

TIRES

Nitrogen air loss study

(The following comments have been compiled from various writers in reference to that study.)

October 04, 2007

Filling tires with nitrogen rather than air is becoming a common practice in the replacement tire market. This service offers tire dealers another avenue for making money while also promoting safety. The claimed safety benefits often include the potential for reducing air loss compared to an air-filled tire. Maintaining proper inflation can help prevent tire overheating; promote optimum tread life; and reduce rubber aging and wheel corrosion. The use of nitrogen in large truck fleets and the commercial tire industry are well documented and support these claims.

The National Highway Traffic Safety Administration (NHTSA) has seen reduced aging of tires filled with nitrogen. Though the data does support that passenger car tires could benefit by all the claims made for nitrogen, tire manufacturers say that they already design tires to perform well with air inflation. And while nitrogen will do no harm, manufacturers say that they don't see the need to use nitrogen, which generally adds \$5 or more per tire charge.



Consumer Reports wanted to find out if nitrogen is worth the price, so we purchased a Nitrogen Inflation System and checked out how well the inflation held up over a one year period. We evaluated pairs of 31 tire models of H- and V-speed rated, all-season tires used in our tread wear test from 2006. We filled one tire per model with air and the other with nitrogen. The test was quite simple: fill and set the inflation pressure at room temperature to 30 psi (pounds per square inch); set the tire outdoors for one year; and then recheck the inflation pressure at room temperature after a one year period.

The tires were filled and deflated three times with nitrogen to purge the air out of the tire cavity. We also used an oxygen analyzer to be sure we had 95-percent nitrogen purity in the tire--the claimed purity limit of our nitrogen system, which generates nitrogen gas from ambient air.

A screenshot of a data table from Consumer Reports.org. The table has several columns, including "Tire Model", "Initial Pressure", "Final Pressure", and "Air Loss". The rows list various tire models and their corresponding pressure changes over a one-year period. The table is partially obscured by a green highlight on the right side.

The test started on September 20, 2006 and the final measurements were taken on September 20, 2007. The results show nitrogen does reduce pressure loss over time, but the reduction is only a 1.3 psi difference from air-filled tires. The average loss of air-filled tires was just 3.5 psi from the initial 30 pressure setting. Nitrogen-filled tires lost an average of 2.2 psi from the initial 30 psi setting. More important, all tires lost air pressure regardless of the inflation medium, so consumers should check their tires' air pressure

routinely. No evaluation was done to assess the aging claim.

Bottom line: Overall, consumers can use nitrogen and might enjoy the slight improvement in air retention provided, but it's not a substitute for regular inflation checks.

--Gene Petersen

Added 10/11/07

I think we are missing some of the advantages here. First, the air loss mentioned above is 2.2 vs 3.5 psi. That is a significant difference, even at this low inflation pressure. Also, nitrogen is an inert gas, and so will react with the rubber/chemical compounds much less, contributing to reduced wear. Another point is that nitrogen will not heat up like oxygen, so during extended highway driving you will reduce the over inflation and wear/tear resulting from heat build-up.

I have nitrogen in the tires on my Prius and noticed an immediate improvement in gas mileage of 3-5 mpg. Better gas mileage was the selling point when the dealer suggested the change. I'm interested to know why gas mileage was not part of the test.

I just had Nitrogen added in our 99 9-3. I'm getting roughly 1 mpg better than before. I also noticed a difference in the ride. It seems there is less give and therefore tighter steering. My wife who didn't know about the nitrogen made the same observation about the handling. Anyway, seems worth it to me.

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The Rubber Manufacturers Association has also issued this statement:

Applications such as aircraft, mining, and commercial/heavy use utilize nitrogen to help reduce the risk of internal combustion (fire) if the brake/rim/wheel components overheat. Also, dry nitrogen is used in professional racing to help reduce variation in inflation pressures (caused by moisture) where even small differences in pressure can affect vehicle handling at the extreme limits of performance.

With Nitrogen I see almost No Pressure lose with Monthly checks and only a 4 PSI Increase.

This gives the vehicle a very much improved ride and handling.

The ride and handling improvement is more than worth the cost.

2. Despite repeated advice from consumer and industry groups, fact is, consumers simply do not check tire pressures regularly (you can forget about monthly checks). People just don't have the time and that is unlikely to change soon. When did you check your tire pressure last? According to studies, a large majority of us (90% in a report by RMA http://www.goodyear.com/media/pr/nat_2003/22655ti.html) do not check our tire pressure properly. So, many of us are likely riding on underinflated tires. If Nitrogen tire inflation can reduce that under inflation effect, it contributes, even if modestly, to improved gas mileage and ride comfort. Mileage improvement stories listed here are likely factual and these people, like many others, were riding on underinflated tires and nitrogen tire inflation helped, just like air inflation would have. But with nitrogen, proper inflation may last just a little longer.

Right now I am still driving on a N refill I got in Olean, NY in the fall of 2006. I have put on 18,000 miles having driven twice to the East Coast, once to the West Coast including two trips to Las Vegas. I reside in Colorado at an altitude of over 6000 ft. where the winter temperatures regularly drop to sub zero

temperatures and I drive to altitudes of over 10,000 ft. Not once have I had to add N since this N refill in NY, nor has my pressure varied more than a pound or so through extreme heat and cold conditions. My very sensitive tire pressure system (2006 factory) has remained "silent" throughout all this time, even at 20 degree below zero temperatures.

One other factor the report fails to address properly is that under conditions of driving long and fast under very hot conditions, an air-filled tire's pressure will increase significantly, possibly even approaching dangerous levels. This does not happen with N filled tires. Check out why race cars use N in their tires.

Rather than the micro effect on an individual, environmentally responsible CR reporting should include the macro carbon footprint benefit of nitrogen inflation for the billion tires that are delivering 3 trillion miles of service per year.

Your readers are smart enough to crunch the numbers and be amazed by how much fuel is saved by an even small improved nitrogen inflation pressure advantage.

Nitrogen inflation will improve a vehicles fuel performance. it will not make a tire bullet proof. Some claims being made are not technically sound and are actually irresponsible, hurting the concept.

CR should amend it's report and extrapolate its inflation differential findings to fuel efficiency on a billion tire/three trillion miles per year macro scale showing the many millions of gallons of fuel saved. It is reported that under inflation wastes an estimated 600 million gallons (\$1,800,000,000 at \$3.00/gallon) per year. How can we conclude that nitrogen inflation is too expensive???

1. "Believe Ideal Gas Law. It simply states that N₂ and "air" are pretty much the same thing, so both will act the same."

Fact: Incorrect. Fact is that Oxygen in the air permeates (leaks) out FOUR times faster than nitrogen. That makes nitrogen retain tire pressure for longer time.

2. Nitrogen "Drivers should check and refill tires regularly - monthly, if not weekly."

Fact: Most of us DO NOT check tire pressures regularly. At most, it is visual inspection, which can be very inaccurate. For many people, refilling tires less often with nitrogen is a convenience

I vote for nitrogen. I have a Convoid stroller for my daughter. The Convoid is like a wheelchair. The 8" front tires are quite small, and carry a lot of weight. I had to pump them up quite regularly. Then I found out the local Costco inflated their tires with nitrogen. They graciously pumped up the tires of the stroller. I noticed that the tires maintain their pressure longer, and I have to pump them up only about 1/4 as often. I didn't do a scientific study/keep track of dates and pressures, but my experience is enough to convince me that filling tires with nitrogen has merit.

I was very disappointed with my tires, but after hearing about nitrogen inflation, I decided to give that a go. After inflating the Goodyear passenger type tires with nitrogen, my ride is much quieter and more forgiving over the rough roads here. The handling did indeed "tighten up." Finally, the pressure fluctuations stopped... I still check the pressure in my tires monthly, and over the course of 14 months, I've only had to adjust the pressure in my tires once (vs. 5-6 times with air-filling).

My fuel economy is the same since I previously monitored and adjusted the pressure in my tires frequently. However, I still feel like the nitrogen is a worthwhile investment, as it also improved ride and handling for me. I think the relative lack of water vapor in nitrogen vs. compressed air is another reason for the advantages

I would also think that there would be a lot less oxidation with a nitrogen filled tire. Neoprene oxidizes over time and will have its physical properties compromised. So, with Nitrogen, there should be less oxidation and hence, less degradation

A few missing bits of information. The temperature/pressure factor is influenced by the amount of water vapor in the tire. The water vapor is the reason for pressure differences with temperature changes. The required 95% purity of N₂ in the tire assures that most of the water vapor has been removed. A static test

of tires is not a true test, a tire in use on a vehicle goes through many temperature changes, which changes pressure. The higher pressure from high temperatures should cause more leakage. Tires inflated with N2 are not as susceptible to huge pressure increases/decreases caused by temperature. Remember-- even 1% under inflation will decrease fuel mileage and tire life. The new Nissan GTR is reported as having N2 in the tires from the factory.

But, newer vehicles are going more miles between oil changes---sometimes 6 months and 7,500 miles. These long service intervals really demand Nitrogen in the tires

Because nitrogen, in our case, is a processed gas (moisture and oil was filtered out by our nitrogen generator), you might expect better inflation control as the tire heats up under normal service vs. air with unregulated moisture, etc. And nitrogen has been shown by the government and industry to reduce tire aging

The positive benefits of nitrogen in higher service pressure applications, such as used in large truck tires, has been documented in the industry

Pure Nitrogen inflation versus compressed air

First of all it has nothing to do with nitrogen. Nitrogen is not the problem... the problem is the oxygen. Our atmosphere is made up of 78% nitrogen, 21% oxygen and 1% misc gas, but it is the oxygen that causes the problems. Oxygen reacts to temperature changes; oxygen and the moisture associated with it also cause oxidation inside the tire which is corrosive. Oxygen is a smaller molecule which permeates through the rubber faster than nitrogen. Oxygen also destroys the characteristics of rubber over longer periods, known as dry rot.

This nitrogen study that was performed by Consumer Reports was a waste of time. By not putting the tires into use or at least simulated use you have not considered the heat factor. The more heat in the tire the more pressure inside the tire, the more pressure in the tire the faster it wants to leak out. As the heat builds up in your tire so does the pressure and this is why tires explode. Case in point... Boeing 727-200 - Overheated tire exploded in wheel well after takeoff, damaging hydraulic and electrical systems. Aircraft lost control and crashed. 167 of 167 killed (Maravatio, Mexico, 3/31/86). This was determined to be a single tire that was just serviced and filled with compressed air and not Nitrogen like the other tires. The FAA now mandates nitrogen inflation is all aircraft.

As for rolling resistance... Consumer Reports can preach all they want about maintaining proper tire pressure, but the fact of the matter is we don't. AAA reports that 85% of all cars on the road are driving on underinflated tires. If you have regular air in your tires and you're only having your tires check when you have your oil changed you are wasting money. Ask any quick lube service facility how many cars come in for service that don't need any air added to their tires, I'll willing to bet it is less than 10%. With Nitrogen it doesn't leak out as fast... end of story. Less pressure lose equals better rolling resistance which equals better MPG.

If Michelin didn't believe that nitrogen was better for your tires why would they have a nitrogen filling station at their corporate headquarters in South Carolina free to their employees?

The government has known about the benefits of nitrogen for years. The reason for all the recent talk is that there is a relatively new process for creating small amounts (2cfm – 21cfm) of nitrogen. These new nitrogen generators are now affordable own and easy to install and operate. Prior to this process you had to buy nitrogen gas in 2000psi bottles or own your massive nitrogen generation plant like you find at most food service plants. Yes insides that potato chip bag is dry inert nitrogen, because if it was oxygen the food would spoil.

The big question is should we pay to have nitrogen in your tires. I do... but I wish I didn't have to. I think the public should demand it from their service providers and if they don't offer it go somewhere else. If Costco can offer it for free to all their customers and they tires are still the least expensive in town why can't everyone else offer this valuable, money saving, safety feature for free. Auto manufacturers have recently started inflating certain models with pure nitrogen, but they are not telling anyone they are doing it. As a former employee of the National Auto Dealers Association I am willing to bet the dealer network is behind this silence.

Clemson University conducted a study of data from a nitrogen inflation field test and they concluded that the fleet got 6% better fuel economy and 50% better tire wear. 50%... WOW, no wonder the tire manufacturers don't want us to use nitrogen. If we all start demanding it America would be a better and safer place.