

More dyno stuff

What needs to be considered here as most readers are looking for some correlation of wheel HP to engine HP.

The following quoted phrases are from 2 recent articles about chassis dyno testing.

From Car and Driver

"There's no really accurate way to get engine horsepower from a chassis dyno," says Matt Harwood, marketing coordinator for Mustang Dynamometer, a major supplier of chassis dynos in Twinsburg, Ohio. Some tuners use the so-called 15/20 rule, which assumes a 15-percent driveline loss for manual transmissions and 20 percent for automatics. But, says Harwood, "I've seen losses as high as 35 percent." So unless it's printed in the brochure or was measured on a true engine dyno or by a tuner with tons of experience with your particular brand of car, any flywheel horsepower number quoted by a hot rodder under the shade tree is most likely just a calculated guess."

And from Hotrod Magazine:

The Truth: Are Chassis Dynos Legit?

What you need to know about getting your car tested

"There is really no way to measure, predict, or otherwise determine engine flywheel power from a chassis-dyno test with any repeatability."

I would like to add this:

A major misconception is that flywheel HP and flywheel torque can be measured from a chassis dyno. The ONLY thing a chassis dyno measures is wheel torque and engine RPM that is generated while the vehicle is either accelerated under full throttle in one gear (inertia dyno) or the dyno loads the drive wheels (or axles) while trying to maintain a constant RPM (load dyno). HP is calculated from torque measurement at various RPM increments and the two are presented in a graphical format.

There are many things between the engine and the drive wheels that will also cause a loss and this is referred to as "driveline loss". Most people try to back into flywheel torque and HP by wheel torque measurement and then "convert" to wheel HP and then add in an assumed driveline loss. The driveline loss was usually expressed in terms of percentage loss, which is absolutely incorrect!

Many if not all dyno shops use a % of loss for the drivetrain that can vary between 15% to 25%. This type of calculation can be very misleading and produce crank HP numbers that are not correct!. I recently saw a person who had done a dyno test of his '91 M5 and he reportedly got 245 HP at the wheels. He then backed into crank HP by saying that a stock M5 should have 310 HP at the crank so his drivetrain loss was 21%. He then went on to rebuild the engine that increased the displacement (stroker) to 3.9L. and did another dyno test he got 365 at the wheels. Using his logic and 21% drivetrain loss he reported that he had 462 HP at the crank.

Now why would he have a loss of 65 HP in the drivetrain with the stock engine and a loss of 97 HP after he rebuilt the engine. Same transmission, same driveshaft, same differential, same brakes, same tires. If he were correct in the first case of a loss of 65 HP in the drivetrain (310HP crank HP to 245 wheel HP) then he would have the same HP loss after installing the stroke engine. Measured wheel HP of 365 plus drivetrain loss of 65 HP equals 430 crank HP. Big difference between 430 HP and 465 HP.

One thing that can be said, wheel HP is what is measured and that is the number that should be fairly close to reality, any other number using a calculation method is only a guess. Using % loss for drivetrain is NOT an accurate method! Based on dyno testing that I have done and witnessed, firstly using an engine dyno and then a wheel dyno with the same engine with a known and measured crank HP showed that most BMW big car powertrain loss will be in the 50 to 70 HP loss range. Why the variance? Manuals have less loss. Gear ratios effect loss to some degree albeit small. Lubricant have an effect, thicker lubricants have higher loss, colder lubricant have higher loss, brake drag varies to a small degree, if a wheel dyno rather than a hub dyno is used a slight bit of tire friction will cause a small additional loss etc.

To equate this to an E31 reality:

First scenario:

A stock 1991 850Ci 6 speed is on the chassis dyno and it measures torque that calculates out to 234 HP at the wheels. If we were to take BMW published engine HP numbers (flywheel HP) that would be 300. OK, 300 into the driveline and 234 out of the driveline would equal 78% output or the driveline would loss about 22%.

Second scenario:

The engine is replaced in the same vehicle with a 1994 850 CSI stock engine and then dyno'd. The wheel numbers measure out to 315 rear wheel HP. Using the above driveline loss of 22% would calculate out to 404 flywheel HP, right? That is what everyone does! Must be right!

Totally wrong! IF of loss is calculated in terms of percentage, in the first case the loss is 65 HP, in the second case the loss is 89 HP. Same car just a different engine. The driveline wasn't change at all, why would the driveline loss when expressed in HP go up just be cause we changed the engine? It doesn't, This is where the mistake is made. The loss of the driveline is a constant and will not change with an increase or decrease of input HP. The loss of the 1991 850Ci 6 speed is typically 65 HP, automatics have a little less loss at around 60-62 HP on average.

If, in the second scenario, the measured wheel HP of 315 HP was added to the driveline loss of 65 HP the Flywheel HP estimate would be 380, right where it should be.

Again, when you use a wheel or hub dyno, the only thing you can say for sure is what has been measured at the wheels and that is wheel torque and calculated HP, crank torque and HP is purely an estimate or speculation.