

Performance Talk

by Tim Logsdon, Brand Manager, 602-206-3520

Arrowhead HD - Chandler HD - Tucson HD

How Torque and RPM Work Together

(For All You GearHeads Out There)

Okay riders, lots of articles have been written about Torque, RPM, and Horsepower. If you are a techie then Read On. If not, then go to the last sentence – it's what matters anyway!

Torque Rules

Torque is simply a Rotating Force. It is the potential to DO work. Hold a 10# weight with your arm (about 2 ft. long) straight out. The torque on your shoulder is: $10\# * 2\text{ ft.} = 20\text{ft}\#$.

Your piston(s) push DOWN with a force during the combustion cycle against your crankshaft to produce TORQUE.

Three observations:

1. Nope. No HP created yet, only torque. When the crankshaft rotates . . .

THEN we make HP.

2. Want more torque?

- increase the force against the piston (bigger bore and add air/fuel); or
- Increase the stroke.

3. No substitute for good 'ol cubic inches!

RPM (can't get enough)

Simple. Increase cubic inches for torque and increase RPM for horsepower.

How are RPM and Torque related to Horsepower?

Back in the Day, they discovered that a horse could move a 550lb. weight one foot in one second. Wow. HP really IS related to "horse"-power!

Why do all of those Torque vs. HP curves in the magazines ALWAYS intersect at EXACTLY 5,252 RPM?

If you like math:

$550\#/second * 60\text{ seconds}/minute = 33,000\ \#/minute$

circumference of a circle = $2 * \pi (3.1426) * \text{Radius}$

$HP = \text{Foot}\ \# (\text{torque}) * 2 * \pi * \text{Revs}/minute (RPM) / 33,000$

~OR~

$HP = \text{Torque} * RPM / 5,252$.

So "5,252" is only a constant to convert ft.lb/second to something useable for engines (that make torque and have RPM).

Let's Look At Two 100 HP Bikes (Get out your calculators)

The 100HP Crotch Rocket

70 ft. lb. (torque) * 7,500 RPM/5,252 = 100HP

Twist the throttle and you have 70 ft.lb. on tap. Nice, but not great – until we start revving higher and build HP. Want more performance? Then shift near redline (maximize RPM) and add more air fuel (more torque) by modifying fuel system and exhaust.

The 100HP Big Twin Cruiser

100 ft.lb. (torque) * 5,252 RPM/5,252 = 100HP

Twist the throttle in any gear and Wow – 100 ft.lb. of torque feels great! Who cares if acceleration (building RPM and therefore HP) takes some time.

Why do Sport Bikes and Big Twins feel so different to ride yet have similar HP?

The answers require a better understanding of our good friends, Torque and RPM. The sport bike needs Higher RPM to achieve HP in this example. Downshift and rev-high! Sit back and twist the throttle on the Big Twin! The torque is at your service to deliver HP in any gear (wide RPM range).

Summary

So, let's all be friends. After all, with 100HP, what is there to argue about?
Tim Logsdon