Revisiting the four-stroke-versus-two-stroke controversy with an Italian twist

It’s never been a level playing field. Race teams, magazines and riders have been comparing two-strokes and four-strokers for years, but the deck has always been stacked. Either the displacement, the technology or some random factor has been weighted one way or the other for one simple reason—we’ve never had two bikes that were made for the same purpose by the same company working within the same rules.

The people at the small TM factory in northern Italy decided it was time. For 2017 the company gives you a choice in 300cc off-road bikes. You can choose the carbureted two-stroke or the EFI four-stroke. In Europe, these two bikes might go into different classes—E2 for the 300cc four-stroke and E3 for the two-stroke, but that’s just an accident of rule-making. Bikes around this engine size have won most off-road championships worldwide for years, regardless of class, brand or engine type. These two bikes represent the best of their respective worlds.
Odd enough, the same factors that make the four-stroke feel heavier make it handle better at speed. It’s more stable. In rough terrain, in particular, the four-stroke goes straighter and is less likely to be thrown off course by square edges, holes or whoops. Once again, your seat-of-the-pants riding impression would probably lead you astray. You would never believe that the two bikes have the same suspension components. The four-stroke feels cushioned and more well rounded. Both bikes have great suspension, particularly in front, but the four-stroke just delivers a smoother, more comfortable ride. The two-stroke’s forward progress is easily interrupted by bumps and holes, and that has a negative effect on traction.

THE MAIN EVENT
All that is interesting but not very surprising. We’ve long documented the handling differences created by the two methods of propulsion. The big difference is power. Conventional wisdom has always held that two-strokes make more power per cubic inch, and that’s why it was considered “fair” to give four-strokes a displacement advantage in racing.

Is it still justified? Not really. In terms of peak power, those two bikes are very close. But in power delivery, they are nothing alike. The two bikes put their power to the ground in such dramatically different ways.

THE TRUTH OF THE TRAIL
Don’t be too confused by the weight figures. Four-stroke weight numbers have dropped dramatically in recent years, and the 300 two-stroke was designed earlier. The real difference is how they feel when you ride them. The two-stroke feels much lighter. It’s easier to throw around and manhandle. There are gyroscopic laws that work on the larger crank and additional spinning shafts in the four-stroke that affect the handling in a big way. If you want to win a lot of bets, have people ride these two bikes, then guess the weight difference. You might have to bring a certified scale to the track to prove yourself.
that they defeat all our usual methods of comparing acceleration, in a full-race start, traction presents a random element that makes results inconsistent. The four-stroke usually hooks up better, but not always, and rider skill plays a bigger role on the two-stroke. The time-honored roll-on test, which we usually perform on pavement, eliminates traction and rider skill as variables, but rpm plays a bigger role. If you open both throttles at the same time from a slow-rolling start in, say, third gear, you should get a good picture of how they differ.

In this case, the two-stroke walks away easily when the comparison is done starting at low rpm. When the roll-on test starts from a faster pace, the two-stroke has to shift immediately, and the four-stroke seizes that advantage to pull away.

The bottom line is that you ride these two bikes differently. The two-stroke is all about low revs and growling through obstacles. It’s virtually unstoppable. The bike doesn’t stall or hesitate, even if you’re in a gear that’s far too tall and you have to suddenly accelerate to clear a log or wheelie over a ditch. The four-stroke’s power, on the other hand, is very soft down low. If the trail suddenly turns upward, you can’t just open the throttle and expect good results. The bike wants to downshift. All the four-stroke’s power is way up high, so it works best if you rev it. The powerband is actually very long, going from about 6000 rpm all the way up to somewhere in the 13,000 zone. But, if you put the engine under a sudden load when it’s not ready, it groans and complains. Even the automatic decompressor makes noise, joining a chorus of unhappy traits. The solution is to be aggressive. The four-stroke wants you to be riding hard and fast all the time. When you do that, it flies up hills, hooks up in mud and pulls through sand. It’s an aggressive race bike, and it wants aggressive riders.