



Fetling your fueling for real-world rideability

POWER COMMANDER DYNO TUNING

WORDS AND PHOTOGRAPHY: CHARLES EVERITT

This story is *not* about boosting your bike's peak horsepower. You need to know that right from the get-go. Because, although some riders obsess to excess about the biggest numbers their bike's engine can pump out on a dyno (not that there's anything *wrong* with that), generally they'd be far better off trying to pump up figures that enhance rideability instead. Such numbers reside much farther down the rpm range and at smaller throttle openings than the WFO-at-red-line figures associated with peak-power values. And *that*—rideability, not bragging rights—is precisely what this story is about.

Why is rideability such a crucial and desirable quality? Because unless your street address includes words such as The Corkscrew, Stavelot or The Karussell, most of us do the majority of our riding at lower road speeds that correspond to the reduced rpm, small throttle openings and lower gear ratios that practically define rideability.

Not coincidentally, that's the same territory the engine visits during emissions testing. In order for the engine to pass ever-tightening standards, manufacturers have little option but to lean out the air/fuel mixture well below what would yield best power. Such a diet is what creates awkward dips in the torque curve, which in turn causes stalling, fluffy throttle response and flat spots so big

you could park a squadron of C-17s on them.

You probably know the answer to these fueling follies, or you've at least heard about it in a different context: Dynojet's Power Commander. First sold in 1997 for Suzuki's TL1000S and TL1000R, the popular little black box has since evolved into the Power Commander III USB. The PC's mission has always been to alter a bike's fueling, and the III USB does so by changing a fuel injector's pulse width; that is, the length of time it spews high-test. More or less fuel richens or leans out the air/fuel ratio.

Dynojet's Tuning Link software really took such tuning to the oft-mentioned Next Level. Tuning Link controls the Power Commander III USB and the firm's Model 250 dynamometer, making it not only possible but easy to optimize an engine's air/fuel ratio, automatically, a process known as custom mapping. Yes, with each PC, Dynojet does include a base map configured for a variety of aftermarket pipes and air filters, as

play nice with aftermarket pipes, air filters, cams and other hot-rod parts. Unfortunately, the PC's success in that theater almost certainly and inadvertently narrowed its usage. Conventional wisdom said Power Commanders were only necessary for modified motorcycles, probably all of them racebikes anyway, and therefore a waste on stock bikes.

That could hardly be further from the truth. Our test subject was an '06 Yamaha YZF-R6, a brilliant track bike, but also one that exhibits fairly serious rideability issues on the street: It requires unusually high revs to get away cleanly from a stoplight, throttle response below about 6000 rpm feels dull and flabby, and power finally comes in—harshly—above that figure.

We rode the R6 to Mickey Cohen Motorsports (www.cohenmotorsports.com, [714] 993-5000), a Dynojet-approved Power Commander

There are hundreds of such Tuning Centers in the U.S., and the operator must undergo two days of training.

A Tuning Center, Cohen says, "has the expertise to accurately read the air/fuel ratio, so they can then optimize that ratio" over a combination of essentially eight throttle-opening percentages (05, 10, 20, 40, 60, 80, 100), and from approximately 1500 rpm until the rev limiter kicks in (in this case around 15,800 rpm), in 250- or 500-rpm increments. Each box in the resulting chart has a whole number: 0 indicates no change from the bike's stock fuel-injection mapping, numbers greater or less than 0 indicate percentage values over (richer) or under (leaner) the stock mapping.

After more than two dozen dyno runs on our R6 (not all of them to the rev limiter), Cohen had created a custom map that was nothing short of a revelation in terms of rideability. Using an air/fuel ratio of 13.2:1 (which Dynojet has found to be optimal for most Japanese inline-fours), the custom map showed

to stock, but maximum horsepower leapt by 5 bhp.

Sharp eyes might notice another small dip around 8000 rpm. That's due to the R6's fly-by-wire system, which won't allow the butterflies to open more than 60 percent below 9000 rpm. You might also note a negligible change in the upper part of the rev range. That's because, Cohen said, a stocker's ECU generally calls for an air/fuel ratio of 13.2:1, except in the operating range where emissions testing takes place; there's just not a lot of room for improvement on a stock motorcycle. Otherwise, though, from looking at the air/fuel ratios measured by an exhaust-gas analyzer, he said, "You *know* that's a home run."

Riding the R6 post-op showed just how right he was. Cohen says the comment he hears most often is how smooth the bike is; that is, how smoothly and accurately the power delivery and throttle response have become. And smooth is actually quite an accurate descriptor. By overlaying a 13.2:1 ratio on the R6's fuel-injection maps, fueling simply becomes more consistent. As a result, the engine's torque and resultant power both flow more smoothly; consistency equals smoothness.

As another editor noted, "I remember the R6 took a *lot* of revs and clutch-slipping just to keep up with traffic going away from a stoplight, and even

more to get ahead of them—not anymore, though. And while it still has that great rush of power on top, the trip getting there is so much smoother."

So, with a Power Commander and a custom map, the R6's rideability improved dramatically. Of course, your results might vary with another bike. And, admittedly, a PC plus dyno time isn't exactly chump change. But it is a near-certainty that once you've had it done, you'll wonder why you waited so long.

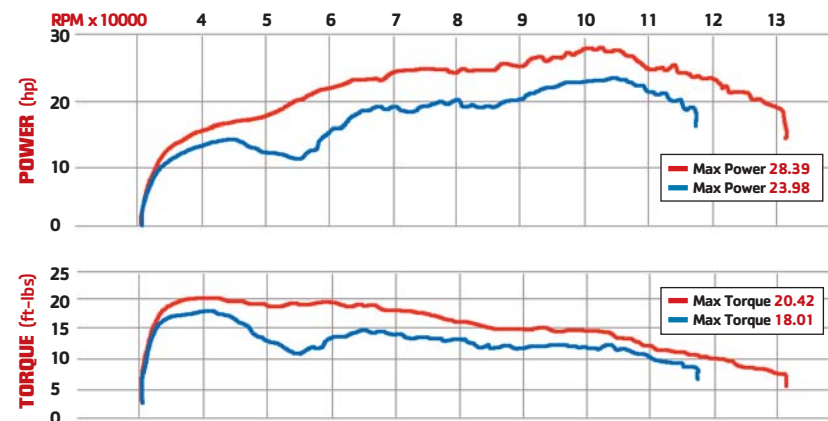


Chart shows R6's horsepower and torque at 20 percent throttle. Notice how custom mapping (red line) adds 8 horsepower and 8 lb.-ft. of torque over stock (blue line) at about 5500 rpm.

well as stock. Plus, you have access to all of Dynojet's maps on its Power Commander Web site. But even the company itself says a PC with the right base map should provide 85 to 95 percent optimization of the air/fuel ratio. It takes custom mapping to get that last 5 to 15 percent.

Dynojet's sophisticated hardware and software has, for the better part of a decade, been associated with making modern fuel-injected motorcycle engines

Tuning Center, and an excellent choice in hindsight both for Cohen's experience and expertise, and for his sheer enthusiasm. "I love dyno work," he says, and you'll believe him. "You always learn something in there [dyno room]." The Power Commander III USB itself retails for \$339.95 (as do almost all of them for inline-four-powered motorcycles), and Cohen charges a flat \$250 for custom mapping.

improvements over stock almost everywhere, with the biggest jump coming at about 5500 rpm. There, at 20 and 30 percent throttle openings, the stocker's horsepower and torque curves sagged noticeably (green line is stock, blue line is for the base map, red is for Cohen's map). But with Cohen's mapping, the PC-equipped R6 showed a huge jump of 8 horsepower and 8 pound-feet of torque. At 30 percent throttle opening, peak torque remained almost identical