

## Science – Evidence – Recommendation Papers

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# WHAT THE EXPERTS ARE SAYING ABOUT NITROGEN TIRE INFLATION

**“Air migrates through rubber. Truck tires can lose 2psi per month as a result of air passing through sidewalls – like a balloon that shrivels up, but much slower. That’s why regular inflation checks are a must. Even if there’s nothing “wrong”, you can still be losing pressure.”**

- Bridgestone/Firestone North American Tire LLC *“Should You Stop Putting Air in Your Tires?”*

**“Since pure nitrogen has a lower permeability than oxygen, the use of pure nitrogen would improve tire inflation pressure retention.”**

- Staff Report, California Environmental Protection Agency, Air Resources Board, (CARB) *“Initial Statement for Reasons for Proposed Rulemaking”*

**“The perennial problem of low tire inflation can be effectively solved by the simple expedient of using Nitrogen to inflate tires. Nitrogen is dry and contains no moisture. Nitrogen is inert so rust cannot form since there is no Oxygen or moisture present to cause oxidation of the wheel.”**

- Lawrence Sperberg, Probe Forensic Testing Laboratory and author of *“Million Mile Truck Tires Available Today – Oxygen & Moisture, the Killer of Tires”*

**“Tire manufacturers agree that under-inflated tires waste between 2.5% and 4% of fuel in increased rolling resistance. For a fleet with 500 tractors and 1000 trailers running an average of 240,000 km a year and getting 6.9 mpg, this translates to an annual fuel usage of over 49,000,000 liters of diesel a year. At a spot price of 90 cents a liter, that is a total fuel bill of almost \$44,100,000 a year. 2% loss in efficiency is equal to almost \$882,000 excess costs per year, every year. Tires inflated with Nitrogen maintain correct inflation pressure longer than air inflated tires – up to five times longer. This reduces rolling resistance of the tire and reduces fuel consumption. This means that these lost costs are recouped and drop to the firm’s bottom line as pure profit. Also, when correct tire pressure is maintained, the tread lasts as long as the manufacturers intend. Under-inflated tires wear faster.”**

- Konrad Mech P.Eng; MBA, President of Drexan Corporation and author of the noted Technical Paper on Nitrogen tire inflation *“Why Nitrogen Tire Inflation Extends Commercial Tire Tread Life.”*

**“Higher temperatures and higher partial pressure of Oxygen induce severe property degradation rates in (tire) belt coat compounds...A tire filled with Nitrogen will degrade, but at a significantly slower rate than tires filled with air.”**

- Uday Karmarker of Akron Rubber Development Laboratory Inc. and Harold Herzlich of Herzlich Consulting Inc. from their study *“Effect of Nitrogen Purity on the Oxidation of Belt Coat Compound”*, presented to the 2006 International Tire Exhibition & Conference.

**“Drexan completed the long-haul trucking trial to determine the benefits of Nitrogen tire inflation, and the results exceeded our expectations,” says Mech. “Moreover, fuel efficiency of the nitrogen inflated equipment increased by 3.3 percent even though the tire pressure of the air inflated tires was aggressively maintained. We did not expect this, so it is very good news.”**

- Konrad Mech, President, Drexan Corporation and author of the Drexan Nitrogen Tire Inflation Study on Long Haul Fleets as presented at the 23<sup>rd</sup> Annual Clemson University Tire Industry Conference in South Carolina in March 2007.



## Summary of Nitrogen Studies & Technical Papers

- Study Name** U.S. GAO Report
- Title** *Underinflated Tires in the United States*
- Main Emphasis** A review of the problem of under-inflated tires in U.S. and recommended solutions
- Author(s)** U.S. Government Accountability Office
- Organization** U.S. Government
- Date** February, 2007
- Key Points**
- Very good overall white paper on the problems caused by under-inflated tires in the U.S.
  - Outlines the positive benefits of Nitrogen for preventing under-inflation.
  - Under-inflated tire statistics reviewed.
  - Compressed air permeates tire more quickly than Nitrogen.
  - Tires inflated with Nitrogen retain pressure levels longer and age more slowly.
  - Nitrogen is recognized in this government paper as a technology that will reduce tire under-inflation, promote better fuel economy, and a safer handling vehicle.
- 
- Study Name** Baldwin / Ford Motor Company Nitrogen Study
- Title** *Effects of Nitrogen Inflation on Tire Aging and Performance*
- Main Emphasis** Focuses on the positive effects Nitrogen tire inflation has on the change in rubber properties of tires
- Author(s)** John Baldwin, David Bauer & Kevin Ellwood
- Organization** Ford Motor Company
- Date** May, 2004
- Key Points**
- When Nitrogen is used to inflate tires, the oxidative degradation of tire rubber is slowed down, and aging of tires is significantly slowed or even halted.
  - A significant reduction in rubber oxidation could be a tremendous benefit to the fleet owner as well as the average consumer in terms of improvement in a tire's structural durability.
  - Oxidation and subsequent degradation of the steel belt rubber is significantly lower with Nitrogen compared to air.
  - The results of slower tire aging are about the same with 96% to 99.9% Nitrogen inside the tire carcass.
- 
- Study Name** Bridgestone / Firestone Commercial Truck Tires Article
- Title** *Should You Stop Putting Air in Your Tires?*
- Main Emphasis** Great article explaining the advantages and myths of Nitrogen tire inflation
- Author(s)** Article from [www.trucktires.com](http://www.trucktires.com)
- Organization** Bridgestone / Firestone North American Tire LLC
- Date** April, 2004
- Key Points**
- Good explanation of oxidation and its adverse affect on tire aging.
  - Adverse effects of moisture in air on tire temperature.
  - Nitrogen's ability to maintain pressure in truck tires and thus lengthen tread life and provide more retread cycles.



## Summary of Nitrogen Studies & Technical Papers

<b>Study Name</b>	<b><u>Clemson University Study</u></b>
<b>Title</b>	<i>Tire Nitrogen Filling System – A Final Report to Industrial Technologies Sector of Ingersoll-Rand Corp.</i>
<b>Main Emphasis</b>	IR sponsored two studies on Nitrogen inflated tires for fleets and passenger vehicles with the Mechanical Engineering Department of Clemson University. The study's primary objectives were to examine the effect of rolling resistance on a vehicle's fuel consumption, as well as to examine the success probability of using Nitrogen filled tires to improve vehicle safety, performance and operating costs.
<b>Author(s)</b>	Nader Jalili Ph.D; Prakash Venkataraman
<b>Organization</b>	Department of Mechanical Engineering; Clemson University
<b>Date</b>	February, 2008
<b>Key Points</b>	<ul style="list-style-type: none"><li>▪ The study focused on 2 areas: (1) how tire inflation pressure varies with time in a static state, and (2) how tire inflation pressure affects rolling resistance and tire tread wear.</li><li>▪ The study concluded that: (1) Nitrogen inflation can maintain tire pressure 35% - 55% better than shop dry air per month at room temperature, and 29% - 35% better at oven temperature, thus concluding that inflating with Nitrogen can reduce leakage in tires. (2) Nitrogen filled tires produce lower tire rolling force than air filled tires, thus corroborating previous research stating that Nitrogen filled tires help improve tire life and fuel economy, and reduce overall vehicle operating costs.</li><li>▪ Nitrogen inflated tires can maintain tire pressure 74% better than shop air per month at normal operating conditions and as a result, produce about 70% less rolling resistance than air filled tires. Reduced rolling resistance has a positive influence on fuel economy and life of a truck tire, preventing premature wear on truck tires. By inflating tires with Nitrogen, fuel economy can be increased by about 23% and tire life can be increased by 50%.</li><li>▪ All these improvements can help reduce the money spent on fuel and replacement tires.</li><li>▪ Nitrogen reduces CO2 emission into the atmosphere due to burning of diesel fuel.</li><li>▪ <i>This study does an excellent job of providing the technical support for the statement that reducing rolling resistance in both automotive and truck tires, the Nitrogen filled tires last longer and reduce the amount of fuel consumption.</i></li></ul>

<b>Study Name</b>	<b><u>NY City Transit Nitrogen Study</u></b>
<b>Title</b>	<i>Nitrogen Tire Filling – Field Data Analysis, NY City Transit – Flatbush Depot</i>
<b>Main Emphasis</b>	To evaluate the benefits of using Nitrogen in bus tires.
<b>Author(s)</b>	Ashok Mathur
<b>Organization</b>	Air Products & Chemicals Inc.
<b>Date</b>	January, 2009
<b>Key Points</b>	<ul style="list-style-type: none"><li>▪ A 3-month study was conducted by NYC Transit to evaluate the results of using Nitrogen in public transit buses versus regular air. The fleet from NYC Transit's Flatbush Avenue Depot in Brooklyn, NY was used for this study.</li><li>▪ Actual field data was rigorously collected over the trial period and used for this analysis. The positive results from this study were the basis for the decision to convert all remaining depots in the transit system. Five depots have been converted thus far.</li><li>▪ This study used 285 buses, and measured such categories as tires requiring top-offs in the first 30 days, number of flat tires every month, tire pressure loss, impact of under-inflation on extra fuel and tire life, fuel consumption as a result of under-inflation, annual cost of extra fuel required due to under-inflation, tire life reduction due to under-inflation, and CO2 emission reduction due to fuel efficiencies gained.</li><li>▪ The study clearly demonstrated these advantages of Nitrogen filled tires over air-filled tires:</li></ul>



## Summary of Nitrogen Studies & Technical Papers

1. Tires retained correct pressure for a longer period of time, resulting in fewer top-offs, lower tire pressure maintenance labor costs, and fewer flat tires per month (approximately 3/month), and reduced downtime.
2. Tire rolling resistance was reduced, resulting in a projected 2.5% annual fuel savings.
3. Tire friction and tire wear were reduced, and is projected to provide 20% improvement in tire life.
4. CO2 emission reductions are estimated to be 1.5 million lbs per depot.

<b>Study Name</b>	<b><u>ExxonMobil Nitrogen Inflation Study</u></b>
<b>Title</b>	<i>Nitrogen Inflation of Tires</i> Presented to the National Highway Traffic Safety Administration (NHTSA)
<b>Main Emphasis</b>	Focuses on the effects of Nitrogen on tire pressure stability and tire life
<b>Author(s)</b>	Walter H. Waddell
<b>Organization</b>	ExxonMobil Chemical
<b>Date</b>	2006
<b>Key Points</b>	<ul style="list-style-type: none"><li>▪ The topic of gas permeability (Oxygen vs. Nitrogen) is addressed. Nitrogen gas was found to permeate slower than Oxygen through rubber.</li><li>▪ Inflation loss rates were reduced 45% using dry, 99.9% pure Nitrogen inflation</li><li>▪ Durability of new tires increased quantitatively with decreasing % of Oxygen in the filling gas.</li><li>▪ Shearography cracking of oven-aged tires can be quantitatively correlated to tire inflation pressure retention.</li><li>▪ Shearography cracking of oven-aged tires was reduced using Nitrogen as fill gas.</li></ul>
<b>Study Name</b>	<b><u>University of Bologna Tire Inflation Study</u></b>
<b>Title</b>	<i>Tyres Inflation With De-Oxygenated Air</i>
<b>Main Emphasis</b>	Documents the importance of correct inflation to ensure the highest performance specifications for the tire, lowest fuel consumption and low/even treadwear
<b>Author(s)</b>	Luca Sabino
<b>Organization</b>	University of Bologna Mechanical Engineering Department
<b>Date</b>	2000
<b>Key Points</b>	<ul style="list-style-type: none"><li>▪ Filling tires with de-oxygenated air does a superior job of maintaining correct inflation longer in order to ensure that performance specifications for the tire are met (high-contact friction for effective road holding, good handling or accelerating, and short stopping distance), reduced fuel consumption, more even treadwear, etc.</li><li>▪ Tires inflated with de-oxygenated air lose pressure at half the speed of a tire inflated with air.</li><li>▪ A major disadvantage of using air for tire inflation is the deterioration of the tire casings lining caused by Oxygen contained in the air (oxidation). The harmful effects of Oxygen on the lining due to oxidation have been known and studied since the late 60's but tire technology has only taken these studies into account in recent years. Using de-oxygenated air does not have this disadvantage.</li><li>▪ Reducing the temperature of the tire, or the concentration of Oxygen in a tire, will increase the life of a tire. Reducing heat generation inside the casing is extremely difficult, and requires changes in the chemical composition of the rubber. It is far simpler to change the Oxygen concentration inside the tire by using de-oxygenated air as the inflation gas.</li><li>▪ A tire inflated with de-oxygenated air is subject to reduced deterioration, which permits a larger number of repairs (retreads) on truck tires. While using air enables 3-4 structural repairs, using de-oxygenated air increases this number to 6-7 repairs.</li></ul>



## Summary of Nitrogen Studies & Technical Papers

- Study Name** Karmarkar-Herzlich Nitrogen Purity Technical Paper
- Title** *Effect of Nitrogen Purity on the Oxidation of Belt Coat Compound*  
Presented at the International Tire Exhibition & Conference 2006
- Main Emphasis** Focuses on how changes in the Nitrogen/Oxygen ratio of the tire fill gas affects the aging characteristics of a tire.
- Author(s)** Uday Kamarkar & Harold Herzlich
- Organization** Akron Rubber Development Laboratory Inc., & Herzlich Consulting Inc.
- Date** 2006
- Key Points**
- With reference to the practice of using Nitrogen for tire filling to reduce pressure loss and moisture in tires and reduce the effects of oxidation on the aging of tires, this study sets out to scientifically and accurately develop a better understanding of the effect of Nitrogen purity on tire component oxidation.
  - Purity of Nitrogen is a function of the initial generator, target pressure of the tire, the number and method of refills of the cavity gas.
  - For a tire with target pressure of 32 psi, filling with a Nitrogen generator of 98% Nitrogen purity output will generate a final purity of 92%, 96% and 97% with each successive complete refill.
  - For a Nitrogen generator of 95% purity output, 90%, 94% and 95% target purity with each successive refill.
  - Percent of Oxygen in the tire cavity (Nitrogen purity level) is a significant factor influencing the rate of degradation of the tires.
  - Higher temperatures and higher Oxygen content (lower Nitrogen purity) induce severe property degradation rates on tires.
  - Purity of Nitrogen plays a very significant role in the aging of rubber compounds.
  - A tire filled with Nitrogen will degrade but at a significantly slower rate than tires filled with air.
- 
- Study Name** Herzlich White Paper - Nitrogen Inflation of Pneumatic Tires
- Title** *A Review of Nitrogen Inflation of Pneumatic Tires*
- Main Emphasis** Harold Herzlich, a tire industry chemical engineer with 50 years experience, provides an excellent review of the accepted scientific principles and peer-reviewed scientific papers which point to the wide acceptance of using Nitrogen for tire inflation rather than air.
- Author(s)** Harold Herzlich
- Organization** Herzlich Consulting Inc.
- Date** December, 2005
- Key Points**
- In easy to understand language, Herzlich cites the documentation that concludes that proper tire inflation improves fuel consumption, vehicle stability, tire reliability and tire life.
  - The economic advantages for high purity Nitrogen tire inflation are reviewed and documented
  - The chemical factors justifying high purity Nitrogen for tire inflation are reviewed and documented.
  - Key findings of researchers in various tire tests involving Nitrogen are reviewed and summarized.



## Summary of Nitrogen Studies & Technical Papers

<b>Study Name</b>	<b><u>Herzlich White Paper – The Science of Nitrogen Tire Inflation</u></b>
<b>Title</b>	<i>The Science of Nitrogen Tire Inflation</i>
<b>Main Emphasis</b>	Harold Herzlich, a tire industry chemical engineer with 50 years experience, provides an excellent, no-hype discussion of the science of Nitrogen tire inflation and lays all the facts on the table. He puts most all the pertinent information from all the relevant studies together for an excellent primer for someone new to the concept of using Nitrogen for tire inflation. Excellent work.
<b>Author(s)</b>	Harold Herzlich
<b>Organization</b>	Herzlich Consulting Inc.
<b>Date</b>	December, 2006
<b>Key Points</b>	<ul style="list-style-type: none"><li>▪ Facts and concepts covered include...</li><li>▪ Air and air pressure</li><li>▪ Why is tire temperature so important?</li><li>▪ What is inert Nitrogen?</li><li>▪ What is Oxygen?</li><li>▪ What is vulcanization?</li><li>▪ What's the big deal about Oxygen when inflating tires?</li><li>▪ Won't the antioxidants handle the Oxygen weakening phenomena?</li><li>▪ Why is inflation pressure maintenance so important?</li><li>▪ Why is Nitrogen better for inflation maintenance?</li><li>▪ Why is Nitrogen better for tire durability?</li><li>▪ What purity level is necessary in the tires?</li><li>▪ Why is Nitrogen inflation gas purity such a big deal?</li><li>▪ How does Nitrogen generator purity affect the number of purges?</li><li>▪ Chemical laws misapplied</li><li>▪ Other advantages of Nitrogen inflation</li><li>▪ Peer-reviewed studies documenting everything are summarized</li></ul>
<b>Study Name</b>	<b><u>Sperberg Truck Tire Study</u></b>
<b>Title</b>	<i>Million Mile Truck Tires Available Today - Oxygen &amp; Moisture – The Killer of Tires</i>
<b>Main Emphasis</b>	The Sperberg study is widely recognized as one of the most important studies validating extension of tread life by using Nitrogen instead of air. His major premise is – you can get a truck to go a million miles by simply taking the Oxygen out of the tires
<b>Author(s)</b>	Lawrence Sperberg
<b>Organization</b>	Probe Forensic Testing Laboratory; El Paso, TX
<b>Date</b>	1996
<b>Key Points</b>	<ul style="list-style-type: none"><li>▪ Sperberg presents a solid, understandable explanation of why the principal cause for the deterioration of pneumatic tires is chemical oxidation.</li><li>▪ He draws the conclusion from his study that the removal of most of the Oxygen (and the moisture in that Oxygen) will result in significantly longer tire life.</li><li>▪ He also concludes that the perennial problem of low tire inflation can be effectively solved by simply using Nitrogen to inflate tires rather than air in order to hold the correct tire pressure.</li><li>▪ The study results proved that Nitrogen inflation increased tread life on new truck tires by 26%.</li><li>▪ <i>Sperberg makes the overall conclusion from his study that Nitrogen tire inflation can make significant contributions to the Transportation industry in terms of cost savings and safety.</i></li></ul>



## Summary of Nitrogen Studies & Technical Papers

<b>Study Name</b>	<b><u>Konrad Mech Technical Paper - Nitrogen and Extension of Commercial Tire Tread Life</u></b>
<b>Title</b>	<i>Why Nitrogen Tire Inflation Extends Commercial Tire Tread Life</i>
<b>Main Emphasis</b>	Explanation of why commercial truck tires get longer tread wear with Nitrogen filled tires
<b>Author(s)</b>	Konrad Mech P.Eng; MBA
<b>Organization</b>	Drexan Corporation
<b>Date</b>	October, 2005
<b>Key Points</b>	<ul style="list-style-type: none"><li>▪ Interesting review of tire rubber chemistry and how tire manufacturers add chemical anti-oxidants to rubber compounds to slow the effects of oxidation. But as tire pressure decreases, operators continually add more compressed air, thereby adding more Oxygen, which effectively negates this strategy.</li><li>▪ Mech cites the leading technical papers which address tire rubber chemistry and the detrimental effect of oxidation on tire rubber.</li><li>▪ Mech reviews Sperberg's landmark truck tire study, and uses it to quantify the extension of tire treadwear.</li><li>▪ Mech also reviews 4 additional significant benefits to commercial truck fleet operators:<ol style="list-style-type: none"><li>(1) <u>Maintenance of correct tire inflation</u>. Under-inflated tires waste 2.5% - 4% fuel because of increased rolling resistance. Just a 2% loss in efficiency for a commercial fleet can mean dramatic excess fuel costs per year – every year. Tires inflated with Nitrogen maintain inflation pressure longer than air-inflated tires – up to 5 times longer. By improving rolling resistance, fuel consumption is reduced and fuel costs are recouped, dropping to a firm's bottom line as pure profit. When correct tire pressure is maintained, the tread lasts as long as the manufacturers intend. Under-inflated tires wear out much faster.</li><li>(2) <u>Extended casing life</u>. Mech reviews the Sperberg Truck Tire Study's results on extended casing life (26% on new tires and 54% on retreads). Casings with Nitrogen retain their strength longer. A casing filled with Nitrogen will retain over 80% of its original strength after two years, while an air-filled casing will only have 40% of its original strength – a 100% increase in casing strength for Nitrogen over compressed air. This translates to significant tire savings.</li><li>(3) <u>Reduced Tire Failure Rates</u>. As with the food industry's experience, Nitrogen can extend tire and casing life and reduce the number of tire failures in service by reducing oxidative aging of rubber. Failures will drop substantially, saving the cost of replacements and unscheduled roadside repair costs.</li><li>(4) <u>Simpler Maintenance Due to Elimination of Condensed Water in Tires</u>. Much of compressed air is wet. Water causes rim rust, and can cause chronic leaks through the valve stem. Rust also gets pushed under the bead of the tire, creating micro leak paths. In winter, if a tire needs to be aired down, moisture in the tire casing can freeze in the valve stem. Because Nitrogen is a dry gas, all these maintenance problems are eliminated.</li></ol></li></ul>
<b>Study Name</b>	<b><u>Drexan Fleet Study – Nitrogen Tire Inflation in a Long Haul Trucking Fleet</u></b>
<b>Title</b>	<i>Nitrogen Tire Inflation in a Long Haul Trucking Fleet</i> Study results were presented to the 23 <sup>rd</sup> annual Clemson University Tire Industry Conference in 3-07.
<b>Main Emphasis</b>	Study conducted and funded by Nitrogen tire inflation proponent and equipment supplier, Vancouver-based Drexan Corporation, in conjunction with long-haul trucking fleet Harris Transport of Winnipeg, Canada. Objective of the study was to determine the benefits of Nitrogen tire inflation for fleets.
<b>Author(s)</b>	Konrad Mech, President
<b>Organization</b>	Drexan Corporation
<b>Date</b>	March, 2007



## Summary of Nitrogen Studies & Technical Papers

### Key Points

- Study was conducted in conjunction with Transport Canada's *Freight Sustainability Demonstration Program*, whose objectives were to reduce greenhouse gas emissions from the freight transportation sector, to stimulate the development of best practices for increasing the sustainability of Canada's transport system, and to realize measurable environmental benefits.
- According to the study, a control group of 452 tire positions filled with air showed 5.38 mpg with an average tire life of 26,623 km per 32<sup>nd</sup> of treadwear. A group of 836 Nitrogen-filled tires produced 5.56 mpg with 49,748 km per 32<sup>nd</sup> of treadwear. That's a fuel economy increase of 2/10ths of a mile per gallon, or a 3.3% increase in fuel efficiency with the Nitrogen group. The tread life increase was 86% with the Nitrogen group.
- During the trial, the additional fuel efficiency translated to a savings of 500,000 liters of fuel, or roughly \$425,000 in fuel cost savings.
- The results of the study were analyzed by a Ph.D. statistician. The results of the report with statistical data was submitted to Transport Canada for their in-house technical review on 3-30-07.

**Study Name** TRIB White Paper on Nitrogen Tire Inflation

**Title** *Why Inflating Tires With Nitrogen Makes Sense*

**Main Emphasis** A good primer and overview of Nitrogen tire inflation - discusses how Nitrogen tire filling helps optimize tire costs while providing environmental benefits

**Author(s)** Harvey Brodsky

**Organization** TRIB (Tire Tread Information Bureau)

**Date** August, 2005

### Key Points

- 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 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.
- Advantages of inflating with Nitrogen include:
  1. Less inflation pressure loss for a more stable, consistent tire pressure
  2. Cooler running tires
  3. Longer tread life
  4. Less oxidation of tire components
  5. Reduced rim and wheel corrosionThe result is increased tire life, improved fuel economy, reduced tire aging, and a more durable casing for improved retreadability.
- Other topics addressed include the Science behind Nitrogen, Inflation Checks, Environmental Benefits, and Mixing Nitrogen and Air.

# Retain Customers by Turning Up the Gas!

By Nick West

In recent years, nitrogen has been an increasingly-popular passenger vehicle service. When Kenny Grant, Parts and Service Director for Honda Cars of McKinney (Texas), had customers start asking about using nitrogen in their tires, he went online to research nitrogen and the systems available to deliver it. Now, Grant says they are installing nitrogen in the tires of all new cars (300), used cars (100) and approximately 75 customer service cars per month. For his store, nitrogen has "arrived".

He believes that nitrogen tire inflation has a number of loyalty-building and profit-building aspects to it. "We like how it ties our customers to us" states Grant. "If they have a flat tire, they come here now so they can have the nitrogen re-installed for free. On the

internal side, we install nitrogen on every new car, which is a great selling point."

Temperature stability is another user benefit. "In Texas, where we can have a 40 degree ambient temperature change in just a day or even just a few hours," says Grant, "nitrogen has eliminated the TPMS (tire pressure monitoring system) warning light coming on during cold mornings. Nobody wants an angry or puzzled customer calling in with a brand new car and a light on the dash."

There's one additional plus. Since Honda Cars of McKinney is a Hendrick Automotive Group dealership, Grant loves the fact that one of Hendrick's NASCAR drivers, #24 Jeff Gordon, is now endorsing the PurigeN 98 nitrogen equipment he uses! ■

“ He believes that nitrogen tire inflation has a number of loyalty-building and profit-building aspects to it. ”



If you know someone who belongs on this page, contact Publisher Nick West at [Nick@FixedOpsMag.com](mailto:Nick@FixedOpsMag.com) or 877-349-3367.

# Motor Age

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JUNE 2008

## RESOURCES

### OBSERVER

INDUSTRY NEWS, NOTES AND HAPPENINGS



The new Nissan GT-R isn't riding on air — it's riding on nitrogen.

Photo courtesy: Nissan

#### TIRE TECHNOLOGY

## New Nissan to feature tires filled with nitrogen

WHEN THE SPORTY 2009 Nissan GT-R makes its U.S. debut this month, every car will arrive in the country with nitrogen-filled tires, exclusively developed for Nissan and the GT-R.

This model was first released in Japan in 2007, and each American-market vehicle comes equipped with Bridgestone RE070R high performance run-flat summer tires, Dunlop SP Sport 600 DSST run-flat summer tires or Dunlop SP Sport 7010 A/S DSST run-flat all-season tires.

The automaker says no Nissan dealership will be certified to sell a GT-R unless it can provide access to nitrogen in order to maintain the tires in top factory-issue condition.

With that in mind, the company has selected the PurigeN98 high-purity nitrogen tire inflation system from N2Revolution, Inc. as its "recommended and approved service equipment" necessary for dealer service shop certification regarding the GT-R marque.

"Nitrogen-filled tires help maintain proper tire pressure on all cars, which, in turn, helps improve fuel efficiency and reduce tire wear," says Robin Pearl, PurigeN98's president. "And, because nitrogen molecules are more stable than those of oxygen and contain no moisture, the gas doesn't degrade the rubber or steel belts or leak through the walls of tires as quickly. As a result, drivers can realize significant savings on both fuel and tire replacement costs."



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**FOR IMMEDIATE RELEASE**

**MAJOR MOBIL 1 FRANCHISEE TO OFFER PURIGEN98™**  
**AT 40 FLORIDA LOCATIONS**  
**High-Purity Nitrogen Tire Inflation System Helps Save Trees and Fuel**

**SUNRISE, Fla.** – (June 10, 2008) – For years, professional racers, airlines and even NASA have relied upon tires filled with high-purity nitrogen to enhance handling, stability and tire wear as well as overall safety. Now, everyday drivers have the opportunity to fill their car tires with high-purity nitrogen at 40 Mobil 1 Lube Express locations throughout Florida.

N<sub>2</sub>Revolution, Inc., the exclusive manufacturer and distributor of the **Purigen98™** high-purity nitrogen tire inflation system, has signed an agreement with Southern Express Lubes, Inc., one of the largest Mobil 1 Lube Express franchisees in the United States, to offer the product at most of its service centers in the greater Orlando, Tampa and South Florida markets.

“As one of the fastest growing quick lube service centers in the nation, Mobil 1 sets a very high standard in our industry and our customers expect us to offer only the highest quality products,” said Steve Carman, director of field operations for Southern Express Lubes.

Nitrogen is emerging as the latest consumer trend in the auto industry due to its ability to keep a tire properly inflated longer than a tire filled with regular air. For example, Nissan recently endorsed the product for its vehicles.

Nitrogen molecules are more stable than those of oxygen so the gas does not leak through the walls of tires as quickly, helping motorists maintain proper tire pressure. With properly inflated tires, drivers find they save 3 percent or more on fuel costs and enjoy better handling, braking and vehicle stability. Tire wear also is reduced, which can result in significant savings

on replacement costs. Nitrogen-filled tires can help lessen the carbon imprint on Mother Earth by reducing fuel emissions and the harvest from rubber trees.

Southern Express Lube chose PurigeN98™ because it is guaranteed to deliver a minimum of 98 percent pure nitrogen.

“We tested PurigeN98™ at several of our locations before making the full commitment and achieved high success. There’s a reason many reputable dealers throughout the country are offering PurigeN98™.”

Drivers can convert their car tires to PurigeN98™ for \$29.99 (cars) or \$39.99 (trucks) at select Mobil 1 Lube Express shops. Locations can be found by visiting [www.selubes.com](http://www.selubes.com).

In addition to being available in 40 states and Canada, PurigeN98™ has been endorsed by four-time NASCAR Sprint Cup Champion Jeff Gordon, who uses the product in his personal cars. Both the Mario Andretti Racing School and Jeff Gordon Racing School also have entered into exclusive agreements with N<sub>2</sub>Revolution, Inc. to use PurigeN98™ in the tires of their racing experience cars.

### **About PurigeN98™**

N<sub>2</sub>Revolution, Inc., based in Sunrise, Fla., develops and manufactures leading-edge automotive solutions, with PurigeN98™ as its flagship product. Led by a team of distinguished veterans from the automotive, environmental, financial, engineering and scientific industries, the company is committed to developing high-quality, affordable, environmentally friendly products that enhance the quality of life for today’s sophisticated consumers. N<sub>2</sub>Revolution has been recognized with the Emerald Award from Broward County, Fla., in the category of Innovative Procedures / Process Improvement and has been featured in news reports by MSNBC and numerous broadcast and print media nationwide.

For information about N<sub>2</sub>Revolution and its energy-saving solutions, call 954-838-7545, email [info@n2revolution.com](mailto:info@n2revolution.com), or visit [www.purigen98.com](http://www.purigen98.com).

###



# NEWS RELEASE

FOR IMMEDIATE RELEASE

Contact: Robin Pearl, N2Revolution  
954-838-7545  
[rpearl@n2revolution.com](mailto:rpearl@n2revolution.com)  
[www.purigen98.com](http://www.purigen98.com)

## **Tuffy Auto Service Centers Selects Purigen98 High Purity Nitrogen Generators** *Purigen98 service to be offered in the Company's 250 stores*

April 9, 2007 - Toledo, Ohio & Sunrise, Florida

In a joint press release Tuffy Auto Service Centers & N2Revolution, Inc., manufacturer of Purigen98 on-site high purity Nitrogen generators announced that Purigen98 has been selected as the exclusive on-site nitrogen generator supplier in each new Tuffy franchise equipment package. In addition, Purigen98 has been selected as the approved supplier and new business opportunity for existing franchise locations.

"Selection of Purigen98 as our exclusive supplier was based on our desire to offer Tuffy customers high purity nitrogen tire inflation and Purigen98 delivers 98% purity guaranteed", said Mickey Szerlag, Director of Training who monitored the trial at Tuffy's Corporate Training Store location in Toledo, Ohio.

"During the trial period it became evident that the addition of Purigen98 high purity nitrogen to our menu of product offerings would benefit our customer while adding to our customer satisfaction and increasing customer loyalty. In addition, the incremental sales will help our stores generate significant additional bottom line profit" says Bill Taylor, Manager of the Corporate Training Store where a pilot Purigen98 program was conducted.

"With over 250 locations in the U.S., this agreement represents a major step forward in our quest to build a nationwide network of Purigen98 dealers and to make our service readily accessible to everyone who wants the benefits of high purity nitrogen tire inflation.", said Pearl.

For more information please call Mickey Szerlag, Tuffy Auto Service Centers, Director of Training at 419-865-6900 or Robin Pearl, President / CEO of N2Revolution, Inc. at 954-838-7545.

### **About Tuffy Auto Service Centers:**

Tuffy is the third largest franchised undercar repair chain in the country, specializing in brakes, shocks, mufflers alignments, oil changes, air conditioning, heating and cooling systems, starting and charging systems, and general maintenance and repair. Headquartered in Toledo, Tuffy Associates Corp. operates and franchises over 250 Tuffy Auto Service Centers in Delaware, Florida, Iowa, Illinois, Indiana, Maryland, Michigan, North Carolina, North Dakota, Nebraska, New Jersey, Ohio, Pennsylvania, South Carolina, South Dakota, Virginia, and Wisconsin.

### **About Purigen98:**

N2Revolution, Inc, based in Sunrise, Florida, develops and manufactures leading-edge automotive solutions. Its flagship product is Purigen98™. N2Revolution recently received the Emerald Award from Broward County, FL, in the Innovative Procedures/Process Improvement category, and has been featured on MSNBC and in a number of broadcast and print media nationwide. Led by a team of distinguished veterans from the automotive, environmental, engineering and scientific realms, the company is committed to developing high-quality, affordable and environmentally friendly innovations that enhance the quality of life of today's sophisticated consumer. For more information about N2Revolution and its energy-saving solutions, call 954-741-4278, e-mail [info@n2revolution.com](mailto:info@n2revolution.com), or visit [www.purigen98.com](http://www.purigen98.com).

###

TIRE RETREAD INFORMATION BUREAU (TRIB)  
900 WELDON GROVE  
PACIFIC GROVE, CA 93950 USA  
(831) 372 1917 - FAX: (831) 372-9210  
TOLL FREE FROM ANYWHERE IN NORTH AMERICA: (888) 473-8732  
E-MAIL: INFO@RETREAD.ORG

## **NEWS RELEASE ABOUT TIRES**

# **Why Inflating Tires With Nitrogen Makes Sense**

### **For Immediate Release**

PACIFIC GROVE, CA, AUGUST 2005

Contact: Harvey Brodsky, (831) 372-1917

*The practice of inflating tires with nitrogen has been around for a long time. Because of the benefits of nitrogen over air, it has been commonly used in tires on aerospace vehicles, commercial and military aircraft, race cars 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 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, Lemans and NASCAR race cars; commercial and military aircraft; military vehicles; heavy off-road construction equipment, and the Space Shuttle. 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 air reacts with the rubber compounds in the tire, causing them to break down and lose their strength and durability.

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 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.

Because nitrogen molecules are slightly larger (denser) 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 2 psi, whereas even a well-maintained tire inflated with compressed air will lose, on average, about one or two psi per month.

Furthermore, as a dry gas, nitrogen disperses heat more quickly than air. Cooler running tires reduce both resistance and friction for better fuel economy.

## **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.

Inflation pressure cannot be accurately estimated by kicking or thumping a tire. 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 fuels 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 tires. 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 effects 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, 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.

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](mailto:info@retread.org) or visit TRIB's website at [www.retread.org](http://www.retread.org).

- end -

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Document ID# 1746670

2006 Chevrolet HHR

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# **Info - Use of Nitrogen Gas in Tires #05-03-10-020 - (Dec 22, 2005)**

## **Use of Nitrogen Gas in Tires**

**All 2006 and Prior GM Passenger Cars and Light/Medium Duty Trucks (including Saturn)**

**2003-2006 HUMMER H2**

**2006 HUMMER H3**

**2005-2006 Saab 9-7X**

### **GM's Position on the Use of Nitrogen Gas in Tires**

**General Motors does not oppose the use of purified nitrogen as an inflation gas for tires. We expect the theoretical benefits to be reduced in practical use due to the lack of an existing infrastructure to continuously facilitate inflating tires with nearly pure nitrogen. Even occasional inflation with compressed atmospheric air will negate many of the theoretical benefits. Given those theoretical benefits, practical limitations, and the robust design of GM original equipment TPC tires, the realized benefits to our customer of inflating their tires with purified nitrogen are expected to be minimal.**

### **The Promise of Nitrogen: Under Controlled Conditions**

**Recently, nitrogen gas (for use in inflating tires) has become available to the general consumer through some retailers. The use of nitrogen gas to inflate tires is a technology used in automobile racing. The following benefits under controlled conditions are attributed to nitrogen gas and its unique properties:**

- A reduction in the expected loss of Tire Pressure over time.**
- A reduction in the variance of Tire Pressures with temperature changes due to reduction of water vapor concentration.**

- **A reduction of long term rubber degradation due to a decrease in oxygen concentrations.**

**Important: These are obtainable performance improvements when relatively pure nitrogen gas is used to inflate tires under controlled conditions.**

#### **The Promise of Nitrogen: Real World Use**

**Nitrogen inflation can provide some benefit by reducing gas migration (pressure loss) at the molecular level through the tire structure. NHTSA (National Highway Traffic Safety Administration) has stated that the inflation pressure loss of tires can be up to 5% a month. Nitrogen molecules are larger than oxygen molecules and, therefore, are less prone to "seeping" through the tire casing. The actual obtainable benefits of nitrogen varies, based on the physical construction and the materials used in the manufacturing of the tire being inflated.**

**Another potential benefit of nitrogen is the reduced oxidation of tire components. Research has demonstrated that oxygen consumed in the oxidation process of the tire primarily comes from the inflation media. Therefore, it is reasonable to assume that oxidation of tire components can be reduced if the tire is inflated with pure nitrogen. However, only very small amounts of oxygen are required to begin the normal oxidation process. Even slight contamination of the tire inflation gas with compressed atmospheric air during normal inflation pressure maintenance, may negate the benefits of using nitrogen.**

#### **GM Tire Quality, Technology and Focus of Importance**

**Since 1972, General Motors has designed tires under the TPC (Tire Performance Criteria) specification system, which includes specific requirements that ensure robust tire performance under normal usage. General Motors works with tire suppliers to design and manufacture original equipment tires for GM vehicles. The GM TPC addresses required performance with respect to both inflation pressure retention, and endurance properties for original equipment tires. The inflation pressure retention requirements address availability of oxygen and oxidation concerns, while endurance requirements ensure the mechanical structure of the tire has sufficient strength. This combination has provided our customers with tires that maintain their structural integrity throughout their useful treadlife under normal operating conditions.**

**Regardless of the inflation media for tires (atmospheric air or nitrogen), inflation pressure maintenance of tires is critical for overall tire, and ultimately, vehicle**

<http://service.gm.com/servlets/BlobShtml?ShtmlFile=1746670&publd...> 12/31/2005

**performance. Maintaining the correct inflation pressure allows the tire to perform as intended by the vehicle manufacturer in many areas, including comfort, fuel economy, stopping distance, cornering, traction, treadwear, and noise. Since the load carrying capability of a tire is related to inflation pressure, proper inflation pressure maintenance is necessary for the tire to support the load imposed by the vehicle without excessive structural degradation.**

**Important: Regardless of the inflation media for tires (atmospheric air or nitrogen) inflation pressure maintenance of tires is critical for overall tire, and ultimately, vehicle performance.**

*GM bulletins are intended for use by professional technicians, NOT a "do-it-yourselfer". They are written to inform these technicians of conditions that may occur on some vehicles, or to provide information that could assist in the proper service of a vehicle. Properly trained technicians have the equipment, tools, safety instructions, and know-how to do a job properly and safely. If a condition is described, DO NOT assume that the bulletin applies to your vehicle, or that your vehicle will have that condition. See your GM dealer for information on whether your vehicle may benefit from the information.*



**WE SUPPORT  
VOLUNTARY  
TECHNICIAN  
CERTIFICATION**

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# NEWS RELEASE

FOR IMMEDIATE RELEASE

Contact: Robin Pearl, N2Revolution  
954-838-7545  
[rpearl@n2revolution.com](mailto:rpearl@n2revolution.com)  
[www.purigen98.com](http://www.purigen98.com)

## ***Jeff Gordon Endorses Purigen98™— Safety and Environmental Friendliness Touted***

NASCAR superstar Jeff Gordon won't compromise passenger car safety for performance, that is why he supports Purigen98™, a high purity nitrogen tire inflation gas that stabilizes tire pressure and reduces its pressure loss.

"I have used high purity nitrogen in my race car tires for years and while winning is great, nothing is more important to me than the safety of my family," Gordon said. "Purigen98™ gives me that extra peace of mind, that's why I am putting Purigen98™ in my personal vehicles."

Gordon uses Purigen98™ in his cars, and now this superior product is also available to consumers. Although performance and safety are important to all motorists, increasingly so is the impact of automobiles on the environment.

According to the US Department of Energy, Americans waste 10 million gallons of fuel every day because of driving on under-inflated tires. Annually, this equals 3.6 billion gallons of fuel wasted and 77 billion pounds of greenhouse gases needlessly dispersed. The use of Purigen98 will significantly reduce this impact.

"Our country needs to be made aware of the significant benefits that Purigen98™ offers to all motorists, and we are extremely excited that Mr. Gordon has joined our effort," said Robin Pearl, president of Purigen98™.

Purigen98™ is available at better car dealers, tire stores and auto service facilities nationwide. Only Purigen98™ dealers are authorized to use the trademarked blue caps to show that tires have been inflated with Purigen98. Mr. Gordon and Purigen98™ are committed to help America's driving public reduce fuel consumption, save energy, increase safety and help reduce greenhouse gas emission.

### **About Purigen98™:**

N2Revolution, Inc, based in Sunrise, Florida., develops and manufactures leading-edge automotive solutions, its flagship product being Purigen98™. N2Revolution recently received the Emerald Award from Broward County in the Innovative Procedures/Process Improvement category and has been featured on MSNBC and in a number of broadcast and print media nationwide. Led by a team of distinguished veterans from the automotive, environmental, financial, engineering and scientific industries, the company is committed to developing high-quality, affordable and environmentally friendly innovations that enhance the quality of life of today's sophisticated consumer. For more information about N2Revolution and its energy-saving solutions, call 954-838-7545, e-mail [info@n2revolution.com](mailto:info@n2revolution.com) or visit [www.purigen98.com](http://www.purigen98.com).

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4025 First Street  
Livermore, CA 94551  
925-373-0660 • FAX: 925-373-9023

January 29, 2008

Big O Tires Franchisees of Nor Cal/Neva

To my fellow dealers:

I would like to take this opportunity to encourage you to consider adding nitrogen tire fills to your current product offerings. While I'm sure many of you, if not all of you, have been exposed to the benefits of nitrogen for the consumer, the benefit I would like to discuss with you are the benefits to your business and to the dealers in our region.

With our profit margins getting tighter and our competition getting tougher it is getting harder and harder to make a living in the tire business. We are constantly looking for new products, new processes and new techniques to give us that edge in the marketplace. I believe nitrogen is one piece of the puzzle. I purchased my generator in January 2007 and in four months the system was paid for. In the 8 months that have followed I have added over \$25,000.00 profit to our bottom line. I know that many of my fellow dealers are struggling to make a buck. Can you really afford not to add nitrogen to your business? It is my opinion (not one that Robin at N2 Revolution shares) that within five years we will have to include nitrogen at no charge with tire purchases. If this happens my equipment is paid for thanks to my customers. If I'm wrong, it just means that I'll continue to make money. Can you say the same? Also as a member of the regional marketing committee we have discussed advertising nitrogen on many occasions but there are not enough dealers that offer it. I feel it is just another way to differentiate ourselves from the competition, show our customers that we put their safety first and that Big O Tires is on the cutting edge of emerging technologies.

When I decided to offer nitrogen at the Livermore store, I looked at many different systems, some of which were less expensive. I went with the Purigen 98 system from N2 Revolution for several reasons. I felt it was important to differentiate our store from Costco by offering high purity nitrogen, which is nitrogen with a purity level above ninety-five percent. We have tested the purity level in Costco tires on many occasions and have made a sale with our nitrogen after analyzing the gas in their tires (it runs 85 to 92 percent). That is another thing that may allow me to continue to sell it when my competition is giving it away. I also liked the idea that it is the only unit to my knowledge that has a built in heater to produce high purity nitrogen even in low temperatures. I also had a comfort level because many of the Big O Stores in my area had already committed to become Purigen 98 dealers so there is continuity in our area.

I have been a Purigen 98 dealer and a N2 Revolution customer for just over a year now and I have found the company very helpful and customer centric. I would not hesitate to recommend them to any franchisee looking to add nitrogen to their product mix.

Sincerely

A handwritten signature in dark ink, appearing to read "Terry McCune", written over a horizontal line.

Terry McCune  
Big O Tires #5080  
Livermore, California



**October 7, 2008**

**PurigeN98  
N2Revolution, Inc.  
523 Saw grass Corporate Parkway  
Sunrise, Fl. 33325**

**Dear Mark Worden,**

**At the beginning of August this year I was very interested in adding Nitrogen to our service menu. I needed a product that I felt our customers would benefit by its use. This seemed like the perfect product that could enhance fuel economy, increase tire life, help reduce tire pressure monitor light issues and generate income for our Service Dept.**

**I already knew that Semi-Trucks, Airplanes, Military vehicles, and even Nascar was using it in their tires, so it has positive advantages for its use.**

**I wanted a machine with a large reservoir, portable, regenerates quickly, does 5 tires at once, easy to use and was rechargeable.**

**We looked a few different machines from different manufactures and even had a couple of on-site demonstrations.**

**The machine that was the right fit for us was the Purigen98 Mobiflator 6164. It had it all. Sixty gallon capacity, mobile on large casters, five at once fill lines, and is rechargeable so we "do not" need a 120v wall outlet when we need to use it. This last point was very important since we are going to put nitrogen in all of our new vehicles and could use the machine outside if we had too.**

**We bought our machine the middle of August, and to date have been doing so well with retail sales that the cost of our machine is literally paid off.**

**Sincerely,**

A handwritten signature in black ink that reads "Charles Salemi".

**Chuck Salemi – Lombard Toyota**



860 Tunnel Rd. Asheville, NC 28805 (828)298-4911

February 6, 2009

Clif,

Please accept our thanks for making us purchase the Nitrogen Machine from your company, purigeN98. Since the machine has arrived, and after your training program, it has been nothing short of another profit center for our fixed operations. With the variable operations in most dealerships struggling, I feel that as a Dealer Principal, I have to give our advisors every chance that I can to make a profit. Nitrogen filled tires are a no brainer and an easy sell. We are always looking for a way to capture a customer at a defection point, and for franchise dealers that point is tires. Nitrogen locks that customer to your facility and your process and your people.

We have also been very impressed by your attention to detail and personal concern with our people. The key to any program or plan is in the implementation. We feel that our people are very educated about the product and have a process in place to make it happen.

Thank you for your assistance,

A handwritten signature in black ink, appearing to read "Rhett Blanchard", is written over a horizontal line.

Rhett Blanchard  
President  
Asheville Dodge



Clif;

I wanted to thank you for introducing me to the Purigen 98 tire inflation system. With your nitrogen generator I have boosted sales and created a customer base that has to come back to my shop to get their cars serviced.

In the past I have had customers come in and say "don't touch my tires I have Nitrogen". Now I can convert even these customers over to Purigen for a small fee by showing them the purity of the nitrogen in their tires and educating them as to the difference. This keeps customers coming back to my shop and not the competition.

I and my employees also really appreciate the speed and simplicity of your machine. It takes a minute or less to connect to all four tires, enter the recommended tire PSI and start the machine. This allows us to continue to service our customer's vehicle without adding extra time to their wait.

The Purigen-Secure roadside that I am able to offer in conjunction with the nitrogen is a great selling point. Since most of my customers are female, they love the security of having a roadside plan in addition to the benefits of high purity Nitrogen in their tires.

Again Clif, I cannot thank you enough for all the hard work you have put into my shop with your training and continued on-site follow-up and for all the new business and income that you and Purigen 98 has brought to my shop.

If anyone has a question about your Nitrogen Program, have them contact me at any time.

Sincerely,

A handwritten signature in black ink, appearing to read "Willis Hudson", with a long horizontal flourish extending to the right.

Willis Hudson

Speedee Oil Change and Tune Up

1883 Hendersonville Rd

Asheville, NC 28803

828-654-7835



*World's Oldest World's Finest Motor Oil*

February 12, 2009

Mr. Jason Cohen  
*PurigeN98*  
523 Sawgrass Corporate Parkway  
Sunrise, FL 33325

Dear Jason:

I wanted to let you know how very impressed we are with our *PurigeN98* Nitrogen Program!

We compared *PurigeN98*'s offering to the others in the industry, and found that your Nitrogen system, quality standards, marketing materials, and support program far surpasses everyone else's.

I initially ordered your systems for our Clarksville and Oak Grove locations, and we were extremely pleased with the professional installation and first-rate on-site sales training we received from your staff. They were both professional and knowledgeable, and worked with our staff extensively in order to effect a successful launch. In fact, your Manager stayed an extra day to actually work with our customers, sell Nitrogen conversions, and show my staff how to take advantage of every opportunity.

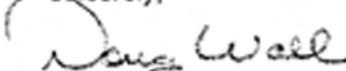
So far, our Nitrogen program has been very well received by our customers, and they appreciate the benefits that come with maintaining proper tire pressure: improved gas mileage, a safer ride, longer tire life, fewer TPMS problems, and fewer CO2 emissions. Based on our initial success, we've now purchased two additional systems for our Clarksville and Nashville locations.

The profitability of this program has *far exceeded* my expectations, and I'm very pleased with the positive impact it's had on our business performance at all four of our stores. Our average per customer paid ticket has greatly increased because of our *PurigeN98* Nitrogen Program. The equipment has performed well, and the ongoing support and follow-up from your Area Manager has far exceeded what was promised.

The *PurigeN98* program is truly a complete First Class package from start to finish. *I fully endorse it*, and recommend that anyone considering adding Nitrogen to their operation choose *PurigeN98*'s program. It stands head and shoulders above the rest!

If you have anyone who is considering the viability of Nitrogen or *PurigeN98*, or who has any questions, please have them call me at 972.489.1032 any time.

Sincerely,

  
Doug Wall  
VIOC Franchisee

*Convenient Car Care, LLC and Tenoco, LLC*  
*Independent Licensee of VIOC Franchising, Inc.*

*P.O. Box 3323*  
*Clarksville, TN 37043*

*Office 931.645.8100*  
*Fax 931.645.8100*



P. O. Box 1701 • Irmo, SC 29063 • Phone & Fax: (803) 798-5693

February 17, 2009

To Whom It May Concern:

Grease Monkey of Columbia South Carolina installed four of the Purigen nitrogen machines in our stores at the end of 2008.

The Purigen 98 machines have been an asset to our business. Our customers are starting to better understand the importance of having nitrogen in their tires.

The machines have been easy to use, and we have had few problems with them.

Cliff Mervine is our area sales representative. He has been very good at answering questions, and he has kept in contact with our four managers since installing purigen machines in our shops.

We look forward to the nitrogen business growing as customers become more familiar with the value of having nitrogen installed in their tires.

Sincerely,

Leroy Gibson  
Grease Monkey

5537 Sunset Boulevard • Lexington, South Carolina 29072 • (803) 356-1327  
119 Rabon Road • Columbia, South Carolina 29223 • (803) 788-8899  
5126 Old Bush River Road • Columbia, South Carolina 29212 • (803) 731-9638  
1101 Broad River Road • Columbia, South Carolina 29210 • (803) 731-5330