

## **Actual tire sizes vary by brand and can affect handling. Do the Tires Suck, Or is it Chassis Geometry?**

**By David Swarts**

Changing tire brands can change your lap times, but not necessarily why you might think. How each tire affects your bike's chassis geometry may be more critical than a change in rubber compounds.

Imagine that you go pretty good around the track on Brand X tires. Without changing anything else, you switch to Brand Y tires sold for the same bike, go back out on the track, ride exactly the same, lose the front end, and crash.

Some people say, "That's just how Brand Y is." Others say, "You didn't give them enough time to heat up." Then someone states, "You're a cheesy squid who can't ride on any tires." Ouch!

In fact, changing brands of tires—even in the same labeled sizes—can have a profound effect on the handling of a motorcycle. Despite being labeled with the same width and sidewall aspect ratio, different brands of tires will rarely have the same diameter, or height. And a different diameter tire will change the geometry of a machine and the way it handles. A rider could be left searching for a whole new set-up on a practically brand new motorcycle.

The same thing can happen when switching tire sizes, a good example being the case of GSXR750 riders switching from an OEM Dunlop D207 190/50-17 rear street tire to a Dunlop D207 GP 180/60-17 rear racing tire. The D207 GP's diameter is 641mm, 13mm greater than the diameter of the D207 street's 628mm. That change raises the rear axle 6.5mm, making the rake 0.4 degrees steeper and reducing trail 3mm. Depending on the initial set-up, that can be enough difference to make the front end tuck when the rider is off the gas.

In some cases, switching from a dry pattern tire to a rain tire—even with the same brand and labeled size—will cause handling problems because the rain tire has a different diameter than the dry tire. Such a change can increase a tendency for the front to tuck when that's the last thing a rider needs on a wet track.

Let's consider the real-world example of Todd Harrington, best known for his 1996 AMA 600cc Supersport win at Road America. For many years, the 4&6 Racing rider was a loyal Dunlop customer even though he wasn't getting anything more than a discounted price. But the tires were good, and so was Harrington's relationship with Dunlop.

Coming into the 1999 season Harrington heard good reports about the new Michelin Pilots. "But every manufacturer with a new tire says that," said Harrington skeptically. "Then I saw what Josh (Hayes) was doing."

Hayes, a Team Valvoline EMGO Suzuki rider, qualified third for the AMA 600cc Supersport race at Daytona on Michelin Pilots.

That was all it took for Harrington and 4&6 owner Jim Rashid to decide to try the Pilots. Rashid not only operates the Chicago-based 4&6 Cycles, he recently became the latest owner of a G.M.D. Computrack franchise.

Rashid took Harrington's 1999 Kawasaki ZX-6R with Dunlops and set it up according to Computrack's "sweet numbers." The closely guarded sweet numbers are a guideline for chassis geometry settings that optimize handling characteristics. Both Harrington and Rashid realized that small changes in one area can have a relatively drastic effect in many other aspects. Still new with the Computrack system, Rashid decided to consult Kent Soignier of the G.M.D. Computrack Atlanta location for his experienced input.

Soignier had already measured the new Michelins, so Rashid plugged the numbers into the "What If" program of the Computrack computer and transposed them onto the computer model of Harrington's bike to see what effects it would have on the geometry and what he could do to compensate for the new tires. Computrack's "What If" program allows theoretical changes to be made to a motorcycle in the computer with a mouse rather than in the hot pits with wrenches and a tape measure.

Rashid entered the new tire diameter, and the computer told Rashid that he would have to lower the front 6mm and raise the rear 12mm to compensate for the different dimensions of the Pilots compared to the D207s. Those are big changes in ride height. "Usually one or two millimeters makes a big difference," underscored Rashid.

With the chassis of his ZX-6R optimized for the Michelins, Harrington was able to lower his best lap time by 0.5-second after just 10 laps. Now, this is not some Novice racer dropping time while learning a track. This is a professional racer dropping a half-a-second from 1:56s to 1:55s on Thursday afternoon at Daytona.

With the chassis optimized for the new Michelins, Harrington knew before he went out that he would have exactly the same motorcycle as before, except with different tires. "I knew that I only had to concentrate on the feel of the new tires," Harrington explained.

When Harrington dropped his times without even going 100 percent, he knew that he had found an improvement with the new tires. In fact, the Pilots allowed Harrington to brake so much harder and later that the team had to add compression damping to keep the front end from bottoming. Harrington was also getting more traction at the rear, so the front was lowered further, and his lap times continued to fall.

A good tuner and rider could have taken the measurements and figured out the proper adjustments by trial and error—but certainly not in just 10 laps. Realistically, it could've taken all weekend to find a revised set-up that worked.

Harrington wasn't the only rider at Daytona to find that changing tire brands required geometry adjustments. When last year's Formula USA Champion Michael Barnes came over to buy some fuel from Rashid, he mentioned that he was also running the Pilots. "Barnes said that they felt good but not perfect," said Rashid, who then asked if Barnes had altered his ride height to suit the new tires. "After he said no, I told him to try dropping the front and raising the rear of his bike." After making chassis adjustments, Rashid said that Barnes dropped two seconds from his qualifying time.

Even though Barnes was riding a Honda CBR600F4, the ballpark ride-height adjustments helped because Barnes' Pilots were the same size as Harrington's Pilots.

The Computrack measurements show the Michelin Pilot 120/70-17 front tire is larger (5.72mm) in diameter than the Dunlop D207 GP despite being badged with the same size. A larger front tire increases the rake and the trail, raises the swingarm pivot height, increases the swingarm down-slope, and increases the wheelbase. So making this tire swap would affect the steering, rear wheel traction, and overall handling of a motorcycle. Then adding the smaller circumference 170/60-17 Pilot rear would increase the above-mentioned geometry changes, compounding the effects on the handling characteristics, plus shortening the gearing.

A rider changing from Dunlop D207 GPs to Michelin Pilots on a Kawasaki ZX-6R without any other changes would have increased the rake by 0.39 degrees, added 3.62mm of trail, lowered the swingarm pivot height by 3.07mm, increased the swingarm down-slope by 0.39-degree, and increased the wheelbase 0.13mm—not mentioning the change in effective gear ratio. These numbers may not seem very large, but to a professional searching for tenths of seconds in practice, these numbers are significant.

Switching from the ZX-6R's stock Bridgestones (with a 60-series front tire) to the Pilots (with a 70-series front) would result in even more drastic changes. The rake would go up almost a full degree, and the trail would increase by 8mm!

Many riders seem bound by an ignorance-based sense of loyalty to one brand of tire, fearing that switching brands will change the way the bike feels. Now that I better understand why a different tire brand may react unlike a known tire, I can't wait to try out other tires to find out what is best for me.