

The Right Purity for Your Customers

Nitrogen purity is an important part of the nitrogen inflation service, but what is the right purity? The correct purity is based on the pressure in the tire. There are two numbers you need to know; 93.4% for passenger tires and 97.7% for truck, SUV and fleet tires.

Dalton's Law as it Applies to Tires

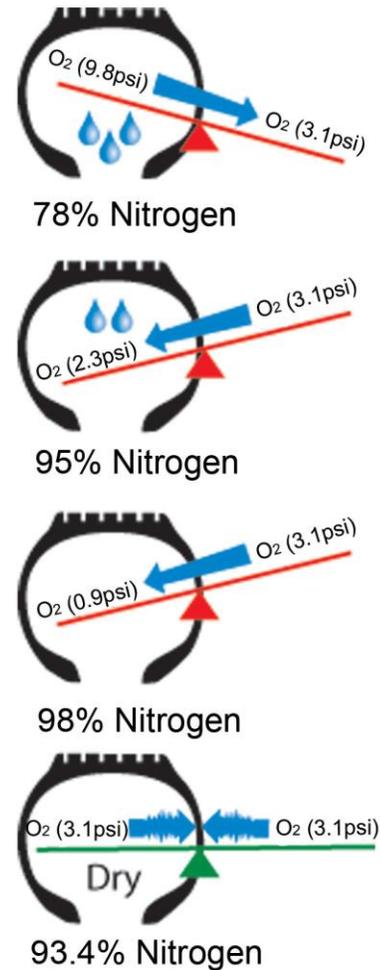
Oxygen and moisture are two major enemies of tires. Water vapor permeates out of a tire 250 times faster than nitrogen, and oxygen permeates out of a tire 3-4 times faster than nitrogen. These statistics highlight the true goal of nitrogen inflation, which is to minimize water vapor and oxygen from a tire. As it permeates through a tire, oxygen reacts chemically with the rubber molecules causing them to lose their strength and elasticity so they take on the characteristics of a non-rigid plastic. When you fill a tire with compressed air, oxygen and water vapor migrate out through the tire to the atmosphere, speeding up this destructive oxidation process.

However, filling a tire with 100% nitrogen will require you to factor in a law of science that you probably haven't thought of since school – Dalton's Law of Partial Pressures. This law states that if you have 3.1 psi of oxygen in the atmosphere, such as a tire, pressures will equalize based on the partial pressure not the total pressure.

Here's an example: If a 32 psi tire has 32 psi of N₂ and 0 psi of O₂, and the air outside the tire has 3.1 psi of O₂, oxygen will actually migrate back into the tire until the N₂ pressure inside the tire reaches 93.4 psi. Therefore, it is important not to fill a tire to a purity above this level. Otherwise, the ensuing oxygen migration back *into* the tire will contribute to the breakdown of the rubber compounds – just as it did when the tire was filled with regular air and oxygen was migrating *out* of the tire.

The Use of Tanks

Adding a tank will accomplish two things: it will increase your purity by 1 – 2% in the tire by creating back pressure on the generators and allow you to produce nitrogen while tires are deflating, thus significantly reducing inflation time. You want to size the tank that accompanies your system appropriately for the number of tires you fill. This will ensure that you have adequate capacity without becoming a burden to your generator and compressor. If your tank is too small and is easily depleted by a vehicle, it loses its advantage and you are now filling a tank and a vehicle, thus adding customer wait time.



There are Three Ways to Measure Purity

Machine/Membrane
-95%

In the Tank
-97.5%

In the Tire
-95%

Nitrogen in Higher Pressure Tires

It's important to remember that everything that is stated above is also true for larger, higher pressure applications such as truck and SUV tires. The difference is that with higher pressure tires a higher purity of nitrogen is needed to achieve the balance point. For a 100 psi tire, the optimal nitrogen purity is 97.7%. The following graph shows the optimal nitrogen purity in the tire over changing pressures.

**OPTIMAL N2 Percentages in a Tire at a given Tire Pressure
(Dalton's Law of Partial Pressures)**

