A Member of
The Linde Group | AGA

N-TYRE® nitrogen in tyres.

An Outstanding Investment.

Field Trials Confirm The Facts.

Taking Out Oxygen Is The Key.

A field trial conducted by Lawrence R. Sperberg marks a cornerstone in N-TYRE® nitrogen in tyres research. It provides conclusive proof, that nitrogen extend tread wear and casing life and reduces tyre failure rates.

In his trial Sperberg ran tyres on drive axles in matched pairs. Two pairs had nitrogen inflation; the others had atmospheric air inflation. Tyre sizes were mostly 11R24.5 & 11- 24.5. The trucks ran routes on the Eastern Seaboard and the Southern US.

All tyres were inspected at intervals between 3.750 km and 6.250 km. The trial ran for over 12.000.000 km and was conducted using new casings, and retreads of air aged casings.

After the trial, an electron microscope were used to examin changes in the rubber chemistry of all tyres - from the inside of the casing right to the tread face.

Oxidation of Tyre Rubber Directly Impact Tread Wear

175 truck tyres were tested until they were worn down to the tread wear indicators. About 125 of these tyres wore out without failing at distances ranging from 200.000 to 360.000 km. About 50 of the tyres failed physically at varying mileages generally on the low side.

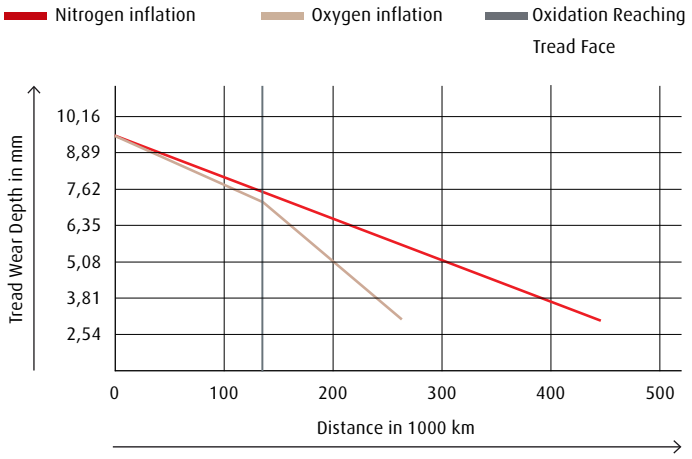
All the tyres was carefully monitored, measured for tread loss etc., and inspected at 16.000 km intervals, a lot of them at 3600 to 4800 km intervals.

When the tyres were removed from service, samples of tread rubber were taken from the shoulders of the unfailing tyres and from the actual failed areas of the destructed tyres. These specimens were then subjected to the electron micro probe examination that has been described previously. The examination was specifically directed at determining oxygen and sulphur levels, which was best accomplished by using IOKV (100.000 electron volts) electron beam and an exposure of 30 seconds.

Both figures tell the same story. When a tyre lives to wear out, the oxygen slowly migrates and permeates its way into and through the tyre cord body and finally into the under tread and then into the tread itself. It takes a long time for an appreciable amount of oxygen to reach the tread since most of the oxygen is waylaid along the way by the liner, and then the cord arid cord insulation compound.

One reason that truck tyres can run 400.000 km with the original tread, while passenger tyres can only go 80.000 to 90.000 km, lies in the relative bulk of the two different tyre bodies.

Tread Wear - New Casing



The bulkier the body the longer it takes the oxygen to work its way into the tread. Unfortunately the bulkier the body the higher is the heat build up and the faster is the rate of oxidation of the available double bonds. Once the tyre body is oxidized, the tyre is dead no matter how much tread remains on it. The thinner the tyre body the lower the running temperature and the slower the rate of oxidation with a correspondingly longer life.

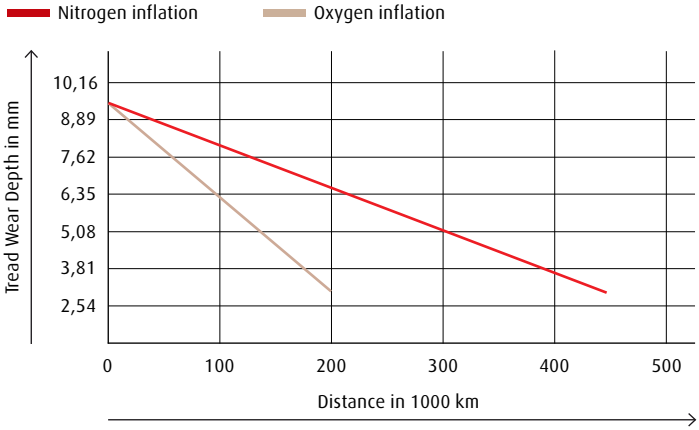
The result of "fatigue" practically all tyre engineers throughout this century attribute the gradual loss in tyre strength to be, is nothing more than a slow inexorable oxidation taking place at the available double bonds of the rubber molecules.

Extended Tyre Life

In one experiment involving 54 new truck tires, 33 of them were inflated with nitrogen and 21 were inflated with air. These tyres ran side by side on the same tractor units until they failed or until they wore to the tread wear indicators. In this case, the 54 new truck tyres, nitrogen inflation resulted in 26 % more km being run before wear reached the tread wear indicators.

In the case of the failed tyres a smaller percent of nitrogen tyres failed physically (30 % vs. 57 %) and they gave 48 % more km before failing than did the air tyres. This 48 % improvement is due to the tyre bodies lasting longer and not the better wearing properties of the tread, which is the situation with the tyres that lived to wear out.

Tread Wear - Retread Casing



The tread life results of Sperberg's trial:

- → Tread life on a new casing increased on average by 26 %
- → Tread life on a retreaded casing increased on average by 54 %
- → The failure rate of casings in service was reduced by 50 %, for both new casings and retreaded casings.

Calculations.

N-TYRE® nitrogen in tyres – An Outstanding Investment.

Sperberg's study was performed in 1985, on bias ply drive tyres, not steel belted radials. Also, tyre rubber compounds have changed since 1985. However, the chemical reaction between oxygen and the rubber compounds is still exactly the same as described above.

Recent limited trials conducted and funded by Vancouver-based DREXAN, is showing the exact same results as predicted by Sperberg. Trailer tyres, previously reaching between 200.000 and 220.000 km inflated with atmospheric air, are currently trending to achieve over 400.000 km when inflated with nitrogen.

Drexan's president, Konrad Mech researched and authored the study, and presented the results at the 23rd annual Clemson University Tire Industry Conference in South Carolina in March 2007.

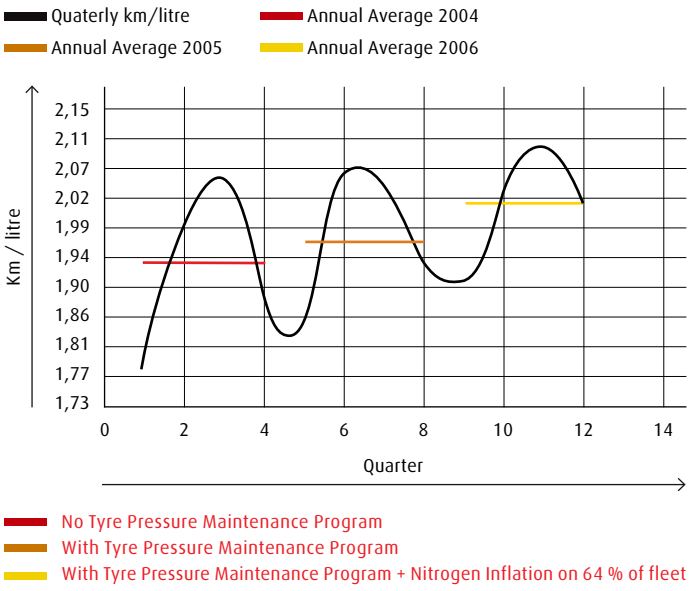
The Trial

Harris Transport of Winnipeg converted 65 percent of its fleet to nitrogen. The study comprised over 177 million tread-km for 1.988 tyre positions.

In the tyres inflated with atmospheric air, a control group of 452 tyre positions showed an average of 2,27 km/l, and an average tyre life of 26.623 km per 32nd of tread wear. A group of 836 nitrogen-filled tyres, the study says, produced 2,35 km/l, with 49.748 km per 32nd of tread wear.

That is a fuel economy increase of 3,5 %, and a tread life increase of 86 %. During the trial, the additional fuel efficiency translated to a savings of over 500.000 liters of fuel, or roughly $425.000 in fuel cost savings.

Fuel Efficiancy - Quarterly



Fuel efficiency of the nitrogen inflated equipment increased even though the tyre pressure of the air inflated tyres was aggressively maintained.

The results were obtained by measuring tread wear on an air inflated control group comprising 35 % of the trial fleet. The results were statistically analyzed by a PhD statistician and were found to be highly significant.

Extended Tread Wear Dramatically Lowers Operating Cost

The second highest expense next to fuel is tyre repairs and replacement. Tyre failures are most commonly caused by under-inflation, which accelerates degradation of the tyre casing. Truck tyres are expensive, costing over 5.000-7.000 SEK each.

Research tells us that truck tyres normally last 430.000 km, including two retreads. By from the start inflating those tyres with nitrogen instead of compressed air, tyre life can be increased by as much as 25 % and allow those tyres to be retread multiple times. Increasing tyre life to about 545.000 km would save at least 1.400 SEK per tyre, based on today's prices. For example, 50 trucks and 900 wheel positions, the savings could amount to over 1 500.000 SEK a year!

Tests with nitrogen filled tyres have further confirmed that tyre failures are reduced by 80 % and more!

An Example

For a fleet with 50 tractors and 100 trailers running an average of 240.000 km per year and getting 2,9 km/l, this translates to an annual fuel usage of over 4 137.000 litres of diesel per year. At a spot price of SEK 10/litre, that is a total fuel bill of almost 41 370.000 SEK per year. 2 % loss in efficiency is equal to almost 830.000 SEK excess costs per year – every year – on fuel alone!

By using N-TYRE® nitrogen in tyres these lost costs can be recouped and dropt to the firm's bottom line as pure profit.

Nitrogen.

The Main Component In Atmospheric Air.

The athmospheric air around us consists of:

- 78,1 % nitrogen
- 20,9 % oxygen
- 1,0 % other gases: argon, neon, krypton, helium, hydrogen and xenon
- plus a variable amount of water vapor, carbondioxide, methan and ozon.

What Is Nitrogen

Nitrogen is elemental number 28 in the periodic table. It is a dry and non flammable gas. Nitrogen cannot be seen, smelled or tasted, still 78 % of the air we breath is nitrogen. Nitrogen is one of the "inert" gases. This means that it is reluctant to react with other materials. For example it does not react with any of the materials in a tyre, being rubber, adherents or metals.

The Making of N_2

Industrial nitrogen can be separated in three different ways depending on the purpos for witch it is made:

- Cryo-technic using cooling
- PSA-technic using an absorbing material
- Membrane-technic

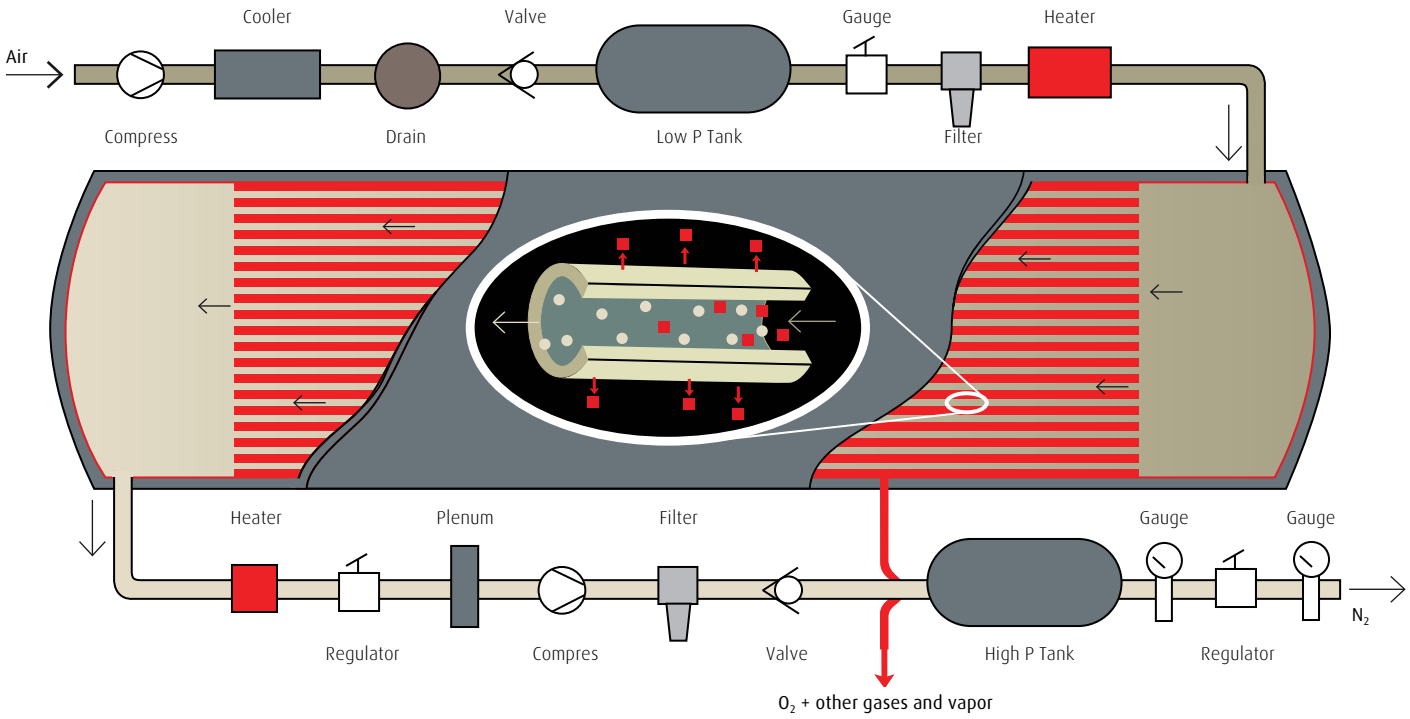
To manufacture nitrogen for tyres AGA uses the membrane-technic. A method that much resembels what happens in a tyre.

Hollow fiber membranes are formed into bundles and fixed between tubesheets in a cylindrical cartridge. The membranes are made from polymer (plastic) and are no more than a few hundreth of a millimeter thick. Gases like oxygen and nitrogen are separated in the cartridge because of the different permeation rates across the membrane exploiting the fact, that the molecules of air-components other than nitrogen have a smaller kinetic diameter.

It is often mistakenly assumed that "molecular size" correlates directly with "molecular weight". O_2 does have a greater molecular weight (32) than N_2 (28), but O_2 is actually smaller in size. Thus, O_2 slips through the relatively tight passage ways between the polymer chains in e.g. rubber more easily than does N_2. The difference in size between O_2 and N_2 is very small, only about 0.3 times 10 to the -10th meters (0.00000000003 meters).

The MEMOSS™ membrane units use cartridges which enable them to reach one of the best selectivities on the marketplace.

Seperating Nitrogen by Membranetechnic



The process can be described as follows: Compressed dry air enters the cartridge on one end. Oxygen, other gases and rest humidity permeate faster than nitrogen through the membrane walls, thus enabling a side venting of those gases to the atmosphere. On the other cartridge end, the pure nitrogen exits and, depending upon the application, leaves the unit direct to the customer's process or to a suitably dimensioned buffer tank.

Nitrogen vs Atmospheric Air In Tyres.

The Ideal Choise For Tyre Inflation.

Atmospheric Air In Tyres

As mentioned athmospheric air consists of

- 78,1 % nitrogen
- 20,9 % oxygen
- 1 % other gases: argon, neon, krypton, helium, hydrogen and xenon
- plus a variable amount of water vapor, carbondioxide, methan and ozon

The "Other Gases"

The gas components in this 1 % group does not do much differense in a tyre. They leak out fairly quick as they all have a substantial faster leakage rate through a tyre lining compared to nitrogen. Some up to 100 times faster!

Vapor Turns To Water And Ice

The moisture contained in athmospheric air have a direct and dramatically effect on pressure and temperature stability inside a tyre. Compressing air concentrates the water in it. Even if water is drained from the compressor every day, without a very efficient air dryer, chances are there is still lots of moisture in the compressed air. Compressed air takes up much less volume, hence the percentage of water by volume is greatly increased. If the temperaure in the compressed air gets bellow the dewpoint of water vapor, it turns into water and bellow the freezing point the water turns into ice. The effect water or ice will have, on a spinning tyre is obvious.

The bouncing from the unballanced tyre will make the tyre walls flex. This extra flexing causes excessive mechanical fatigue of the structure of the tyre and building of heat. Eventualy the ice turns back into water and subsequently vapor wich absorbs and holds heat.
When water changes from liquid to vapor, it expands tremendously in volume, and could cause a blowout. Tyres inflated with atmospheric air tend to run hotter and fluctuate in pressure more. To prevent the building of water and ice in tyres it is mandatory for all aeroplanes worldwide to use NIT as the dewpoint for nitrogen at 95 % purity is below - 56°C and at 99 % purity below - 73°C.

Water Vapor And Oxygen Is A Harsh Mixture

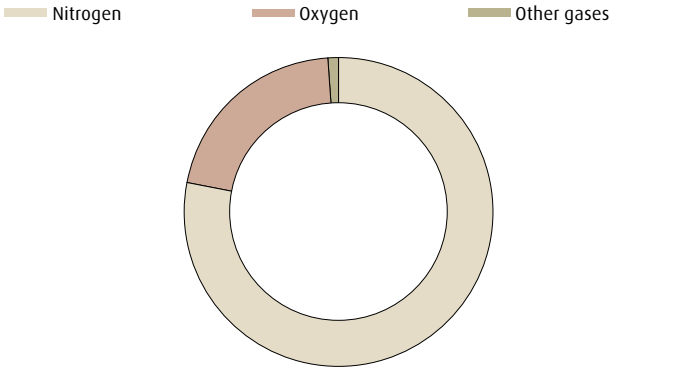
Water vapor in compressed air also acts as a catalyst for oxygen, accelerating the oxydation of rubber and metal destroing tyres by forming rust in steel body plies, valve stems, and wheels. Oxygen and moisture also create aluminum hydroxide, which corrodes aluminum wheels and rims leaving a very fine dust that is difficult to even see inside the tyre. The iron oxide dust is present within the tyre in varying sizes ranging from coarse to extremely fine.

Every time the inflation pressure is checked a small amount of air is required to activate the pressure gauge. When this dust enriched sample of air passes around the open valve core some of the fine oxide particles get trapped between the seal and the metal housing resulting in a very slow air leak almost impossible to detect. When a larger rust particle is trapped between the seal and housing, it is easyer to detect and proper action can then be taken immediately to correct the problem.

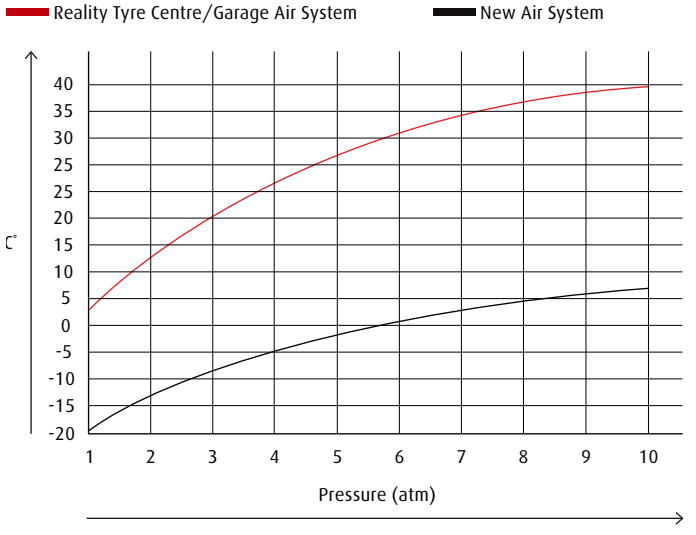
When the metal of the rim is oxydated by the oxygen catlysed by the vapor, small changes in the surface is emerging. This compromisses the tight seal between the rim and the tyre causing multiple small leaks to appear.

Also tyre pressure monitoring devices are suffering from oxydation.

Atmospheric Air In Tyres



Dew Point for Pressurized Air



Oxygen Is Attacking Everything

Oxygen literally eats up tyres from the inside. Since the pneumatic tyres was invented the chemical deterioration caused by oxidation has been known as “tyre fatige”.

It starts within the tyre interior and moves outward. First the tyreliner is invaded and compromised. Then the insulation rubber adjacent the liner is ravaged. Oxidation marches inexorably outward – because of the pressure differential of the tyre inflation on the inside and the atmospheric pressure on the outside. Moving ever outward the oxygen molecule react chemically with the unsaturated double valence bonds present in all rubbers. As oxygen permeates through the entire casing, it causes the rubber to lose its elasticity and strength – similar to what happens to an old rubber band that take on the characteristics of a non rigid plastic and breaks easily.

The tyre linning are designed to be protected from this deterioration by sacrificial antioxidants whose job is to bind free oxygen so that the double bonds in the rubber are not attacked – which they do until they are themselves used up, much too soon after a tyre enters into service. To make matters worse the decay is constantly being fueled by the fresh all too often moist air being injected to maintain the desired inflation pressure.

Oxygen Quickly Escapes The Tyre

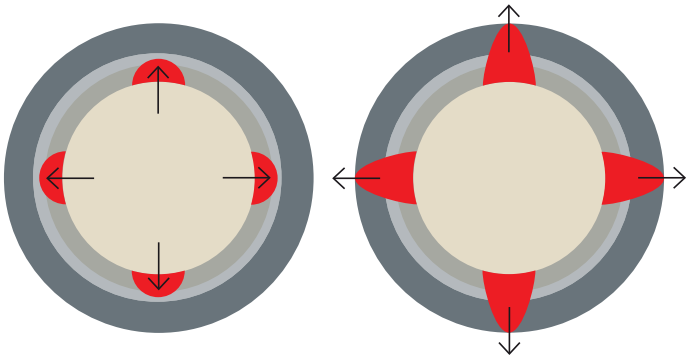
Atmospheric air migrates through the tyre walls and tests has shown that truck tyres loses up to 0,14 bar per month, even when valves and beads seal properly and there are no punctures.

Nitrogen Is By Far The Best Alternative

The 1 % “other gases” leaks out the fastest by far, but also the 20,9 % oxygen leaks out at a much faster rate than nitrogen. Due to the different characteristics of nitrogen- and oxygen molecules the correct tyre pressure can be maintained substantial longer by filling the tyres with nitrogen. In testing tires inflated with nitrogen lost only 0,14 bar in a sixmonth period.

By reducing the content of vater vapor and gases other than nitrogen to 5 %, nitrogen will maintain the tyre pressure up to 6 times longer, it will not build up heat, it will maintain much the same pressure even if heated and it will not react with neither metal nor rubber as oxygen does, tyre failure can be cut dramatically. With more consistent tyre pressure and improved tyre durability, handling is better, too, making the driving safer.

Oxygen Is Attacking and Quickly Escapes The Tyre



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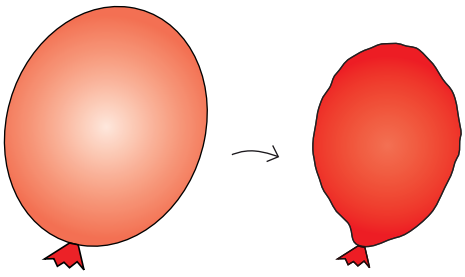


Additional Benefits For Commercial Fleet Operators.

Preventing Oxidative Ageing.

Oxidative Ageing

The oxygen in atmospheric air breaks down unsaturated double bonds. For example today many packaged food products that have a food-oil component are packaged in nitrogen protecting them from oxidation to extend shelf life and preserve the taste.

Tyre rubber also have unsaturated bonds, and the oxidation that occour in unsaturated oils and fats in food is very similar to the that of tyre rubber.

Oxidative ageing occurs from the inside of the tyre out, as pressurized atmospheric air forces its way through the tyre rubber towards the lower pressure on the outside. The oxygen pressured into the rubber breaks down the unsaturated covalent bonds of the polymer chains that secure rubber its strength and flexabillity. As these chains are destroid the rubber looses its characteristics and degrades into a rigid less durable substans. However, the mechanical wear of treads are of course from the tyre face inwards. Using compressed atmospheric air leaves-fleet operators with a dilemma: If topping up the tyres they add even more oxygen to degrade the tyre rubber. If not topping up the tyres they face;

- → a fuel consumption penalty
- → a tread wear penalty due to uneven treadcontact
- → a casing life penalty due to hotter casing running temperatures

Extending Casing Life

A casing inflated with nitrogen will retain over 80 % of its original strength after two years, while a casing inflated with atmospheric air will retain only 40 % of its original strength. This 100 % increase in casing strength results in a significant saving as a stronger casing can be retreaded more times, and each tread on the casing lasts longer when inflated with nitrogen. Potential tread savings can increase from a current average life of 908.000 km to a life of 1.650.000 km with nitrogen inflation.

By using non-destructive testing to verify casing integrity before retreading, fleet managers are able to verify whether a casing is strong enough for retreading once more.

Extending Retreaded Tyre Mileage

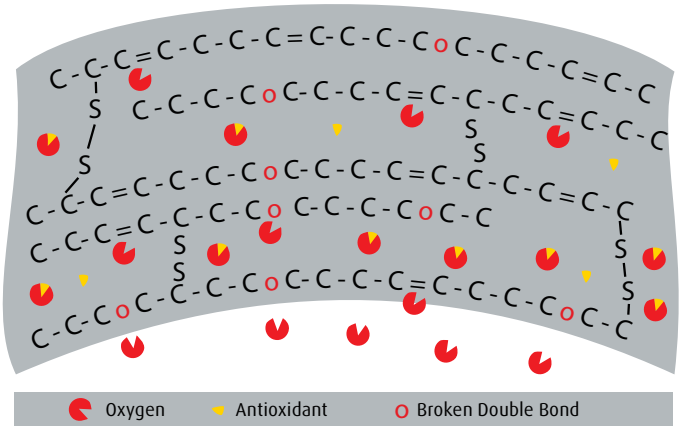
An oxidative aged casing naturally offers less protection against oxidation of the tread than does a new one because the majority of double bonds in the casing have already been oxidized. Hence if again inflated with compressed air, the time for oxygen to reach and react with the face of the tread in contact with the road is much shorter than for a new tyre, and the retreaded tyre therefore wears faster than a new tyre.

Field studies show that because no oxidation will occour when inflating a retreaded tyre with nitrogen, the retread will wear at the same rate as the tread of a new tyre.

Reducing Tyre Failure Rates.

Similar to the food industry's experience, in tyres nitrogen can extend the lifespan by reducing oxidative ageing. Nitrogen inflation not only extends tread wear and casing life, it also reduces the casing failure rate. Tests on new and retreaded casings show that the failure rate for nitrogen inflated tyres is 50 % lower than for air inflated tyres.
Please note that nitrogen do not eliminate the need for regular maintainance of the tyres.

Oxidation of Double Bonds In Polymer Chains



The Key Point For Fleet Owners And -managers

Sperberg's trial* showed that the tread wear on an air aged retreaded casing inflated with nitrogen is the same as it is for nitrogen-inflated new casings. This means that fleets should incorporate nitrogen inflation in their entire fleet (new tyres, new retreads, and old retreads) all at once.

Once retreads start to be put on casings that started their life cycle with nitrogen inflation, then not only will tread wear be longer, but the casings will be much stronger, and failures on the road will be dramatically reduced.

Simpler Maintenance With Nitrogen

Most compressed air are moist. Water and oxygen erodes the rim and creates micro leaks under the bead of the tyre, and can cause chronic leaks through the valve stem. If a tyre needs to be aired down, moisture in the released air can freeze in the valve stem. Since nitrogen is a dry gas, all these maintenance problems are eliminated.

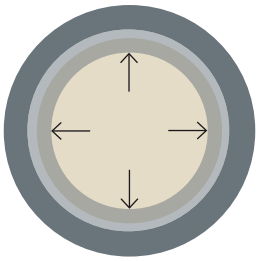
Summary of The Impact From Nitrogen

Fleet maintenance managers are increasingly turning to nitrogen tyre inflation to reduce operating costs and increase fleet up time.
Direct and indirect savings to fleets are:

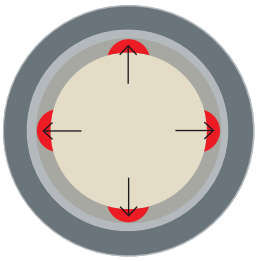
- → Fewer tyre failures in service
- → Lower costs per km in service for steering tyres, drive tyres, and trailer tyres
- → Lower scrap casings ratio
- → Higher casing value for resale
- → Lower retreading costs
- → Lower fuel costs due to proper inflation
- → Lower tyre costs due to proper inflation when running
- → Reduced roadside service calls

- → Reduced late delivery charges (for guaranteed delivery services)
- → Less lost revenue due to breakdowns
- → Lower accident liability due to fewer blow-outs and collateral accident claims
- → Reduced spare tyre inventories

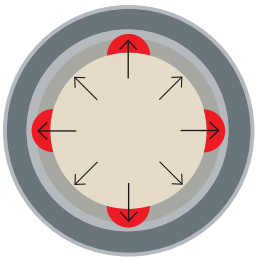
Oxidative Ageing



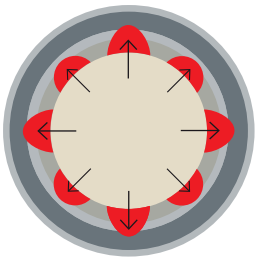
The rubber in a new casing contains antioxidant and antiozonant additives to protect the double bonds from being broken.



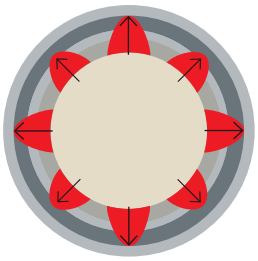
Once the antioxidants are filled, oxygen attacks the unsaturated double bonds in the rubber, from the inside of the casing outward. As oxygen breaks these double bonds, the tyre is continually losing pressure.



Refilling the tyre with atmospheric air actually accelerates the decay of tyre rubber, as the newly introduced oxygen attacks not yet broken double bonds deeper inside the casing, and closer towards the tread face.



At some stage the outer tread face comes into contact with the degraded rubber layer. At this point, the durometer hardness of the rubber changes, and typically tread wear accelerates.



The remainder of the tread wears at a much faster rate than the new tread did. The result of this phenomenon is illustrated in fig. 8.

The Win-Win Situation from Nitrogen.

Improved Economy, Safety And Environment.

Nitrogen has been used for inflating tyres for a long time e.g. aeroplanes, racecars, NASA Space shuttles, heavy duty- and military vehicles. During the past few years NIT has been subject for discussion and now commercialvehicles and passenger vehicles use it too. Some of the driving forces of course being the increased fuel prices as well as the global environmental problems we are facing.

Up untill a few years ago the cost of generating dry nitrogen has been a major dampening factor on NIT. However, the progression in generating methods has brought the cost down, and today AGA's Nitrogen Generating Stations makes it possible for virtually all tyre dealers and gas stations to afford installing these units making the long number of benefits by filling tyres with nitrogen instead of atmospheric air available for their costumers.

Most Vehicles Have Incorrect Tyre Pressure

All tyre manufacturers recommend that the tyre pressure is checked and adjusted at least every 2 weeks. However, studies show that as many as 85 % of all cars have incorrect tyre pressure. In most cases the pressure is to low.

Dalton's Law

Dalton's Law of Partial Pressures states that for a mixture of gases in a container, the total pressure is equal to the sum of the pressures of each gas. Where P1 is the partial pressure of gas 1, P2 is the partial pressure of gas 2, and so on. The responsabillity of every gas-component in keeping up the pressure in a tyre filled with atmosperic air is ever increasing along with the pressure. Hence atmospheric air proofes to be a poor solution for tyre inflation as 1 % "other gases" escapes the tyre very fast and the 21 % oxygen follows fairly easy.

Correct Tyre Pressure Reduces Fuel Consumption

Generally, fuel is the highest vehicle operating expense is fuel.

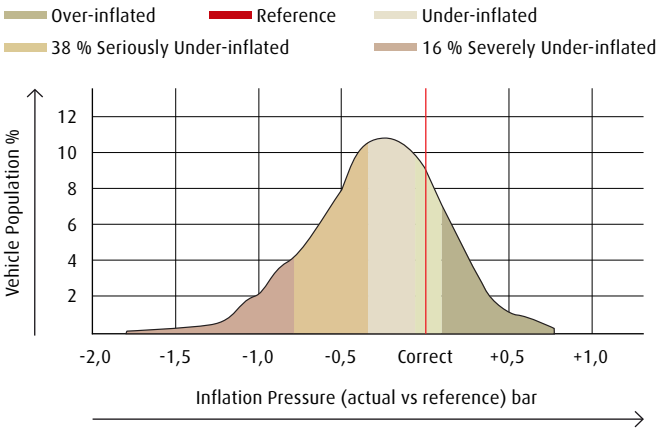
Tyre manufacturers agree that under inflated tyres waste between 3 % and 5 % of fuel in increased rolling resistance as underinflated tyres have a higher rolling resistance in comparison with tyres with correct pressure. Therefore a car with to low tyre pressure needs more fuel to drive compared to a car with correct tyre pressure. Tyres inflated with nitrogen maintain correct inflation pressure up to six times longer than does tyres inflated with atmospheric air. Keeping the rolling resistance of the tyre at a constant low is reducing fuel consumption.

Tyres inflated with nitrogen maintain correct inflation pressure up to six times longer than does tyres inflated with atmospheric air. Keeping the rolling resistance of the tyre at a constant low is reducing fuel consumption.

Correct Tyre Pressure Reduces Tread Wear

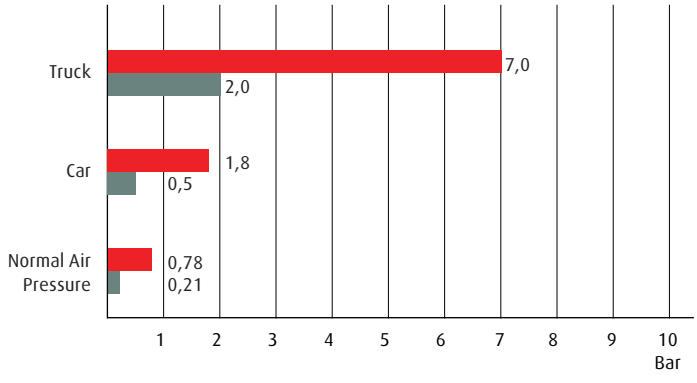
Due to the much slower rate of nitrogen permeating through the tyre rubber, the correct tyre pressure is easier maintained over time whith N-TYRE® nitrogen in tyres.

Distribution Inflation Pressure 2007



Dalton's Law

pTyre = p Oxygen + p Argon + p CO_2 + p Rest + p Nitrogen



p Oxygen	+	p Argon	+	p CO_2	+	p Rest	+	p Nitrogen	=	p Tyre
20,946 %		0,934 %		0,033 %		0,003 %		78,084 %		100,00 %

When correct tyre pressure is maintained, the tread lasts as long as the manufacturers intend. Under-inflated tyres wear faster. This finding has been proven through extensive laboratory and field testing. The lower friction tyres with correct pressure have to overcome in order to move will get them more mileage before its time to replace them.

Not only the friction against the tarmac, but also the friction within the tyres them self are important for their lifespan and performance. If correct inflation pressure is maintained, the tyre walls most effectively support the weight of the vehicle and cushions the bumps on the road. Insufficient tyre pressure allows extra flexing of the tyre walls causing excessive mechanical fatigue of the tyre structure and extra build up of heat. This mechanical stress weakens the tyres faster the result being premature ageing, tread separation, cracking, and blow-out.

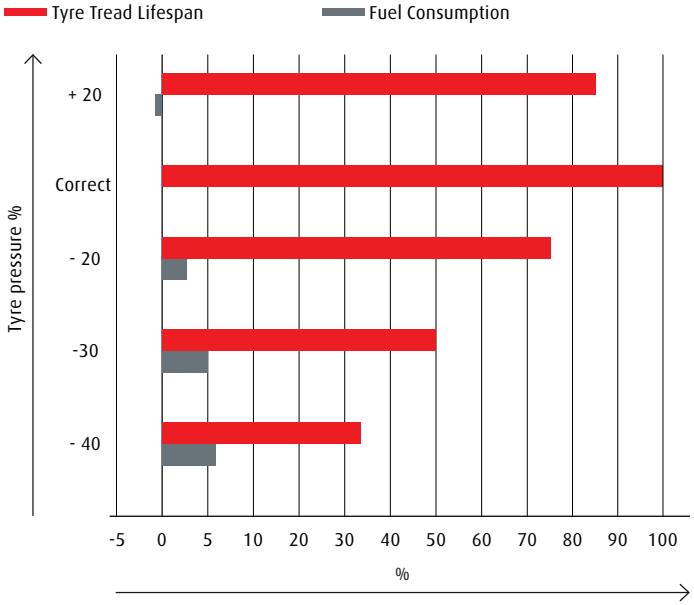
Correct Tyre Pressure Improves Safety

Tyre pressure has a decisive impact on stearing and braking performance as well as the stability of the vehicle. Engineers are developing tyres to perform at an exact pressure to get the correct "footprint". It is easy to understand that a tyre with to low pressure in case of an emergency breaking or a sudden change of direction will not perform as good as a tyre inflated to the correct pressure.

90 % of all tyre blow outs/tyre explosions is a consequence of to low tyre pressure, especially on heavy vehicles. When that happens serious injuries can occur.

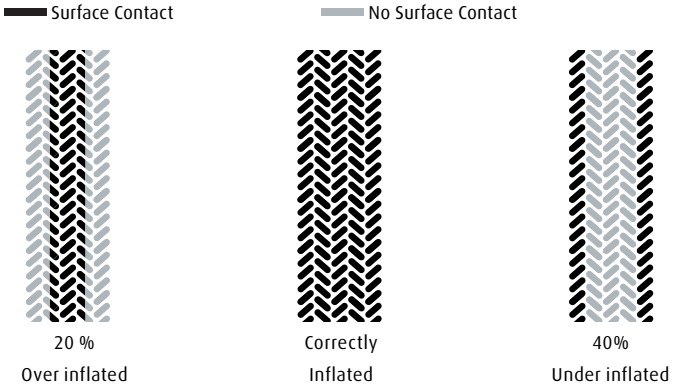
Maintaining the correct tyre pressure is the single best thing to do for tyres. It's so vital, that in America the National Highway Traffic Safety Administration (NHTSA) now requires vehicle manufacturers to install tyre pressure monitoring systems in all light vehicles.

Correct Tyre Pressure Saves Money



Many studies have shown that as much as 3 % - 5 % increase in fuel consumption and a remarkable high tyre tread wear is caused by to low tyre pressure.

Tyre Contact Area Depends on Inflation Pressure



The tyre contact area with the dry road surface is about the size of a postcard.

The Future For Nitrogen.

Nitrogen For The Future.

Pressure Monitoring Systems

An ever increasing number of car manufacturers appreciate the importance of correct tyre pressure; the impact of fuel consumption, tread wear and safety. Many of them now install electronic tyre pressure monitoring systems. A sensor installed inside the rim gives the driver current tyre pressure and will set off an alarm if the pressure becomes to low. Mixing sensitive electronic devices with moist, oil, dust and oxygen is not a good combination. To change a faulty sensor can be costly. Therefore in order to give these transmitters optimal working conditions, the environment must be kept free from moist, oil, dust as well as oxygen. Nitrogen can provide such systems the best working environment. Maximum security for having correct tyre pressure is to have both a tyre pressure monitoring system as well as nitrogen filled tyres.

Contribute To A Better Environment

Environmental impact of CO_2 is on everybody's agenda today and all countries strive for finding solutions to reduce CO_2 release to the atmosphere. The long-term target is of cause a zero level. However, that is not realistic in a short-term horizon, so everybody have to contribute as much as one can, even if in a small scale.

As mentioned previously, nitrogen in tyres gives a reduction of fuel consumption as well as more mileage out of the tyres. Every litre fuel consumed adds another 2,5 kg carbon dioxide to our planet. Its very easy to calculate every nitrogen-drivers contribution in reducing the amount of carbon dioxide to our planet. More mileage out of the tyres leads to a more efficient usage of them and therefore fewer tyres has to be manufactured and transported to the end users. That also results in reduced environmental impact.

Summery On N-TYRE® nitrogen in tyres

- Maintaining correct tyre pressure
- Reduced fuel consumption
- Extending tyre tread life
- Extending casing life
- Improved handling and safety
- Lack of oxygen is a deterrent to combustion i.e. the lack the oxygen prevents fire
- Positive impact on environment

Tyre Safety Tips.

From A to Z.

Tyre Safety Checklist

- Check tyre pressure regularly (every two weeks), including the spare
- Inspect tyres for uneven wear patterns on the tread, cracks, foreign objects, or other signs of wear or trauma
- Remove bits of glass and other foreign objects wedged in the tread
- Make sure your tire valves have valve caps
- Check tyre pressure before going on a long trip
- Do not overload your vehicle. Check the tyre information placard or owner's manual for the maximum recommended load for the vehicle
- If you are towing a trailer, remember that some of the weight of the loaded trailer is transferred to the towing vehicle

Preventing Tyre Damage

- Slow down if you have to go over a pothole or other object in the road
- Do not run over curbs or other foreign objects in the roadway, and try not to strike the curb when parking

Checking tyre pressure is something we always have to do, no matter what we fill our tyres with.

Statements.

Inflating your tyres with nitrogen can allow you to drive up to 25 % more miles before tread wear requires tyre replacement.

Generally, for vehicle owners the second highest vehicle operating expense, after fuel, is tyre repairs or replacement.

That's why racing tires, where fractions of a bar can radically change handling, are inflated with dry nitrogen.

All tyre manufacturers recommend that you check your tyre pressure at least every 2 weeks.

Nitrogen inflation virtually eliminates oxidative aging in tires. This results in big cost savings for fleet owners.

The increase tread life for a nitrogen inflated tyre is because oxygen is prevented from reaching the tread.

A dramatic yet simple upgrade to any vehicle, is filling the tyres with nitrogen. Nitrogen costs very little, saves money in fuel and maintenance, improves performance, increases safety. That simple task alone can save a private car owner up to 30 % and, maybe more, on fuel, tyres and other operating costs each year.

- Nitrogen keeps tyres 20 % cooler
- Nitrogen-filled tyres use less fuel. This provides an average 4 % increase in fuel efficiency* *
- Per the U.S. Department of Transportation National Highway Traffic Safety Administration
- Tests have shown nitrogen to reduce tyre failures by as much as 80 %

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Getting ahead through innovation.

With its innovative concepts, AGA is playing a pioneering role in the global market. As a technology leader, our task is to constantly raise the bar. Traditionally driven by entrepreneurship, we are working steadily on new high-quality products and innovative processes.

AGA offers more. We create added value, clearly discernible competitive advantages and greater profitability. Each concept is tailored specifically to meet our customers' requirements – offering standardized as well as customised solutions. This applies to all industries and all companies regardless of their size.

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