The Importance of Exit RPM

After 21 years at the Penguin school, I've had the good fortune to work with thousands of riders and have fielded tens of thousands of questions. Baseline universal questions like "What's the best line into this corner"and "How did my body position look" are great conversation starters which lead into deeper topics. There are really no bad questions, except for a scary ones like "What's the track record for the first day"……coaches know how that one usually ends.

The question that we will address this month deals with identifying the proper exit RPM. While riders often are looking for specifics we cannot call out an ideal RPM by number as there are many differenct factors involved. For starters, as every engine is different. A rider on a big v-twin is not going to exit at the same RPM as an inline four. However, even if we use a single model as a basis for discussion there are still a number of factors to weigh. The most important question to ask in reply to a query like this is "what is the goal on the way out of the corner"?

As with most things in riding, there is a delicate balance here for many riders. The initial goal for most riders is to accelerate as hard as you can while keeping the risk of a high side as low as possible. For performance, riders must have the power on tap immediately whenever they want it. However, the fear of a high side is a significant barrier for most track day riders and racers. The means used by many riders to reduce the chance of a spinning the tire is often to exit corners at lower RPM. This is usually accomplished by leaving the bike in a gear higher than needed.

This reasoning is fine on the surface, and it does work well for brand new track riders. Since the bike does not make much power at low RPM, the throttle is much less sensitive to abrupt movements (whether intentional or not). Unfortunately for riders who want to learn proper technique and ride faster, this strategy works against you on multiple fronts.

First, the drive off a corner (especially one that leads to a long straight) has more affect on your lap times than any other section of the track. It comes down to duration of advantage. If you exit a corner 5mph faster, that head start helps you down the entire straight that follows. You simply cannot make up for a poor exit on the brakes at the end. I've seen cases where being in the wrong gear can result in trap speeds that are over 10 mph too slow. For reference sake, on most tracks in the US you only need to be an average of 1mph faster around the track to drop 1 second on your lap times. What does a 10-15 mph reduction in trap speed add?!?

Second, having the *ability* to be sloppy with the throttle can create bad habits that cause big problems down the road. At low RPM, there is no longer a direct connection from your right wrist to the rear tire. When in a gear too high, riders can roll the throttle on much faster than normal. The bike does not get into the real meat of the power until they are well down the straight with much less lean angle. However, as riders get comfortable their roll speed through the corner will continually increase. This leads to the surge in power coming progressively earlier and I have witnessed several instances where the motor catches up to an unsuspecting rider at an inopportune time.

The ability to control or prevent highsides should come completely from the smoothness of the right hand of a rider, and not from having the engine in a portion of the power curve that is so low that it cannot high side. **The first rule to use in evaluating exit RPM is that you never want to have to wait for the engine to catch up to your right wrist during the initial drive off the corner**. If you ever come out of a corner and feel like you like there is not a direct connection between your right wrist and the rear wheel, you are losing both precious time and information. In the first few seconds

off the corner, you should always have all the power you need. This is especially true in the most important corners at each track – the ones that lead to the longest straights!

In order to take advantage of the power from being in the right gear, you need to first establish proper direction at the apex – especially in a slow corner. Many riders exit the most important corners of each track without having full established direction. As a result, they have the classic two stage drive disease – one that causes them to crack the gas open 5%, wait 3 seconds to finish the turn, and then roll the gas on hard. Being in the proper gear means nothing if your plan does not allow for the gas to open anyway!

It's important to remember that the faster the corner the more power the rear tire can tolerate. Additionally, the less power your bike makes the more important it is to always be in the right gear. Small bikes have narrower power ranges and you can lose HUGE time by exiting a corner in the wrong gear on a 300 (for example).

Another place you want to be sure that you exit with maximum power available is a fast corner. Instead of shifting that extra gear before that fast sweeper, is it sometimes to your advantage to carry the lower gear and focus on being super smooth with the throttle. The whole key to success on corner exits is a throttle application that is both EARLY and SLOW. As mentioned in a previous article, the first 25% of most throttle applications should take as long as the remaining 75%. Your initial drive MUST be smooth, and then can ramp up quickly as lean angle is taken away. The fastest riders have the slowest initial throttle movements. Why? Because they start them the soonest!

In slower corners, smooth initial application is even more important. These are the places with the greatest risk, and as a result they are also one of the best areas to make time on your competition. The real key here is to be sure to have soft arms in addition to a slow right hand. Most high sides are not caused by throttle input. Of course, you can always high side if you really want it bad enough, but the gas is not the biggest culprit in most high sides. The real problem comes when riders combine too much throttle with too much bar input. In a vast majority of cases, if a rider is soft on the bars and applies too much throttle (in a linear fashion) the bike will simply run wide.

The second rule in evaluating exit RPM is meant to balance the first. Since the initial drive is so important, riders want to avoid making an upshift too early in the drive. Even with modern quickshifters, making an early upshift (especially when there is still significant lean angle) can upset the chassis and also causes a momentary "pause" in the drive that hurts your trap speeds.

On the surface, this seems like a direct contradiction to my earlier suggestion to avoid running through in a gear too high. However, in slow corners (and on very powerful bikes), riders can often get away with rolling through a corner in a higher gear. When in doubt, go back to the first rule of gear selection - **you never want to have to wait for the engine to catch up to your right wrist during the initial drive off the corner**. Again, the slower the corner or the more powerful your bike, the more likely it is that a taller gear will result in a faster lap time. Like the Novice rider looking to lessen risk, this technique can make the motorcycle smoother on and off the gas. Start looking at this as an option in corners that are taken in 1st or 2nd gear.

In the end, riders should look to optimize RPM in as many corners as possible. Corners that lead to long straights are always the top priorities, followed by fast sweepers. Once you have determined the optimum gear for each exit, you can fine tune your motorcycle by changing the sprockets to suit a partiuclar important section on your favorite track. In many cases, a $50 sprocket can make more difference than hundreds of dollars spent on performance modifications.

Until next time, ride fast-ride safe!