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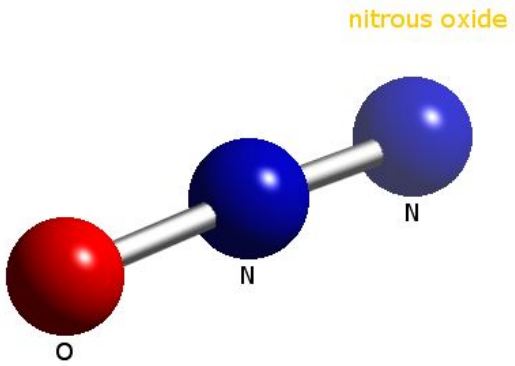
Nitrous Oxide (N2O) is a true enigma in the world of drag racing. It is without a doubt one of the most popular and most misunderstood products used to increase the horsepower of a high-performance racing engine.

Since the proper use of nitrous can be extremely useful in the quest for race winning performance, we thought that it would be a good idea to clear up some of the long-standing myths and misconceptions which have surrounded the innocuous gas since it was first introduced to the sport.

Before we delve into the various myths and misconceptions about nitrous, however, a brief look at how it actually works in a racing application is in order.

Remember when you were on a camping trip, and you cupped a handful of dry tinder that was just barely glowing from a spark ignited by your very last match? Chances are you blew gently on the little bundle until, miraculously, it flared up into a blazing fire starter.

In a very simple nutshell, that is the exact thing that an injection of nitrous oxide does inside a racing engine. Just as the added oxygen helped the handful of tinder burn intensely, the major way to increase the output of any engine is to burn more oxygen and fuel during each combustion cycle. Nitrous oxide or N2O is composed of two parts nitrogen and one part oxygen, and oxygen, along with fuel, produces power. When nitrous oxide is heated to 572 degrees Fahrenheit it breaks down and releases the oxygen into the mixture, and under ideal conditions, provides a substantial boost in power. Simply stated - the more oxygen you can deliver, the more power you can make.



Nitrous oxide injection also serves to boost power by cooling the intake charge. Nitrous is stored in the bottle in liquid form at about 1000 PSI. When it is released into the intake, it expands into a gas. This causes the temperature to drop considerably, which causes the density to rise. The denser the intake charge is, the more that will fit in the cylinder.

Interestingly, the use of nitrous oxide as a performance enhancement has been traced back to World War II, where it was employed to give both Luftwaffe and Allied aircraft "emergency" boosts in both airspeed and altitude capabilities. However, with the advent of jet propulsion at the end of WWII, the government's interest in piston-powered aircraft waned. And for the most part, nitrous R&D was shelved.

There were sporadic attempts at using nitrous oxide in racecars over the next few decades, but for the most part it was relegated to a shadowy, clandestine existence, and few people were aware of its existence. Finally, in the 1970s, nitrous "came out of the closet" and it has been a large part of the drag racing scene ever since. And when used properly, it is a safe, efficient and cost-effective way to produce copious amounts of horsepower in a racing engine. It is the epitome of the expression about getting “more bang for your buck.” So now armed with that information, we take a look at some of the most common bits of misinformation regarding the use of nitrous.

MYTH: Nitrous is Flammable

Basically nitrous oxide by itself is pretty innocuous – it really doesn't do anything. In the form of nitrous oxide it is not dangerous or flammable – it just serves as an oxidizer in a racing application. It doesn't become an oxidizer until it breaks down into its components – two parts nitrogen and one part oxygen. In a racing engine, under normal circumstances, when the N20 is heated to 572 degrees Fahrenheit, it breaks down and releases oxygen into the mixture, allowing extra fuel to be burned. It basically provides a highly concentrated oxygen source, and of course, the higher the concentration of oxygen the faster the fuel will burn.

Keep in mind, however, that while nitrous itself is not flammable, if there's a least hint of fuel in the intake, it will ignite, and the heat will cause the nitrous to break down and release a rush of oxygen to the fire, which causes an explosive flash. That's because it's a real lean fire – if it were a rich fire it would barely cough. Plenum intakes will almost always hold a trace of fuel after the car is shut down, and that's where the trouble can start. The nitrous itself, without fuel, is not flammable. All it does is add oxygen to the flame and make it burn better.

There are incidents of nitrous-injected engines spitting flames out the hood scoop from time to time, but in almost every case this is the result of carelessness and lack of proper procedures on the part of the racer and his crew. You'll see a lot of cars that don't have a shut off valve on their nitrous line, and they'll leave the nitrous on while they're towing the car to the staging lane. If they have a leaking solenoid and most of them leak to a certain extent, and the nitrous is on to the intake, as soon as they turn the power switch on they create a spark. With the ignitions we use in racing, as soon as the power is turned on a plug will fire at random. If it happens to fire the one in the cylinder where an intake is open, it will shoot a spark right up into the intake, and if the nitrous has been leaking, it will cause an explosion - all simply by turning the switch on.

Again, this is a totally avoidable situation, and in no way due to the use of nitrous itself.

MYTH: Nitrous Alone Make Horsepower

Injecting nitrous oxide itself does not make horsepower. The introduction of nitrous oxide allows more fuel to be burned at a quicker rate, increasing horsepower. So it is the extra fuel added with the nitrous that makes more horsepower.

MYTH: I Got a Bad Fill

You hear a lot of people say somebody gave them a bad fill and just pumped their cylinder full of air. This is not possible because if you fill a cylinder full of air its weight will not change significantly. If your bottle is not filled properly it will not be the correct weight. This misconception comes from people not monitoring bottle pressure when activating their system. If the cylinder is too cold the pressure will decrease, hindering performance. If the cylinder is overheated the entire liquid contents will flash into gas, drastically changing the mass flow of nitrous through your system. Most systems are rated for pressures ranging from 900-1050 psi, which with a correctly filled cylinder would be 90-100 degrees.

Installing a nitrous pressure gauge on your cylinder does not help you monitor how full your bottle is. The only way to correctly determine how full a cylinder is by weight. If you only have 2 lbs of nitrous left in your cylinder, you can heat the cylinder to obtain 1000 psi nitrous pressure. But in heating the bottle to obtain this pressure you have boiled off that 2 lbs of liquid nitrous into a gas and when the system is activated performance will be hindered drastically because nitrous systems are calibrated

for liquid nitrous. That is why your cylinder has a siphon tube that runs to the bottom of the tank to pick up and deliver liquid nitrous to your system.

MYTH: The Nitrous Used in Drag Racing is the Same as Dentists Use

When administered for pain relief, nitrous oxide is mixed with oxygen to prevent brain damage and unconsciousness. The nitrous oxide used by your dentist is the purest form available, however, and if it was available to the general public you could use it in your engine. The nitrous oxide that is available to the general public for performance enhancement has sulfur dioxide mixed with it to avoid substance abuse. There is no performance advantage to be gained by obtaining medical grade nitrous for your engine.

MYTH: Nitrous Can Damage Your Engine

Nitrous oxide itself can not damage your engine. However, improper tuning and misuse of a nitrous system can cause drastic parts failure as will any mistuned turbo system or supercharged system. If you lean out or detonate any of these combinations engine damage will occur. Most nitrous systems, if used as directed, will not cause damage to your engine. Most people purchasing a nitrous system are looking for an edge on their competition. Carelessly attempting to tweak more out of their combination then the equipment was designed for, however, as in any performance engine, can and ultimately will result in engine damage.

Nitrous systems are constant flow, this means that at any engine rpm you are injecting the same amount of nitrous and fuel. Most systems are not designed to be used under 3500 rpm, below this rpm the engine is spinning so slow that the cylinder is overfilled with nitrous and fuel causing combustion pressures that are too hard for most engines to sustain.

When disassembled, an engine with a correctly tuned nitrous system will have no signs of fatigue anymore so than an engine run just as hard with no nitrous. In many cases, boosting performance with nitrous oxide will prove to be more reliable and less maintenance dependant than using exotic camshaft profiles and high compression pistons.

What is better a “wet” kit or a “dry” kit? It all depends on the application. A "wet" kit is ideal for both normally aspirated applications as well as forced induction applications. It can require a little bit more installation time than a "dry" kit, but is easier to tune if greater than stock HP settings are to be experimented with. A "dry" kit is excellent for normally aspirated combinations that have a return style fuel system. They are very easy to install and are a great "first time" nitrous system. It is not recommended that "dry" systems be used on forced induction engines.

Can I use nitrous on a stock engine? How much can I use? Yes. NOS manufactures systems far virtually any stock engine application. The key is to choose the correct kit far a given application; i.e., 4 cyl. engines normally allow an extra 40- 60 HP, 6 cyl. engines usually work great between 75-100 extra HP small block V8’s (302/350/400cid) can typically accept up to 140 extra HP, and big block V8’s (427-454) might accept from 125-200 extra HP. These suggested ranges provide maximum reliability from most stock engines using cast pistons and cast crank with few or no engine modifications.

The purpose of purging - as we stated earlier nitrous systems are calibrated to be used with liquid nitrous when you connect the line to your cylinder and open your valve. The air that was in that line is now compressed forward towards your nitrous solenoid. Purging allows this compressed air to escape and pulls the liquid forward to your solenoid, allowing a correct mixture of nitrous and fuel at

the initial activation of the system. The purge is also used to relieve pressure from the system after use when the valve is closed.

The expansion of nitrous - Nitrous oxide expands with a rise in temperature. When you turn on your nitrous bottle and purge your line, you fill that line with liquid nitrous as long as your bottle is open. As temperature in that line increases due to under-hood heat, the pressure increase may use the bottle as a reservoir. But once you purge that line, if you close your bottle the nitrous in the line has no where to bleed off expansion and will rupture if not purged out. This is a rare case, but if you see a line rupture it is usually when the bottle is closed after the line has been purged. If you make run and come back and turn the bottle off without purging the line, the expanding nitrous will also put an extra strain on your solenoids and plungers, cutting down their life expectancy dramatically.

Filling your bottle - People are always taking their bottles to the local speed shop and asking "hey - can you squeak me in an extra pound or two, buddy?" That is definitely not what you want if you're looking for optimal performance. If you need more nitrous capacity, buy a larger cylinder but do not overfill your bottles. If you had a clear ten pound nitrous bottle and filled it with ten pounds of nitrous, you would see that two thirds of the cylinder was full of liquid and the top third was a layer of gas. That layer of gas is called a pressure head. That is what gives you your pressure stability. If you overfill your bottle, you decrease the size of that pressure head and when you begin to siphon nitrous from your cylinder the liquid can not boil off fast enough to maintain a decent pressure curve. In this case, more is not always better.

Tuning for air - Of all engine combinations, a nitrous engine is the least affected by air quality changes. The reason for this is because a nitrous racer carries his own atmosphere with him in his

nitrous bottles. The outside atmosphere is only responsible for one half of his engine's horsepower. We are not saying that air conditions do not have an effect on a nitrous car but rather that they are just not as drastic as in a non-nitrous naturally aspirated or supercharged engine where the outside atmosphere is responsible for 100 % of the horsepower. Since a nitrous engine is still naturally aspirated in the sense that it has to draw outside air in, the barometric pressure is responsible for how much nitrous a given engine will swallow before it spits it out in a form of reversion. There is also the side that without any water in the air in the form of humidity your nitrous combination will be more prone to detonation.