Why Inflating Tires With Nitrogen Makes Sense

PACIFIC GROVE, CA, AUGUST 13, 2005 - *The practice of inflating tires with nitrogen has been around for a long time. Because of the benefits of nitrogen over air, is has been commonly used in tires on aerospace vehicles, commercial and military aircraft, racecars and off-road equipment.*

With advances in technology and the expanding commercial infrastructure of nitrogen availability, nitrogen inflation is a growing trend in the transportation industry.

This article by the Tire Retread Information Bureau (TRIB), provides a primer and overview of nitrogen inflation, and discusses how it helps optimize tire costs while providing environmental benefits.

TRIB is a non-profit, member-supported industry association dedicated to the recycling of tires through retreading and repairing, and to promoting proper tire maintenance for all tires.

By far, the single most critical factor for maximizing tire life and minimizing the chance of catastrophic tire failure is maintaining the proper inflation pressure for a given tire size and load. Properly inflated tires not only last longer, but also are safer.

One way to help maintain proper tire inflation is to fill tires with nitrogen instead of compressed air. Nitrogen allows a tire to retain more of its original properties.

Among the benefits of nitrogen inflation: less inflation pressure loss for a more stable, consistent tire pressure; cooler running tires; longer tread life; less oxidation of tire components, and reduced rim and wheel corrosion. The result is increased tire life, improved fuel economy, reduced tire aging and a more durable casing for improved retreadability.

While the trend toward nitrogen inflation is relatively “new” to the truck and bus tire market, it has been long used in tires on Formula One, Indy, Le Mans and NASCAR racecars; commercial and military aircraft; military vehicles; heavy off-road construction equipment, and the Space Shuttle. The Moon Buggy had its tires inflated with nitrogen. Also, the Tour de France bikes use nitrogen in their tires. Nitrogen is environmentally safe and non-combustible.

A reason for the slow growth of nitrogen tire inflation in on-highway transportation has been the availability of nitrogen. However, more and more nitrogen filling facilities are appearing

nationwide as on-site nitrogen generators have become more affordable and as more manufacturers of nitrogen generators have entered the marketplace.

THE SCIENCE

Over time the pressurized air inside a tire slowly migrates and permeates its way into and through the tire. Air contains moisture. So in addition to reducing the tire's inflation pressure, the oxygen and moisture in the air reacts with the rubber compounds in the tire, causing them to break down and lose their strength and durability. A chart is available illustrating that nitrogen is the slowest of all gases to flow through a permeable barrier such as a tire. For a copy of the chart please contact us at the number or email address shown below.

An underinflated tire is much more prone to premature failures. That's because when underinflated, as a tire rolls, it flexes more than it was designed to. This flexing bends the tire's rubber and steel (used within the rubber to provide additional operating characteristics) and generates heat. Heat is a tire's worst enemy and accelerates tire wear dramatically. There is a direct correlation between how much a tire is underinflated and how much faster it wears.

Since air, which contains oxygen, is not an inert gas, it is affected by changes in temperature, which affects the rate of air loss from a tire. The air inside a tire expands when heated and contracts when cooled. More air is lost in hot weather. The consensus is that for every 10-degree Fahrenheit change in temperature, there will be a one psi (pound per square inch) change in the pressure of a tire. Nitrogen will not fluctuate as much. Being an inert gas - not readily changed by chemical reaction, nitrogen provides constant pressure and is less susceptible to accelerated diffusion caused by changing temperatures.

Nitrogen inflation minimizes moisture and oxygen in a tire so there is less rubber degradation and no corrosive properties as found in compressed air. A reduction in rubber oxidation slows a tire's "aging," improving the casing's structural durability, lengthening its useful life and yielding a higher proportion of retreadable casings that can survive more retread cycles. All of this helps lower operating costs. Some fleet managers, who had been dead set against retreads, are now willing to use retreads with nitrogen inflation.

Because nitrogen molecules are slightly larger and less permeable than oxygen and all the other gases in air, it migrates considerably slower through a tire. It might take a truck or bus tire inflated with nitrogen about three months to lose two psi, whereas even a well-maintained tire inflated with compressed air will lose, on average, about two psi per month.

INFLATION CHECKS

Just because nitrogen provides consistent inflation pressure over longer periods, that doesn't mean there is no longer a need to regularly and properly check tire pressure. Tires still need to be checked using a calibrated tire gauge and when a tire is "cold" - meaning when a tire is at approximately the same temperature as the surrounding air, typically before a vehicle has been driven, or driven less than one mile.

Kicking or thumping a tire cannot accurately estimate inflation pressure. Trying to determine if a tire needs air by thumping it is as effective as trying to determine if a vehicle's engine needs oil by thumping on its hood.

Regardless of what is inside a tire - air or nitrogen, properly maintaining tires maximizes tire life and fuel economy, and provides improved handling, traction, braking and load-carrying capability. By being more fuel efficient, less fuel is consumed, which decreases petroleum fuel demand and reduces emissions and pollution.

ENVIRONMENTAL BENEFITS

Nitrogen can provide stronger casings for more retreadability, and retreaded tires actively contribute to helping conserve valuable finite natural resources and reduce solid waste disposal problems. Every retread produced means one less new tire, which minimizes the number of new tires that need to be produced annually.

Production of new truck and bus tires consumes large amounts of energy and materials that impact the environment. Truck and bus tires are basically petrochemical products. It takes 22 gallons of oil to manufacture one new tire. Most of that oil is used in the tire casing, which is reused in the retreading process, where only approximately 7 gallons of oil is required to retread that same tire. So each time a tire is retreaded, approximately 15 gallons of oil are saved.

Retreading conserves hundreds of millions of gallons of oil every year, which in today's oil-scarce world is extremely important. And because retreading requires less rubber, fewer rubber trees are "tapped," which helps preserve the natural environment and reduces the loss of natural habitat.

To make the crude rubber used to manufacture tire, workers known as "tappers" make a shallow cut in the trunk of rubber trees and insert a "tap" - actually as small spout - with a cup underneath. Latex containing rubber drips into the cup. The latex is collected and processed into crude rubber.

By extending the useful life of a tire, retreading offers additional environmental benefits. Every tire retreaded is a tire that does not need to be disposed of.

Because every reputable truck and bus tire manufacturer designs and engineers its tires for several retreading lives, only one worn tire casing requires disposal instead of many. The natural resources that are saved and the positive impact on the environment are multiplied.

So are the cost benefits to users of retreaded tries. For most commercial vehicle fleets, tires represent the third largest item in their operating budget after labor and fuel costs. Retreading can cut tire costs in half and sometimes even more.

MIXING NITROGEN & AIR

There is some confusion about what happens when nitrogen and air are mixed inside a tire. By way of example: when a nitrogen-inflated tire needs some additional pressure and nitrogen is not available.

Normal air is about 78% nitrogen; so adding compressed air will simply drop the nitrogen purity. There shouldn’t be any adverse affects on the tire or vehicle handling, provided the pressure is kept at the proper level.

The manufacturers of nitrogen inflation system advise that any tire containing both nitrogen and air be purged and then re-inflated with the proper amount of nitrogen as soon as possible. The same procedure holds true in the event that a tire would need to be replaced and nitrogen is not available.

In a situation where a nitrogen-inflated steer tire has been repaired and refilled with air, some nitrogen inflation system manufacturers recommend that the nitrogen be let out of the other steer tire and re-filled with air.

The reason, they explain, is that an air-filled tire will heat up and expand, whereas the tire with nitrogen will not, possibly causing a slight pull to the side with the nitrogen-inflated tire. With air in both steer tires, the air pressure will expand relatively equally, so there shouldn’t be any steering issues.

Here again, as soon as possible, the air should be purged from both steer tires and properly re-inflated with nitrogen. There is a small controversy over this point. There are some in the field

who believe the effect of topping up nitrogen filled tire with air has too small an effect in handling terms to require such action.

For additional information, including a list of locations where nitrogen is available, contact the Tire Retread Information Bureau (TRIB) toll free from anywhere in North America at (888) 473-8732, send an e-mail to info@retread.org or visit TRIB's website at www.retread.org.

TRIB WISHES TO THANK OUR MEMBERS WHO DEAL WITH NITROGEN FOR CONTRIBUTING TO THIS ARTICLE.

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