Published by Automotive Engineering on April 2, 2021 by Lindsay Brooke.

Actuating hybrid and EV efficiency

More sophisticated driveline-disconnect systems are part of the electrified-vehicle future, says the head of controls at Stoneridge.

Axle-disconnect systems have been a fuel-efficiency enabler in recent years, delivering improvements of up to 10% in all-wheel drive and four-wheel-drive cars and light trucks, depending on vehicle application. Reducing driveline parasitics by decoupling one set of drive wheels when they're not needed, pays overall efficiency benefits regardless of powertrain type. Electrified vehicles are expected be a significant growth opportunity for disconnect technologies such as actuators, explained Jim Zizelman (right), president of the Control Devices division at Stoneridge. The Novi, Michigan-based company develops control and sensing solutions for automotive, commercial and off-highway vehicles.

"Almost one third of our actuation business today is on hybrids and battery-electric vehicles [BEV]," he told Automotive Engineering. Actuators are typically unsung devices in the driveline space. They ensure the electro-mechanical "handshake" that swiftly links front- and rear-axle drive modules to the transmission and helps provide front/rear and wheel-to-wheel torque splits, depending on system configuration. Stoneridge actuators are used in a "broad array" of vehicles, said Zizelman, who joined the company in 2020 after more than 25 years in powertrain and electronics at Delphi and most recently Aptiv, where he was VP engineering.

"We've been pushing hard to be ready for the electrification transition," Zizelman said. "We design our actuators and disconnection technologies in a platform sense. They're engineered to be 'application agnostic' for broad use with minor changes, in conventional or electric drivelines." The various applications present Stoneridge design engineers with equivalent forces and loads. "In terms of the fundamentals – achieving an easy, smooth, quiet engagement and disconnect – our customers have the same requirements in both their conventional and electric platforms," he said.

More hybrid applications for actuation are emerging as OEMs devise ways to decouple the electric and ICE sections of their drivelines. In EV applications there is a focus on not allowing the traction motor to 'drag' with the wheels when the motor is not in use. "In a two-motor or even four-motor application, it's inefficient to turn that motor over if you're not using it," he explained.

Stoneridge is also involved in several programs involving what Zizelman calls “innovative driveline technologies,” such new approaches to vehicle torque transmission. “If a new transmission design can help reduce the battery pack size and allow use of smaller motors in order to gain ‘electric fuel economy,’ that’s extremely important,” he said. He noted the battle for reducing NVH is increasingly acute in BEV drivelines, and it has Stoneridge focused on ensuring silky, silent engagement and re-engagement.

“On the hardware side, for example, we can reduce the mass of impact in our actuators. And we can reduce the noise of de-connection using software solutions. The goal is always to be X-dB lower than the competition,” Zizelman asserted.

Stoneridge’s current portfolio includes customizable ECUs, electronic shift-by-wire modules, and even a new onboard camera system, MirrorEye, designed to replace conventional exterior mirrors on trucks. “Consider what the cameras see in ADAS systems, perhaps some instability due to the road, can drive communication back into the vehicle’s control system,” Zizelman noted. “It would then call on actuators to perhaps connect a drive axle, or adjust the inter-axle torque balance.”

https://www.sae.org/news/2021/04/actuating-hybrid-and-ev-efficiency