

### For Pointy Heads

*Its time for a chemistry lesson on why nitrous works the way it does. N<sub>2</sub>O is a colourless and almost odourless gas and is quite un-reactive with most other substances at room temperature. However, the fun starts when nitrous is heated sufficiently, as it breaks down, decomposing exothermally into its base constituent elements. Through the heat of combustion, the following chemical reaction takes place: Two molecules of nitrous oxide (2N<sub>2</sub>O) decompose producing two Nitrogen molecules (2N<sub>2</sub>) and one Oxygen molecule (O<sub>2</sub>). This benefits the WRX engine (or any turbocharged engine) in four ways: Firstly the additional Oxygen available makes it possible to burn a lot more fuel efficiently liberating more engine power. Those free molecules of Nitrogen left over when nitrous breaks down have a cushioning effect on the burn process, stabilising the speed of combustion, controlling the flame-front as it travels across the combustion chamber. Effectively chemical supercharging, N<sub>2</sub>O boosts exhaust energy greatly at low RPM where spooling the turbocharger much earlier than before. Lastly another physical property of nitrous comes into play. Injected into the engines intake airstream in the form of a liquid under high pressure, it immediately flashes into a gas absorbing large quantities of latent heat from the intake charge, boosting its density, while helping to protect against detonation. Knowledge is power!*

## 13.11 Nitrous Oxide

Bottle fed, laughing gas, N<sub>2</sub>O or just “on the bottle” are a few of the amusing terms used to describe the use of nitrous oxide in automotive applications. The power boosting properties of nitrous oxide for internal combustion engines first came into serious use towards the end of World War II, used by the Germans in order to improve the performance of their piston-engined fighter

planes at high altitude where air density is low. German engineers didn't have access to high octane aviation fuel that allied engine manufacturers did, and couldn't run supercharging boost pressures high enough to provide the power required for combat operations. Nitrous oxide was used to increase power.

For some time now nitrous has been mostly the domain of the drag racing fraternity, V8 engines and Saturday night specials. This paradigm is changing, as tuners and enthusiasts alike are coming to appreciate really how well a properly engineered nitrous system and turbocharging can work out on the road.

### 13.11.1 Nitrous Oxide Basics

First and foremost, a solid grasp of the reality lever is required here. Laughing gas has almost miraculous properties for increasing power outputs, but your basic mechanical package must be capable of handling the additional grunt. Tacking on a 250kW nitrous kit onto a bog stock 65kW Corolla is an extreme example, with the poor little Toyota engine more than likely exploding under all that extra load. Jokes aside, three main areas should be considered carefully before putting your WRX on the bottle if you want good achieve good results and keep heartache to a minimum.

It must be clearly understood that not only must the basic engine package be strong enough, but it must have sufficient margin built into its tuning in order to absorb increases in power safely and without initiating a self-destruct sequence. A very strong engine that is already tuned and stressed to its limits will be pushed well past what it can handle given a whiff of gas.

Fuel systems are commonly overlooked. The same principles that govern mechanicals apply; a badly over-taxed or under engineered fuel systems simply won't cut it when called on to feed a nitrous engines appetite for fuel, and is a great way to turn pistons into ashtrays.



Boot Mounted Nitrous Tank



Nos Nozzle In Intake Pipe