

Origin and Evolution of the Drivetrain

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Baker Drivetrain*

Modern motorcycle drivetrains consist of four transmissions, so to speak. It all has to do with design intent. For instance, men have two testicles. Women have two ovaries. That's just the way it is. Someone long before me designed it that way. I have no design experience with the reproductive systems of men and women so I can't critique the designs, as issued, from the factory. However, as an end-user of the design, the benefits are many. There are also some design flaws. For more information on that subject, visit your local independent magazine stand or Google Ron Jeremy's name.

Before we talk about motorcycle drivetrains, a little background information is in order. Motorcycles evolved from bicycles. To get the show rolling the rider pedaled the crank to transmit torque to the rear wheel sprocket to rotate the rear wheel and move the bicycle down the road. The first motorcycles had their engines in modified bicycle frames with the axis of the engine output parallel to the foot-crank axis. The engine pretty much replaced the human foot power, and thus was born the motorcycle. That was a good thing because riding bicycles sucks; it requires a lot of work, something I personally avoid. Check out the picture of a beautifully restored Silent Gray Fellow. It is sort of a missing link as it prominently shows the evolutionary step between bicycling and motorcycling. The foot crank is in the usual place, with power transmission via chain to the rear wheel on the right side. The engine transmitted power to the rear wheel via leather belt on the left side, as shown. To engage forward motion, tension on the leather belt was increased by moving the hand lever near the tank. Think of it as an ancient slipper clutch. There's a groovy You Tube clip that shows some cat easing off to a pub on a Silent Gray Fellow without a worry in the world; check it out sometime.

The torque from the engine on the Silent Gray Fellow went through two mechanical reductions before the power hit the road. Effectively it had two single-speed transmissions in series. The first reduction went from the engine output to the rear pulley. The second reduction went from the rear pulley to the rear wheel on a common jackshaft or axle. The road and the rear wheel can be viewed as a rack and pinion, respectively; it is a gear reduc-



tion of sorts. This drivetrain layout produced less than stellar performance because the overall ratio was a compromise between launching the motorcycle off the line without burning up the belt and having a reasonable top speed. Performance sucked and quarter-mile times were measured in minutes. The days of 1-speed motorcycles were numbered and that's a good thing. If motorcycles didn't have transmissions, BAKER Drivetrain would not exist and I might still be working in the transmission department at GM. But they probably would have fired me by now because I wasn't much of a corporate guy and felatio was never my gig.

So the next step in the evolution of motorcycles was to introduce a multiple-speed transmission. Locating the transmission behind the engine was the best choice. Another way was to hang it off the left side of the engine, but balance and width became an issue. I suppose it could have been located inside the rear wheel by employing some Billy Lane helicopter bearing wheel trick but helicopters weren't invented yet. And the unsprung weight after the advent of rear suspensions would have been sacrilegious. So behind the motor it stayed.

The direct power flow (like the Silent Gray Fellow's) from the engine to the rear pulley got split in two, resulting in a primary reduction from the engine output to the tranny and a secondary reduction from the tranny output to the rear wheel pulley. And all motorcycles today, boys and girls, have this basic layout except a few weirdoes. Like Moto Guzzi and BMW that have powertrains laid out like rear-wheel-drive cars, which works well on four wheels but the reaction torque on two is goofy.

So there you have it, the evolution of the modern motorcycle drive train—four transmissions, or a series of four mechanical reduction drives. The primary drive is the first one, the transmission is the second, the secondary drive constitutes the third, and the rear pulley/rear wheel is number four. Multiply the primary drive and the secondary drive together to get the motorcycle equivalent to

the axle ratio in a car. Next month we'll delve into the numbers game as it relates to gear ratios and overall gear ratios. There's a lot of performance or fuel economy to be had if the right ratios are selected. If you want to study up before next month's installment, go to the BAKER website and play around with the ratio calculator. Or you can just check out your new girly magazine and wait for the next issue of *IronWorks*.