HUB DYNO'S vs ROLLER DYNO'S

It's just two bits of rubber isn't it?

With the release of the Mainline ProHub series chassis dynamometer's in 2014, and the popularity this new dyno technology has gained with workshops frustrated with roller dyno's for their extreme horsepower vehicles, we thought we would explain some differences between both types of dynamometer systems, and why the results vary on each type of dyno.

First and foremost, wheels and tyres of a motor vehicle are an "inertial mass", and as such, consume horsepower during acceleration. The *"acceleration"* we are interested in is the acceleration of the wheels and tyres during a "Ramp" or "Graph" test on a typical roller type dynamometer.

During a Ramp Test on a Mainline Dyno, the Inertial losses of the dyno components are a known fact, and are accounted for in the final horsepower result, but, the vehicle's wheel and tyre Inertia, and in fact the rest of the vehicle's drivetrain's inertia is an unknown fact (without involved testing), the inertia of the vehicle's drivetrain should not be assumed.

To make it easy to understand for all technical levels of readers of this article, the average amount of horsepower consumed to accelerate a set of street car wheels and tyres, is around 30 – 40 horsepower and this number increases as the acceleration rate increases. So at a bare minimum, typically you will gain at least 30 to 40 horsepower just by taking your wheels off and bolting your car up to, and running on, a hub type dyno. (Power at the roller vs power at the axles)

The next loss we need to talk about, is *"tyre loss",* which is the loss associated with running a rubber tyre on a knurled steel roller surface, and unfortunately despite what many people think, it is not a 100% efficient process, meaning there is always some "slip" or loss. With higher horsepower levels, the tyre loss factor can increase significantly as a result of soft tyres, designed for good traction on roads, but not on steel rollers. To better understand tyre loss, think about why a drag car that can go over 300kph at the drag strip, but can still be somehow tested on a roller dyno speed limited to 240kph. The answer is significant tyre loss or slip. Some of the speed differential , between what the vehicle speedometer shows and what the actual roller speed shows on the dyno, is due to the tyre "compressing" or "deforming" when under load, so the rolling radius of the tyre reduces due to being strapped down on a roller dyno.

It is true that, with the right tyre, wheel size, tyre pressure and vehicle strap down method, you can hold and record quite high horsepower figures, of around 2000RWHP. By and large, the wheels and tyre used on the average street car, are not those used on a typical "Dyno Queen", and hence, the never ending curse *of "I've got wheel spin on the dyno".*

Use a Mainline ProHub dyno and these issues are eliminated, but what many people expect is the norm for a given car and engine combination can now be quite different, and can cause quite a lot of confusion, due to the elimination of tyre loss and reduced vehicle inertia (no wheels & tyres). Some typical differences we have seen include many XR6 Turbo Falcons that have picked up 100RWKW, from 580kW to 680kW for example. Another example is a customer who went from owning an AWD Mainline dyno to a ProHub 4000 dyno. The best he had seen previously on a typical heavily modified R35 GTR on his roller dyno was 1300RWHP (these cars at this power level have the front shaft removed and run as RWD), but when bolted to his PH4000 the same boost levels netted over 1500AHP (Axle Horsepower). The difference now on his Hub Dyno was, he was no longer limited to what he could do now as far as boost went, so within two years the GTR performance market now has cars making over 2400 Axle horsepower as the new norm !

We hope this helps to explain the differences between the power results obtained on a roller type dyno and Mainline ProHub Chassis Dynamometer.