# OUTSTANDING WET-CLUTCH PROTECTION AND PERFORMANCE

Wet clutches are widely used in motorcycle applications. In a wet-clutch design, the oil acts as a heat-transfer medium, reducing operating temperatures and minimizing varnish and lacquer formation that can lead to slippage and increased heat. The oil also minimizes build-up of wear debris on the frictional plates and provides lubricity to components and wear areas within the clutch, including the bearings and the points of contact between the outer tabs of the frictional plates and the clutch basket.

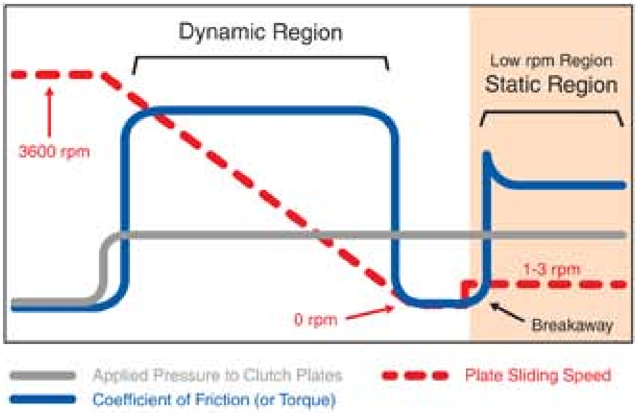
## Wet-Clutch Configurations

Wet clutches can be found in three different configurations. One features a separate oil reservoir for the clutch (isolated from the engine and transmission), another features a shared oil reservoir for the transmission and clutch, and the third features a shared oil reservoir for the engine, transmission and clutch. The different configurations place unique demands on the lubricants that protect them. In the first example, the oil must handle the lubrication and frictional demands of the clutch and possibly a roller chain or single gear set. In the second example, the oil must handle both clutch and transmission lubrication. In the third example, the oil must handle clutch, transmission and engine lubrication, requiring a dynamic fluid capable of meeting a variety of needs.

## Frictional Requirements

Good wet-clutch performance is extremely important to ensure satisfactory drivability. Frictional resistance is separated into two types: static and dynamic friction. The force required to begin movement of a box across the floor is an example of static friction, while the force required to keep it in motion is an example of dynamic friction. It takes less effort to keep the box moving than it does to break it loose. In motorcycles, static friction is the force that keeps the frictional plates and steel plates locked together and prevents them from slipping when the clutch is engaged. Dynamic friction comes into play as the clutch is engaged and the plates begin to contact each other. Dynamic friction begins the rotation of the steel plates. When there is enough contact and the forces of static friction are overcome, the steel plates rotate at the same speed as the clutch and become locked together.

The surface condition of the plates affects the amount of friction generated during lock-up. There are significantly different surfaces in a clutch: the rough frictional plate and the smooth steel plate. The resulting force required for the two different plates to grab and lock-up is called the coefficient of friction. A rough plate will lock-up quicker than a smooth plate.




The graph displays a typical friction profile. As the clutch is engaged, spring pressure forces the rotating frictional plates up against the non-rotating steel plates. Dynamic friction between the two plate-types increases rapidly, causing the steel plates to begin rotating. The level of dynamic friction remains relatively constant until both plate-types are rotating at the same speed. Once rotation speed is equalized, undesirable slippage between the two plate-types is minimized by the resistance provided by static friction. The ability to minimize slippage when the clutch is engaged and locked is depicted on the right-hand side of the graph. Static friction is highest just prior to the plates breaking away or slipping. Once slipping, the resistance force is reduced as dynamic friction takes over.

Dynamic friction should have a high and relatively flat trace, providing a shorter time between clutch engagement and lock-up, and resulting in faster shifting. The level of dynamic friction should decrease slightly as the plate rotation speeds equalize, providing a smooth shift feel. If there is too much dynamic friction, the shift feels abrupt and harsh. If there is not enough, the shift is elongated and increases the potential for excessive plate slippage. High static friction is also desirable as it provides good clutch holding power and the ability to transfer the maximum design capacity through the clutch.

## Wet-Clutch Lubrication

Not all lubricants are suitable for use in wet-clutch applications. Frictional properties, cleanliness, clutch material/oil compatibility, anti-foaming properties, shear stability and high-temperature stability are all important to maintain the integrity and performance of a wet-clutch system.

Properly selected synthetic base oils perform very well in wet-clutch applications and can improve performance and longevity; however, additive chemistry has a far greater impact on performance. Friction modifiers can decrease the coefficient of friction within the clutch pack and result in excessive plate slippage, while extreme-pressure additives commonly used in gear lubricants can cause excessive clutch slippage and related damage.

AMSOIL Synthetic Motorcycle Oil is multifunctional and provides outstanding protection for wet clutches. It is shear stable and resists thinning from mechanical activity, performing like a gear lube without the negative effects of extreme-pressure additives. AMSOIL Synthetic Motorcycle Oil contains no friction modifiers and promotes smooth shifting and positive clutch engagement. It controls heat and helps prevent slippage and glazing, while its high TBN helps improve clutch life by resisting the acids that can degrade clutch material. ■