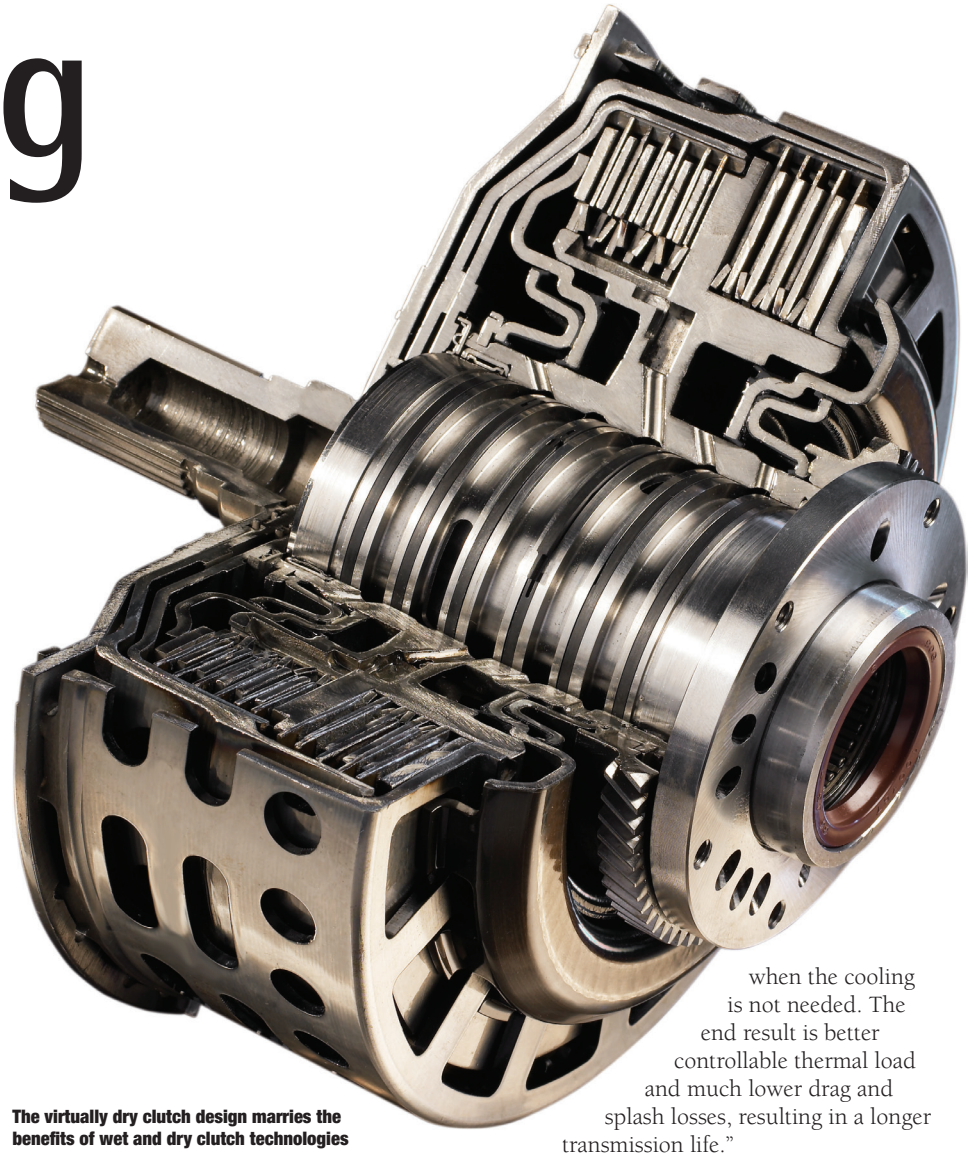
Shifting trends

Optimizing new transmission designs for efficiency and performance is more important than ever before



The virtually dry clutch design marries the benefits of wet and dry clutch technologies

High-performance cars are enjoying a renaissance. These vehicles deliver astounding power and torque with engines mated to sophisticated transmissions. Such an integrated combination ensures modern sports cars deliver more driving excitement, better fuel efficiency and enhanced performance by every metric.

"In high-performance vehicles, the transmission, the engine and corresponding control units must form a holistic system to deliver a vehicle that is fun to drive while achieving optimal on-the-street or on-the-track performance," explains Jeremy Holt, Tremec vice president.

The 2014 Chevrolet Corvette Stingray debuts the first use of Tremec's 7-speed manual transmission. The technologically advanced TR-6070 unit easily accommodates the Stingray's 6.2-liter heart, which boasts 450ps and 610Nm of torque.

The TR-6070 architecture includes synchronizers that feature hybrid friction elements for increased capacity and faster synchronization time. To achieve an improved shift performance, speed gears and shift collars have altered, asymmetrical advanced clutching teeth. In addition, a gear position sensor assists the system's rev-matching shift feature, resulting in near-flawless changes.

Enhanced technologies keep the transmission lightweight at only 65kg. What's more, the TR-6070 torque capacity goes beyond that of the Stingray's 610Nm output, with the transmission designed to handle up to 860Nm.

"The 7-speed manual has a wide, 6.28 ratio spread, allowing the engine to run at lower rpms at cruising speed," explains Paul Rorick, Tremec product application engineering manager. "This improves fuel economy and reduces noise, vibration and harshness levels, as well as CO_2 emissions."

But Tremec's pioneering work in the transmission arena doesn't focus solely on the 7-speed manual; going much further into complete system integration are modern dual clutch transmissions.

Virtually dry DCTs

The starting point for any transmission designer is to understand the amount of torque the system needs to handle. Nowhere does this apply more clearly than in the design of dual clutch gearboxes.

Wet, continuously oil-cooled clutches are used in high-torque transmission applications with or without a torque converter. These clutches create high drag and splash losses. Some mechatronic clutch systems no longer have these high losses. Tremec's virtually dry clutch uses a controlled and selective cooling system to very quickly cool down the clutches and then run the clutches dry.

"Our virtually dry clutch design marries the benefits of wet and dry clutch technologies into a hybrid design," explains Hendrik Pecceu, Tremec's global engineering and R&D director. "Since a dry clutch transmission has no splash losses, we have developed a wet clutch system that can become dry when the cooling is not needed. The end result is better controllable thermal load and much lower drag and splash losses, resulting in a longer transmission life."

The benefits of optimized systems are readily apparent in high-end performance vehicles. And just as the TR-6070 7-speed transmission is integrated to rev-matching technology, Tremec mechatronic solutions provide optimized launch and shift profiles in premier European supercars.

Tremec engineers have designed, developed and integrated the torque target control software for one of the greatest exotics to come out of Italy. The system works together with the engine and ESP electronic control units.

"You can drive it as an everyday car with perfectly comfortable – some say imperceptible – shifting, or, with the push of a button, you can transform it into a real beast," adds Dave Hadley, Tremec commercial manager. "The control software can be programmed for torque interruption – delivering the traditional 'bump' one associates with aggressive shifting – or for a torque boost during shifting."

These torque transfer solutions, with others on the horizon, ensure that modern sports cars with advanced Tremec technologies are not only fun to drive but deliver excellent performance. ***TTI***