



## KAWASAKI ZZR1400

### 100% throttle:

➤ Here's a 2006 (red) Kawasaki ZZR1400 and a 2008 model (blue). The 2008 bike has a little more power at low and mid-rpm, but the difference isn't great. These are the lines you see when we show a 'normal' dyno run. As an indicator of what the motor can do at its optimum, it's a good graph. As an indicator of what the bike feels like to ride, it's next to useless.

Kawasaki claimed a better bottom-end response, but nothing as dramatic as this. They say this is simply down to widening two connector pipes on the exhaust downpipes – but there must also be some serious engine management going on to produce this kind of improvement.

### 20% throttle:

The changes are less obvious, but the new bike is still the more responsive.

### 10% throttle:

Almost equal again. Like the full throttle run, all these throttle positions represent a snapshot – when we ride we're constantly moving through throttle openings, with the ECU choosing the best fuelling and ignition map.

### 40% throttle:

➤ This is where it changes. We're still in the same gear as the top line (fourth) but with the throttle held open at 40%, the difference between the two engines up to 6000rpm couldn't be greater. The 2008 bike has a massive bulge of power – more than the '06 bike at full throttle.

## Case One

### Kawasaki ZZR1400

➤ Kawasaki's hypersports tourer was launched in 2006; on the dyno the fuel-injected 1352cc in-line four made 170bhp. This is what engineers said at the launch when we asked them what the hardest thing about building a 170bhp bike was:

'The first thing is controllability – making sure the rider can use the power. We worked very hard to make sure the ZZR can be ridden easily at any speed. For low speed we need to control the engine and make it easy to ride, and at high speed we need a lot of chassis stability. We wanted to make sure the bike wasn't intimidating to ride in the rain or at low speeds, even if a rider wasn't cautious with the throttle. So we refrained from giving the engine too much torque in the lower rpm range.'

Unfortunately they refrained too much. Some road testers complained about the lack of bottom-end performance – opening the throttle in the lower gears resulted in

less-than-stunning acceleration. So here are the engine changes Kawasaki say they made to the 2008 ZZR1400: revised intake port shapes, finer injector nozzles with a wider spray area, larger exhaust chamber volumes and pipe lengths and a third catalytic converter in the exhaust collector box. Not a great deal, it would seem.

Kawasaki also enlarged the connecting pipes between the exhaust downpipes by 75%, which they reckoned accounted for a substantial increase in 'low rpm torque'. The engine also got a new ECU with, presumably, a whole new bunch of fuelling and ignition instructions.

The graph shows what's happened, comparing the 2006 ZZR (red) with the 2008 bike (blue). On the face of it, the big story is that up to 5000rpm the 2008 ZZR makes more power at less than half throttle than the 2007 bike did at full throttle. Which is amazing enough and explains why the new bike feels so much more lively than the previous one (and it's

something we wouldn't have been able to explain without a part-throttle dyno run).

But look a little closer – the really clever trick is that small throttle openings (10%) and full throttle (100%) are relatively unaffected; the big changes are exactly where Kawasaki want – at 20-40% throttle. Their engineers have pinpointed precisely where and how they want to change the power delivery – and then changed it. The engine changes account for some of the

**'The engineers pinpointed precisely where and how they wanted to change the power delivery'**

change, but much will be down to fuelling and ignition modifications. This kind of precision tuning would have been impossible a few years ago.

Tellingly, we wouldn't have been any the wiser if we'd only looked at a full-throttle dyno run. The fact is Kawasaki have made a huge change to the way the ZZR1400 feels to ride – which we described in our test (March issue) – but which remained hidden. Until now.