** to fill cracks.
- **Reduces internal dry rot and deterioration** by keeping tire casing moist and pliable.
- **Protects against rust and corrosion** with three anti-corrosion agents in that prevent corrosion of rims and steel tire belts. Rust and corrosion damage can occur when steel belts in radial tires become exposed to water due to tread punctures. The patented sealant formulation itself also protects against rust, corrosion and pitting on the rim.
- **Maximizes and extends tire life** by more than 20% by maintaining proper tire inflation and pulling excess heat away from the tread area. The Department of Transportation released the following figures about underinflation:

  5 lbs. underinflation reduces tire life by 28%
  6 lbs. underinflation reduces tire life by 38%
  9 lbs. underinflation reduces tire life by 52%

  Proper inflation of tires is critical to maximizing tire life. Overinflation subjects the center of the tread to excessive wear. Under-inflated tires flex excessively at every turn of the wheel, resulting in high internal heat and premature failures. Properly inflated tires permit the correct amount of tread area to be in contact with the road and also reduces excessive tire flexing.
- **PneumaSeal works as a thermal conductor**, transferring heat away from areas of higher temperatures to areas of lower temperature. This allows tires to run cooler at highway operating speeds, which in turn will extend the tread life.
- **Effective in temperatures down to -40°F**.
- **Seals rim weld imperfections**.
- **Does not affect tire balance.** PneumaSeal has a thixotropic property that gives it the ability to stretch and recover from repeated high speed tire rotation. PneumaSeal's thixotropic formula remains in a liquid state when the tire is in motion and changes to a gel state when at rest. This important property allows PneumaSeal to spread evenly over the inside of the tire providing a smooth, constantly protected ride.
- **Eliminates porosity** (the slow loss of air). Tire manufacturers state that passenger car tires (including new tires) lose up to 1 psi of tire pressure each month due to porosity.
- **Reduces the risk of tire blowouts.** Most tire blowouts are caused by air loss due to a puncture. A puncture leaves a tire dangerously under-inflated and at high speeds the sidewall cannot withstand the flexing and over heating caused by the underinflation.
- **Ready to use.** PneumaSeal requires no mixing, stirring, shaking or other special preparation.
- **Guaranteed to seal for the life of the tire**.
- **Provides peace of mind and safety on the road**.

Product Applications

PneumaSeal has applications in many different markets. This list is a short example and by no means represents the total market.

Agriculture equipment
All Terrain Vehicles (ATVs)
Automobiles
Bicycles
Common carriers
Community service fleets (police, fire, etc.)
Construction
Consumer
Delivery vehicles
Farm implements
Fleet vehicles
Forestry
Golf carts
Golf course equipment
Heavy Duty Trucks (26,000+ GVW)
Industrial (fork lifts, skid loaders, etc.)
Lawn & Garden tractor after market
Lawn & Garden tractor manufacturers
Light Duty Trucks
Medium Duty Trucks (up to 26,000 GVW)
Military vehicles
Miscellaneous small wheel vehicles
Motorcycles
Off the road vehicles (OTR)
Rental vehicles and equipment
Skid loaders
Snow plows and snow blowers
Trailers (boats, horse, house, utility, etc.)
Wheelchairs
Wheelbarrows

How Does PneumaSeal™ Work?

PneumaSeal™ is a completely homogenous, patented formula of fibers, particulates, adhesives, bonding and anti-corrosion agents that have been sized, weighed and blended in an ethylene glycol base that keeps the product in permanent suspension with the tire, for the life of the tire.

When installed inside a tire PneumaSeal will virtually eliminate flat tires. PneumaSeal is designed to seal tread punctures, bead leaks, porosity leak, or any tube, tire or wheel related leaks. PneumaSeal seals the tire to maintain proper inflation and will seal up to ¼ inch tread area punctures for the legal life of the tire. The adhesion properties in PneumaSeal provide continuous protection for the tire.

PneumaSeal is installed quickly and easily through the valve stem (average installation time is just minutes per tire). When a puncture occurs the centrifugal force of the rotating tire and the tire's internal air pressure quickly force PneumaSeal into the puncture. This forms a primary seal that stops the initial air loss. As the tire continues to turn, more PneumaSeal is forced into the puncture. A permanent seal is created as the puncture is packed with particulates and fibers. A small amount of PneumaSeal will go through the puncture to the outside of the tire, which indicates the puncture has sealed.

The unique thixotropic chemical composition of PneumaSeal is extremely important. It thins when a tire is in motion but rapidly thickens when the motion ceases, thereby maintaining an even layer of PneumaSeal on the tire inner liner. PneumaSeal will not separate, freeze or ball up. Its adhesion properties provide continuous coating action that maintains proper air pressure within tires. This protects tires from under-inflation, the number one tire killer. By maintaining proper air pressure, PneumaSeal improves fuel economy and reduces heat generated by a tire's normal flexing and friction. PneumaSeal allow the tire to run cooler and last longer.

PneumaSeal is compatible with and will not react or otherwise harm, the tire composition, the rims on which the tire is mounted or the valves in the tires. PneumaSeal is water dispersible, so clean up is simple, just rinse with water.

PneumaSeal™ Is Environmentally Safe

PneumaSeal has been extensively tested for its environmental safety. All tests concluded that PneumaSeal is no a hazardous material.

Block Environmental Services, Pleasant Hill, CA

Using test protocol based on “Standard Methods for the Examination of Water and Wastewater”, American Public Health Association, 1992; California Title 22 Code, Section #66261.24(a)(6);”Static Acute Bioassay Procedures for Hazardous Waste Samples” (Polisini and Miller, 1988), California Department of Toxic Control (CA. EPA). PneumaSeal was tested and found to be not environmentally hazardous.

Environmental Attorney John R. Spenser

Independent tests conducted by properly licensed and highly respected laboratories, under the personal direction of Environmental Attorney John R. Spenser, (former REGION X Director of the United States Environmental Protection Agency under two Presidents), concluded that PneumaSeal:

(1) Is non-corrosive.
(2) Is safe for disposal in landfill under the “most strict” Washington State regulations.
(3) Has passed the significant Washington State Bio-Assay Test.

Most importantly, PneumaSeal was tested and found to be not environmentally hazardous after being removed from a tire following at least 60 days of use.

United States Postal Service Environmental Criteria

PneumaSeal meets or exceeds all criteria for being environmentally safe. The tests done on PneumaSeal using the criteria specified by the USPS concluded that PneumaSeal does not contain asbestos, in any form, encapsulated or not, or any other substance which the Occupational Safety and Health Administration (OSHA) or the Environmental Protection Agency (EPA) might find harmful to Postal Service employees or the environment.

PneumaSeal has no adverse effect of the health of personnel when used for its intended purpose. Surfactants in PneumaSeal are a minimum of 90% biodegradable. PneumaSeal does not contain hexavalant chromium, methyl, ethyl or isopropyl alcohol, or any material considered as hazardous by the EPA and does not present a waste disposal problem.

Furthermore, PneumaSeal’s chemicals and composition are not harmful to any types of rubber and/or material that would allow solidification such as bonding to the tire or wheel.

Specially Formulated Types of PneumaSeal™

PneumaSeal HD
Multi-purpose green tire sealant for commercial, industrial and fleet maintenance applications. PneumaSeal HD is guaranteed to provide protection for the life of the tire. Prevents flat tires by quickly and permanently sealing tread area punctures up to ¼" in diameter.

PneumaSeal Automotive
High speed blue sealant for passenger vehicles, SUVs and light trucks weighing up to 11,000 lbs. Maintains air pressure by preventing bead leaks, porosity leaks and punctures. Use results in cooler running tires, extended tire life and reduced maintenance costs. Seals punctures up to ¼" in diameter.

PneumaSeal Direct
White tire sealant for applications where sealant needs to be installed directly into the tire without removing the valve core. PneumaSeal Direct easily flows through and will not clog valve stems. Seals punctures up to ⅛" in diameter.

PneumaSeal XXHD
Tire sealant for off road construction and agricultural vehicles. Continuously coats interior casing to fill cracks and prevent dry rot, deterioration and leaks. Reduces fuel costs, maintenance costs and downtime. Seals punctures up to ⅜" in diameter.

PneumaLife
Corrosion inhibitor, coolant, sealant and oxygen scavenger for rims of large scale off road construction vehicles, earthmovers and mining vehicles. Provides continuous rust prevention and reduces labor costs associated with tire dismounting and rim loss from corrosion, pitting and scale.

PneumaSeal Tube Sealant
For use in bicycles, motorcycles, wheelchairs or any tire with an inner tube. Specialized sealant contains unique technology that moves and flexes with the inner tube to seal punctures and prevent leaks.

Frequently Asked PneumaSeal™ Questions

Who should use PneumaSeal?
Anybody who is concerned about their safety and security while driving a vehicle with pneumatic tires. PneumaSeal prevents the inconvenience and risk associated with flat tires.

What does the American Automobile Association say about the incidence of flat tires?
AAA responds to over 3,000,000 flat tire calls per year. Based upon AAA data, it is estimated that there are over 12,000,000 flats in the United States every year. This represents 11% of the road side emergency calls received by AAA.

What will PneumaSeal do for me?
Once installed inside your tires, PneumaSeal virtually eliminates flat tires caused by punctures or other leaks. PneumaSeal is designed to seal tread punctures, bead leaks, rim leaks, porosity leaks or any tube, tire or wheel related leaks. PneumaSeal seals the tire to maintain a constant volume of air in your tires. It permanently seals tread area punctures up to a ¼ inch in diameter.

Does PneumaSeal run to the bottom of the tire when the tire is not in motion?
No. PneumaSeal contains specially selected adhesives which will prevent this from happening. The thixotropic formula causes PneumaSeal to remain in place covering the interior of the tread.

Frequently Asked PneumaSeal™ Questions (Continued)

How does PneumaSeal seal a hole in the tread area of a tire?

PneumaSeal is drawn to the area of the puncture by the escaping air. As the tire rotates and strikes the surface of the road, the puncture is stretched open and diamond shaped particulates enter the cavity left by the puncturing object. Solid fibers and liquid bonding agents wrap around the particulates and form a permanent seal and the fluids that escape to the surface of the tire quickly evaporate.

How does PneumaSeal prevent rim and bead leaks?

The escape of high pressure air from the tire into the atmosphere draws PneumaSeal gums and particulates to the area of the escaping air. The leak is thus located and sealed.

Does a nail or other penetrating object need to be removed from the tire even though PneumaSeal has prevented a flat?

Yes. PneumaSeal will effectively seal around the penetrating object but if the object is left in the tire, it will moves as the tire rotates and may create a larger and larger hole. This may cause additional air loss or tire damage.

Will PneumaSeal settle in a container and need to be shaken or stirred?

No, PneumaSeal does not require any shaking, stirring, mixing or special tire preparation prior to installation. PneumaSeal is a homogenous mixture with the ingredients bonded together in a such a manner that it is impossible for the ingredients to settle to the bottom.

Can PneumaSeal be used in Retreads?

Yes. Heat generated form under-inflated tires frequently contributes to retread separations. Tubeless retreads are particularly vulnerable to tread separations. Frequently, small holes in the inner liner are missed in the pre-retread inspection. High pressure air passes through the hole and spread out between the old casing and the new tread until separation and failure occurs. Be effectively sealing these small liner holes, PneumaSeal reduces the pressure on the new tread, so that full service life is achieved without incident.

Does PneumaSeal react chemically with the rubber tire or metal rim?

No. PneumaSeal is chemically inert.

What is the shelf life of PneumaSeal?

The shelf life of PneumaSeal is virtually indefinite as long as the container is air tight and no evaporation occurs.

Will PneumaSeal dry out while inside the tire?

No. PneumaSeal will always stay in the same condition as it was when it was injected into the tire. A tire treated with PneumaSeal is a closed container and no evaporation of PneumaSeal can occur.

Will the flexible plug of PneumaSeal dissolve when the tire is driven in the rain or snow?

No. The plug consists of cotton, rayon, nylon fibers and ground pieces of polyethylene, all of which are not water soluble.

Will PneumaSeal rust the rim of the tire?

No. PneumaSeal will not rust rims. It contains three (3) anti-corrosion agents to prevent corrosion from occurring.

Will PneumaSeal seal a puncture in the sidewalls of a tire?

No. There is too much natural flexing in the tire's sidewalls for PneumaSeal to be effective. The Rubber Manufacturers Association recommends replacing rater than repairing tires with sidewall punctures.

TECHNICAL REPORTS

Smithers Scientific Services PneumaSeal™ Evaluation Summary

Smithers Scientific Services, Inc., is a leading independent consulting, research and testing firm, servicing a worldwide client base in tire, automotive, elastometric, chemical, medical device and marine industries. Smithers is an approved Federal Government testing laboratory. Since 1925, the company has been dedicated to excellence and accuracy in providing analytical testing, performance evaluations, product analysis, product certification and management consulting.

Smithers Scientific Services conducted extensive studies on PneumaSeal, and listed below are the published findings from their testing. The Smithers testing concluded that:

1. PneumaSeal seals puncture holes left by a ¼ inch puncturing object.
2. PneumaSeal does not degrade components.
3. PneumaSeal does not rust steel wire tire cords.
4. PneumaSeal may act as a hint sink and allow for cooler tread shoulder temperatures.
5. PneumaSeal has a variable viscosity. A study of viscosity as temperature was reduced to -55°F suggests its dynamic flow rate changes as temperature changes.
6. PneumaSeal does not impede the rolling resistance of low profile radial truck tires.

The reports lists the recommended quantities of PneumaSeal which should give adequate sealant coverage to seal holes left by a ¼ inch diameter puncturing object, while not creating any ride disturbances. The quantities specified in the report will provide adequate inner liner coverage beneath the tread surface maintaining sufficient (0.050”) sealant thickness in any one tread puncture location. Installing PneumaSeal in these quantities will not create an imbalance or ride disturbance. The report encompasses the majority of passenger tire size combinations available on the market today.

Using the recommended quantity of PneumaSeal in a tire will meet the two basic requirements for an effective tire seal:

1. The ability to coat an entering, puncturing object and provide an airtight seal. When the puncturing object is thrown out or otherwise removed, the sealant flows into and over the aperture and seals the hole.
2. The sealant stays in place across the full tread, withstanding the 160 Gs of centrifugal force in the shoulders of a tire traveling at 60 MPH. It does not puddle in the center of the tread but rather stays in the shoulder areas where it is also needed. It does not flow in a circumferential direction when the vehicle is parked thus eliminating potential balance problems.

Although certain test tires failed due to excessive speed creating severe tire temperatures and belt separations, the PneumaSeal did not fail. Internal air pressure was maintained. No air loss or leakage of sealant due to centrifugal force occurred.

PneumaSeal, when used in recommended quantities in steel belted radial tubeless passenger tires causes the inner liner surface temperatures to be reduced by approximately 4°F. Passenger tires operated with PneumaSeal contained higher air operating temperatures (approximately 13°F), suggesting that the sealant acts as a heat sink, pulling heat out of the tread area.

Tires tested at reduced inflation pressures, simulating underinflation, showed typical higher temperature characteristics due to increased tire flexing. Tires with PneumaSeal, however, gave indications of reduced tread shoulder temperatures.

U.S. Postal Service Tire Sealant Evaluation Summary

PneumaSeal has successfully completed testing for the USPS vehicle maintenance specifications. The testing completed by Smithers Scientific confirmed that PneumaSeal meets or exceeds the tire sealant specifications outlined in the USPS Vehicle Maintenance Bulletin Supplement #4 to the original performance requirements stated in V-21-93.

The U.S. Postal Service also confirms that PneumaSeal meets or exceeds all the requirements set forth in Vehicle Maintenance Bulletin V-11-95 and that PneumaSeal is approved for use in USPS vehicles. The United States Postal Service has 27,000 post offices and over 1,000,000 vehicles in its total fleet.

The following excerpts come directly from the bulletin:

As part of compliance with the Environmental Protection Agency and the National Energy Strategy, and in concert with Postal Service recycling efforts, the following procedure is mandatory for extending tire casings and making full use of the available modern tire retread technology.

All Vehicle Maintenance Facilities (VMFs) will make full use retreading services for tires used on all postal service vehicles. Where ever possible, the use of headquarters approved tire sealants is suggested in order to extend the life of the tire casing. The use of tire sealant / tire life extenders will:

- Reduce road calls
- Assume constant tire pressure for the life of the tire
- Result in cooler running tires
- Extend tire life
- Even tread wear
- Reduce maintenance costs
- Protect against air pressure loss due to average punctures

The Postal Service established rigid criteria for a tire sealant to meet before it will be approved for use in USPS vehicles. All testing of tire sealants must be done at an USPS approved testing center. The primary criteria: (Note: PneumaSeal meets <u>all</u> of these criteria)

- Maintenance of proper air pressure
- Prevention of air migration
- Prevention of porosity leaks
- Conditioning and prevention of rot and weathering within the tire
- Cooler running tires
- The sealant must be warranted in writing

The Postal Service's bulletin states that proper inflation pressure is the single most important factor in overall tire performance and reliability. Underinflation is the worst enemy of tires. The primary cause for tire blowouts in both new tires and retreads, can be traced back to improper air pressure.

New and retreaded tires reach their maximum operating temperature in 90 minutes at highway speeds. If an underinflation situation exists, tire heat will climb until either tire failure or damage to the casing construction occurs. If the casing damage goes undetected, the damaged tire, when retreaded, will eventually fail due to the heat build up caused when the tire casing was new.

The Postal Service bulletin also states that tire inflation has a tremendous effect on fuel economy.

USPS Santa Clarita PneumaSeal™ Impact Test Summary

Situational Review: The Santa Clarita Post Office Vehicle Maintenance Facility was achieving less than optimum tread life from vehicle tires. It was costly for the maintenance facility to prematurely replace and dispose of worn out tires. The purpose of this test was to determine the significance of the underinflation problem and determine whether PneumaSeal could effectively reduce or eliminate underinflation.

Problem: Underinflation was suspected as the major cause of the premature tire wear. Tire manufacturers report that a normal tire can lose one psi or more of air each month. Left unchecked, underinflation can reduce tire tread life by up to 53%.

Primary Cause of Underinflation: Vehicle maintenance procedures mandate that tire inflation inspection be conducted during a vehicle's semi-annual inspection. The lack of a regular tire pressure inspection and the corresponding topping off of the tires with low air pressure is a major contributor to underinflation. An unmonitored tire can lose more the six psi of air in six months. Unfortunately air maintenance programs are expensive to maintain and supervise. The lack of such a program also contributes to increase vehicle fuel consumption.

PneumaSeal Evaluation Criteria: PneumaSeal was installed in the front tires of two front wheel drive delivery vehicles. The front tires were considered the most vulnerable to tire wear. The PneumaSeal treated tires, the untreated rear tires and the tires on 10 randomly selected vehicles were checked for air pressure over an eight week period.

Evaluation Results: The test concluded that an underinflation situation existed with tires not treated with PneumaSeal. The PneumaSeal treated tires registered 50 psi (no loss of air) at the end of the eight week test. The test vehicles' untreated rear tires registered an average air loss of 8%. The randomly tested tires registered an average of 14% air loss. These results are consistent with industry porosity related air loss statistics of one psi air loss per month.

Productivity and Economic Pay Off: The tire protected against air loss with PneumaSeal recorded no loss of air. The results indicate that PneumaSeal treated tires should get a 33% increase in tread life. The evaluation also determined that underinflated tires were costing the vehicle maintenance facility $96.16 per tire or $384.64 per set of tires.

Additional Benefits Observed:

1. Maintaining proper tire inflation with PneumaSeal increases the retreadability of tires by allowing more casing to be retreaded and increasing the number of retreads per casing.
2. Maintaining proper tire inflation with PneumaSeal improves vehicles fuel economy. In this test, fuel economy increased 34.5%, saving nearly $280.00 per vehicle every 10,000 miles. (Fuel economy was calculated at $1.50 per gallon.)
3. Protecting tire with PneumaSeal reduces vehicle downtime, wasted personnel time and flat tire repair expense. In this test, the savings was $90.00 per flat tire.
4. PneumaSeal produces ecological savings by reducing the number of tires being disposed of and by decreasing tire roll resistance which improves fuel economy thereby reducing air pollution.

Frequently Asked Questions About Tire Inflation

Note: Tires are designed to carry certain loads at specified air pressures. Correct pressure must be maintained to accomplish this goal. Properly inflated tires pay off in extra tire life. Correct inflation enables the tires to support the load of the vehicle.

What is the proper tire pressure?

Correct tire pressure varies with each model of tire and vehicle; refer to vehicle operating manual, placard on vehicle door jamb or sidewall of the tire.

Why should proper tire pressure be maintained?

Excessive heat is a tire's worst enemy. Heat results from friction, caused by flexing of the tire. Flexing increases rapidly as speed increases. It is aggravated by underinflation or overloading. Running a tire at sustained high speeds under such conditions may raise the temperature above the critical level, reducing tire strength and tread life and increasing the risk of sudden tire failure.

- Overinflation – Subjects the center of the tread to excessive wear.
- Underinflation – Causes tires to flex excessively at every turn of the wheel, resulting in high internal heat and premature failures.
- Proper Inflation – Correctly inflated tires permit all the treat to contact the road, yet are not soft enough to flex excessively.

Why do tires fail?

A tire is an air envelope consisting of materials from a long chair of macromolecules. The tire itself does not carry the load. It is the air within the tire which carries the load and provides the only support between the vehicle and the road. The complex chemistry of a modern tire is dependent upon correct air pressure within the tire and all manufacturers say that the cause of most tire failure is due to incorrect inflation.

What are the consequences of underinflation?

1. Reduction in resistance to cuts
2. Ply separation
3. Poor pavement grip, thus decreasing safety
4. Blowout risk due to overheating
5. Increasing rolling resistance leading to higher fuel use
6. Destruction of casing making retreading impossible
7. Excessive flexing leading to excessive temperatures and premature tire failure

What is PneumaSeal's cooling effect?

PneumaSeal cools though inflation pressure maintenance and thermal conduction. Because of the variation of internal and external friction on various parts of the tire, and since rubber is a very poor conductor of heat, there are substantial differences in temperature at various points within the tire.

The high ethylene-glycol content of PneumaSeal acts as a thermal conductor, transferring heat away from areas of higher temperature to areas of lower temperature. This thermal transfer of heat helps keep the hot areas cooler. The effect of thermal conduction tends to be greater in larger, slower moving industrial and commercial tires, because of the larger sidewall areas coated with PneumaSeal.

What are the true cost of underinflation?

Underinflation increases costs and decreases performance to an unacceptable level for all vehicles, particularly truck operators who wish to remain in business. Firestone Tire Company reports:

25% low air pressure = 40% loss of tire service
30% low air pressure = 53% loss of tire service

PneumaSeal™ Material Safety Data Sheet

Prepared in accordance with 29 CFR 1910.1200 (c).

HMIS HAZARDOUS MATERIALS IDENTIFICATION SYSTEM
HEALTH – 1 FLAMMABILITY – 1 REACTIVITY – 0 PERSONAL PROTECTION – B

SECTION I. PRODUCT IDENTIFICATION

Product Identifier: PneumaSeal HD Tire Sealant
Product Identification #(PIF): 401
Prepared by: Chad C. Parson
Product VOC: 480.6 g/L
Emergency Telephone #: 1-800-255-3924
Date Prepared: September 26, 2001
Manufacturer's Name: Kor-Chem, Inc.
General Information #: 404-264-0107
Revised by: Sonya Lockhart 7/21/03
Manufacturer's Address: PO Box 43163, Atlanta, GA 30336

SECTION II. HAZARDOUS INGREDIENTS

CHEMICAL NAME	CAS #	OSHA/PEL	TLV	STEL	max. %
1. Ethylene Glycol	107-21-1	50ppm	50ppm	NE	35-55

SECTION III. HEALTH HAZARD INFORMATION

Effects of overexposure:
Eye Contact: Can cause eye irritation. Symptoms include stinging, tearing, redness and swelling of eyes.
Skin Contact: May cause mild skin irritation. Prolonged skin contact may result in dermatitis.
Inhalation: Vapors may cause irritation to nose, throat, and respiratory tract. High vapor concentrations may result in CNS depression.
Ingestion: Swallowing large amounts may be harmful. If ingested it causes initial CNS stimulation followed by depression., later resulting in liver, kidney and brain damage, which can terminate fatally.

SECTION IV. EMERGENCY FIRST AID

Eyes: Flush well with water for at least 15 minutes. Get medical attention if irritation persists.
Skin: Wash with soap and water. Seek medical attention if irritation persists.
Inhalation: Move to fresh air. If symptoms persist, seek medical attention.
Ingestion: Immediately contact poison control center, emergency treatment center or physician for advice on whether to induce vomiting. Contains ethylene glycol.

SECTION V. FIRE & EXPLOSION DATA

Flammability: NOT FLAMMABLE
Flash Point: NA
Means of extinction: Carbon dioxide, water fog or dry chemical.
Upper Flammability Limit (% by volume): ND
Autoignition Temperature: ND
Lower Flammability Limit (% by volume): ND
Hazardous combustion products: Carbon monoxide, carbon dioxide.
♦*Special Fire Fighting Procedures*: Wear self-contained breathing apparatus; avoid breathing vapor or fumes of heated product.
♦*Unusual Fire Fighting Hazard*: Slippery on floors; be cautious for footing if containers leaking or burst due to heat.

SECTION VI. REACTIVITY DATA

Chemical stability:Stable
Hazardous polymerization: Will not occur.
Reactivity, and under what conditions? NONE.
Hazardous decomposition products: Carbon dioxide, and carbon monoxide.
Incompatibility with other substances: Avoid contact with heat, strong acids, strong alkalies and strong oxidizing agents.

SECTION VII. HANDLING & STORAGE

Storage: Keep container closed, when not in use. Keep away from heat, flame, or sunlight. Protect from physical damage.
Handling: Do not premix with other chemicals. Exercise reasonable care and precaution. Keep out of reach of children.

SECTION VIII. EXPOSURE CONTROL/PERSONAL PROTECTION

Personal protective equipment: Use rubber gloves and eye protection.
Gloves (specify): Chemical resistant gloves
Respirator (specify): NIOSH, if PEL is exceeded
Eye (specify): Chemical resistant eye ware
Footwear (specify): No open end shoes
Clothing (specify): Normal materials handling clothing.
Other: Always provide local exhaust ventilation.

SECTION IX. SPECIAL PRECAUTIONS/ OTHER COMMENTS

Carefully read all instructions on label before handling this product. "FOR INDUSTRIAL USE ONLY"

SECTION X. PHYSICAL DATA

Boiling point: >2120F
Vapor Density: (Air = 1): ND
pH, Neat: 8 - 9
Specific Gravity, (water = 1.0): 1.02
% Volatile/ volume: 94
Vapor Pressure: ND
Solubility: Contains some insoluble materials
Evaporation Rate: slower than butyl acetate
Description/odor: Viscous, thixotropic, green liquid with a slight odor.

SECTION XI. ACCIDENTAL RELEASE MEASURES/ DISPOSAL INFORMATION

Large spill cannot occur because of packaging. Material should be soaked onto absorbent and shoveled into waste containers. All clean-up material should be removed for proper treatment or disposal. Dispose of contaminated absorbent material in accordance to local, state and federal regulations. Do not release to open, public waters. Product has a RQ of 10,707 lb (4,8601 kg) as Ethylene Glycol.

SECTION XII. TRANSPORT INFORMATION

Not Regulated by the D.O.T.

SECTION XIII. REGULATORY INFORMATION

SARA TITLE III REPORTING REQUIREMENTS

SECTION 302: Not listed
SECTION 311: Immediate, Delayed Health Hazard
SECTION 312: Immediate, Delayed Health Hazard
SECTION 313: Listed (Ethylene Glycol)
RCRA: Not reportable.
CERCLA: This product has a RQ of 10,707 lb (4,8601 kg) as Ethylene Glycol.

SECTION XVI. ADDITIONAL INFORMATION

The information contained herein is based on data available to us and is believed to be correct. We make no warranty, however, expressed or implied regarding the accuracy of these data or the results obtained from the use thereof. Regulatory Standards: DOT TITLE 49, Code of Federal Regulations 172.101: Parts 100 to 177, Revised 10/1/92.
SUPER FUND AMENDMENTS REAUTHORIZATION ACT OF 1986, TITLE III TOXIC SUBSTANCE CONTROL ACT LIST (TSCA)- INGREDIENTS LISTED. REGISTRY OF TOXIC EFFECTS OF CHEMICAL SUBSTANCES NATIONAL TOXICOLOGICAL PROGRAM (NTP) REPORT OF CARCINOGENS INTERNATIONAL AGENCY FOR RESEARCH ON CANCER (IARC) MONOGRAPHS, OCCUPATIONAL SAFETY & HEALTH REGULATIONS. CODE OF FED. REGS. FOOD & DRUG, 21 PARTS 170 to 199, Revised 4/1/91, 173.310.

WARRANTY INFORMATION

PneumaSeal's Effect On Tire Warranties

PneumaSeal does not affect tire manufacturers' or retreaders' warranties. Below are statements for three major tire manufacturers and a tire retreading company.

Goodyear:

The Goodyear adjustment policy limitations states, "Goodyear does not warrant and will not give credit in any adjustment transaction for any kind of material added to the tire after leaving a Goodyear factory; nor will it adjust any tire which has failed as a result of adding any such material. (Example: Tire fillers, sealants or balancing substances)."

Michelin:

"While Michelin does not recommend the introduction and use of any sealant type material in its tires, the use of this material, by itself, does not void the warranty. However, if a tire is rendered unserviceable due to the introduction and use of this material, warranty coverage would be void under the heading of abuse."

Yokohama:

"Yokohama does not endorse nor prohibit the use of these product, (tire sealants) and that warranty coverage remains in effect, except if an additive of its use are the cause of a warranty claim. Additives intended to replace air as an inflation medium voids all terms of our warranty."

Bandag:

"Bandag, Inc. does not recommend, endorse or prohibit additives to be installed in the interior chamber of its retreaded tires, providing such additives do not interfere with inspection, repairing and retreading of the tire. Neither should the additive be injurious to the tire's chamber or structure nor should it replace air pressure an the tire's primary means of inflation."

"Bandag warranties will remain in affect with the use of these additives, providing the additive is not the cause of tire warranty claim. Damages attributed to the use of an additive will be denied warranty consideration. In no case would Bandag, Inc. reimburse for the cost of the additive or any other cost associated with the additive."

PneumaSeal™ Heavy Duty Limited Warranty

(Excluding Automotive Tires)

A Scientifically Formulated Tire Protection System For Use In Pneumatic Tires

Coverage: PneumaSeal™ is a premium tire maintenance product which, when installed in your new tubeless tire, provides protection against rim and bead leaks, tire porosity and tread punctures made by penetrating objects ¼ in diameter.

This warranty assures you that, in the unlikely event your PneumaSeal™ treated tubeless tire goes flat, the tire will be repaired with a vulcanized patch and PneumaSeal™ will be reinstalled, free of charge. Read the whole warranty for details.

Policy Limitations: You must be the original purchaser and have the standard non-automobile, heavy duty PneumaSeal™ injected in your new tubeless tire or tires by an authorized PneumaSeal Dealer or Installer.

Service Agreement: Kor-Chem, Inc. will reimburse the cost of flat repairing subject to the limitations stated below.

Owner Obligations: If your authorized dealer-installed PneumaSealed tubeless tire goes flat, you are eligible for the benefits stated above upon presentation of this limited warranty and the damaged tire to your authorized dealer.

KEEP THIS WARRANTY. YOU WILL NEED IT TO OBTAIN WARRANTY COVERAGE AND PERFORMANCE AS DESCRIBED ABOVE.

This Warranty Does Not Cover: Casing slits or sidewall cuts or tread penetration created by object larger than ¼ inch in diameter, cost of towing, willful or malicious damage or vandalism, loss or damage due to accidents, collisions, fire, misuse, negligence or alteration, loss of time, inconvenience, loss of vehicle use or any other incidental or consequential damage.

If PneumaSeal™ is installed by a non-certified installer, the customer is responsible for repairs and product replacement. The repaired product replacement policy described above is the Buyer's sole remedy hereunder.

Formulated For: All Pneumatic Tubeless Tires Except Automobiles

THERE ARE NO EXPRESS WARRANTIES WHICH EXTEND BEYOND THE DESRIPTION OF THE FACE HEREOF. NO REPRESENTATIVE OR DEALER HAS ANY AUTHORITY TO MAKE REPRESENTATION OR AGREEMENT ON BEHALF OF KOR-CHEM, INC. ALL IMPLIED WARRANTIES OR MERCHANTABILITY AND FITNESS FOR USE OR FOR A PARTICULAR PURPOSE ARE LIMITED TO THE DURATION OF THE LIMITED EXPRESSED WARRANTY DESCRIBED HEREIN.

Limitation of Damages: Kor-Chem, Inc. is not liable for indirect, incidental or consequential damages in connection with the use of PneumaSeal™ product including any loss of time, inconvenience, loss of vehicle use or any cost or expense of substitute vehicles during periods of malfunction or non-use.

Note: Some states do not allow limitations on how long an implied warranty lasts or limitations or exclusions of incidental or consequential damages, so the limitations or exclusions in the above two paragraphs may not apply to you.
Legal Rights: This warranty give you specific legal rights and you may also have other rights which may vary from state to state. This limited warranty is applicable only in the United States of America.

Kor-Chem, Inc.
P.O. Box 43163, Atlanta, GA 30336
Phone:(404) 344-9580 Fax: (404) 349-2240

WHD-1016.6

Limited Warranty

A Scientifically Formulated Tire Protection System For Use In Passenger Car and Light Truck Pneumatic Tires

Coverage: PneumaSeal™ is a premium tire maintenance product which, when installed in your tubeless tire, provides protection against rim and bead leaks, tire porosity and tread punctures made by penetrating objects ¼ in diameter.

This warranty assures you that, in the unlikely event your PneumaSeal™ treated tubeless tire goes flat, the tire will be repaired and PneumaSeal™ will be reinstalled, free of charge. Read the whole warranty for details.

Policy Limitations: You must be the original purchaser and have had PneumaSeal™ injected in your tubeless tire or tires by an authorized PneumaSeal Dealer or Installer. The warranty is valid for the serviceable life of the tire to 2/32 inch tread depth.

Service Agreement: For any leak PneumaSeal™ cannot cure, take the tire to an authorized PneumaSeal™ dealer along with this warranty. Kor-Chem, Inc. will reimburse the cost of flat repairing the tire using RMA procedures for a chemical vulcanizing patch repair and the reinstallation of PneumaSeal™, subject to the limitations stated below.

Owner Obligations: If your authorized dealer-installed PneumaSeal™ tubeless tire goes flat, you are eligible for the benefits stated above upon presentation of this limited warranty and the damaged tire to your authorized PneumaSeal™ dealer.

KEEP THIS WARRANTY. YOU WILL NEED IT TO OBTAIN WARRANTY COVERAGE AND PERFORMANCE AS DESCRIBED ABOVE.

This Warranty Does Not Cover: Casing slits or sidewall cuts or tread penetration created by object larger than ¼ inch in diameter, cost of towing, willful or malicious damage or vandalism, loss or damage due to accidents, collisions, fire, misuse, negligence or alteration, loss of time, inconvenience, loss of vehicle use or any other incidental or consequential damage.

If PneumaSeal™ is installed by a non-certified installer, the customer is responsible for repairs and product replacement. The repaired product replacement policy described above is the Buyer's sole remedy hereunder.

THERE ARE NO EXPRESS WARRANTIES WHICH EXTEND BEYOND THE DESRIPTION OF THE FACE HEREOF. NO REPRESENTATIVE OR DEALER HAS ANY AUTHORITY TO MAKE REPRESENTATION OR AGREEMENT ON BEHALF OF KOR-CHEM, INC. ALL IMPLIED WARRANTIES OR MERCHANTABILITY AND FITNESS FOR USE OR FOR A PARTICULAR PURPOSE ARE LIMITED TO THE DURATION OF THE LIMITED EXPRESSED WARRANTY DESCRIBED HEREIN.

Limitation of Damages: Kor-Chem, Inc. is not liable for indirect, incidental or consequential damages in connection with the use of PneumaSeal™ product including any loss of time, inconvenience, loss of vehicle use or any cost or expense of substitute vehicles during periods of malfunction or non-use.

Note: Some states do not allow limitations on how long an implied warranty lasts or limitations or exclusions of incidental or consequential damages, so the limitations or exclusions in the above two paragraphs may not apply to you.
Legal Rights: This warranty give you specific legal rights and you may also have other rights which may vary from state to state. This limited warranty is applicable only in the United States of America.

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WA-1016.6

PNEUMASEAL™ TESTIMONIALS

Note: The following captions were taken from letters written about the performance of PneumaSeal™.

Lt. Roland Peak, Patrol Division Commander, Panama City Beach Police Department

During the course of hurricane Opal, in October of 1995, the Panama City Beach Police Department use the product "PneumaSeal™" in all the four wheel drive Jeep Cherokees we use. As one would expect, the debris field left by the storm was casing countless flat tires. Once we installed PneumaSeal in the tires, we did not have another flat. In one case, an officer located twelve (12) nails in single tire, with no resulting air leak. Under the circumstances, we found the product to work extremely well.

Robert Sigafoss, Chief Mechanic, UGI Utilities, Inc., Lehigh Valley, Pennsylvania

PneumaSeal was installed in 40 vans, 2 cube vans, our Ditch Witch digger and a front end loader. We wanted to conduct a one year study to make sure that there was no corrosion to the rims or chemical reaction to the tires.

I am pleased to report that we had a 90% reduction of flat tires on this test equipment. Our vans, loaders and ditch equipment operate in hostile environments, and flats were are weekly, if not daily occurrence. There was no corrosion to the rim, and no adverse reaction from PneumaSeal to the tire.

Rob Chapman, Habor Tire Service, Inc., (A Bandag Retreader), Rancho Dominguez, California

We have tested the impact of PneumaSeal in our retreading process. 11R22.5 tires from a customer were used. We found the removal (of PneumaSeal) was short and not difficult. It took less than 5 minutes to remove PneumaSeal from each tire with a wet dry vacuum. PneumaSeal did not inhibit the Bandag system from locating damage to the tire nor did it restrict our ability to make repairs. There was no adverse effect on Bandag equipment or the recapping process when working with PneumaSeal treated tires.

PneumaSeal has impressive test results and customer experience proving the effectiveness of the product to inhibit air loss in a tire, cool the tire and prevent flat tires. Based on this, we feel we can see . an increase in retreadable casing from our customers who use PneumaSeal.

Lloyd G. Leichner, Vice President Research and Development, Carlisle Tire & Rubber, Carlisle, PA

The PneumaSeal tire puncture sealant products have been tested by Carlisle Tire and Rubber Company and found to be a very effective means to seal tire punctures. Multiple punctures from a variety of object such as nails, thorns, screws, golf tees, etc. are quickly and permanently sealed.

Carlisle Tire and Rubber Company intends to continue the association (with PneumaSeal) and recommend their product in puncture prone areas.

Linn E. Larsen, Larsen Tire Technology, LLC, Tacoma, Washington

After the installation of PneumaSeal in the 36 vehicle service fleet of TCI Tacoma, Inc., a documented experience of four flat tires per week was reduced to one flat tire per month. The one flat tire per month factor consisted of causes not preventable by PneumaSeal, i.e. sidewall puncture, tire structural failure, or puncture before break-in-period.

The test proved an economic savings that established, according to TCI System General Manager Barbara Wyatt, the entire cost of the product being repaid by increasing productivity in just two months time. The estimated value to the system of the reduction of flat tire experience is calculated to be approximately $10,000 per year.

Customer Resources

Your Kor-Chem Customer Service and Support Team is here to serve you. To place an order or request further assistance, please contact us with the information provided below.

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