Oerlikon Graziano to reveal details of innovative multi-speed EV transmission at CTI Shanghai Transmissions Symposium

Shanghai – China, Sept 11, 2012 - A new eDCT multi speed transmission that provides EVs with greater range while reducing vehicle weight and battery pack size will be presented by high-performance transmission specialist Oerlikon Graziano SpA at the first CTI Symposium China, in Shanghai on 10 - 12 Sept. The company will exhibit a whole family of electric and hybrid vehicle transmissions, supporting a central theme of the event, and will present a technical paper on its new eDCT.

The innovative transmission uses the principles of dual clutch transmissions (DCTs) to provide seamless shifting and up to 15 percent improvement in vehicle efficiency. Visitors to the event can discuss the transmission with the company’s staff on Stand 5, Hall Foyer. The technical presentation on Sept 11 will be given by Claudio Torrelli, Oerlikon Graziano’s Head of Product Development.

Most current EVs use a single-speed transmission, relying on the electric motor’s torque spread to provide adequate performance. However this means the motor spends much of its time operating at only 60 to 70 percent efficiency. Oerlikon Graziano’s new transmission instead uses two smaller motors and provides four speeds to keep the motors running closer to their peak efficiency of approximately 90 percent. The result is an overall efficiency improvement of up to 15 percent, which translates into increased range or improved performance for the vehicle.

“Vehicle manufacturers need innovative solutions to improve the cost, range and performance of electric drivetrains,” said Torrelli. “Our multi-speed transmission can improve acceleration, top-speed and hill-climbing ability for a given motor size. Alternatively EV makers can specify smaller motors to give the same performance with less battery drain, providing greater range.”

Oerlikon Graziano will showcase the new transmission technology at the CTI Shanghai event as part of an increasing range of electric vehicle transmissions. Beside the 4-speed seamless-shift transaxles with e-DCT technology, the company will exhibit single- and dual-speed transaxles, providing solutions for a wide range of electric vehicle applications.
For high performance electric GT car applications, the company will exhibit a rear-drive transaxle assembly with twin 125kW electric motors. For hybrids and passenger or light commercial vehicles, a similar arrangement using twin 35kW or 25kW motors will be displayed.

Dual-speed seamless-shifting transaxles for a single electric motor, that are scalable from passenger car to light commercial vehicle applications, will also be exhibited, as will a single-ratio speed-reducing transaxle for electric passenger cars.

Alongside the EV transmissions, the company will display examples of its highly successful supercar transmissions, including the DCT from the McLaren MP4-12C and the ultra-fast shifting AMT from the Lamborghini Aventador.

The transmission from the 700bhp Lamborghini Aventador, developed and supplied by Oerlikon Graziano, has the fastest shift speed of any road-going transmission with synchromesh. It uses independent shift rail (ISR) technology to commence selection of the next ratio before the previous one has disengaged.

The McLaren sequential shift gearbox (SSG) is the lightest and most compact in its class, and also sets new class standards for the refinement and durability of a dual clutch transmission (DCT). Oerlikon Graziano works closely with each customer to develop these types of transmission, in order to deliver the brand values expected by discerning buyers.

“All the technologies we are exhibiting share common themes of light weight, compact size and high efficiency,” said Torrelli. “Whether for highly efficient electric vehicles or the ultimate supercars, our design strategies are based on these values.”

In-depth interviews with Torrelli, during the Symposium, may be pre-arranged through the company’s press contacts.

**How the eDCT works**

The transmission’s unique configuration uses two input shafts, each driven by its own electric motor. The concept is similar to a DCT but using two motors in place of the twin clutches: one motor drives a shaft that carries first and third gears, the other drives a shaft carrying second and fourth. This allows pre-selection of the next gear before the previous one has been disengaged, using the two motors to synchronise shaft speeds so that no synchronisers are needed.
Following gear selection, the drive torque transfers seamlessly between the motors to complete the shift. Different strategies prioritise economy or performance and the transitions between the two.

The shift control system was developed by UK controls specialists, Vocis Driveline Controls, itself part owned by Oerlikon Graziano. Having considerable prior expertise with DCT applications, Vocis used a range of existing algorithms from their proven software to cover Driver Strategy, Shift Sequencing, Gear Actuation and safety functions complying with OBDII requirements. The company’s technical specialist, Marco Fracchia, co-authored the technical paper.

“The way the transmission shares torque between the motors offers shift opportunities beyond that achievable with a DCT,” said Vocis technical director, Richard Taylor. “The shift strategy is so successful that test drivers find some shifts imperceptible and must refer to data logs to confirm each event.”

The software is simpler than for a DCT application. The engine interface is replaced by a motor interface while the clutch and synchroniser control algorithms are unnecessary and are deleted entirely. The prototype uses a Vocis TMS-20 controller that, in addition to direct inputs and outputs, allows robust CAN communication with other controllers on the vehicle to ensure seamless shifting and intuitive control.

“The prototype is a four speed system but the technology is scalable to suit a wide range of different vehicle types,” said Torrelli. “Whether the application is an electric vehicle, supercar or off-highway equipment, EV or conventional, Oerlikon Graziano develops transmission technologies that allow our customers to introduce more capable and competitive vehicles.”
About Oerlikon

Oerlikon (SIX: OERL) is a leading high-tech industrial group specializing in machine and plant engineering. The Company is a provider of innovative industrial solutions and cutting-edge technologies for textile manufacturing, drive, vacuum, thin film, coating, and advanced nanotechnology. A Swiss company with a tradition going back over 100 years, Oerlikon is a global player with more than 17,000 employees at over 150 locations in 38 countries and sales of CHF 4.2 billion in 2011. The Company invested in 2011 CHF 213 million in R&D, with over 1,200 specialists working on future products and services. In most areas, the operative businesses rank either first or second in their respective global markets.

About Oerlikon Graziano

Oerlikon Graziano is the world’s leading specialist in the design, integration and precision manufacture of transmissions for high-performance road cars. The company is also a leading global supplier of transmissions, axles and driveline components for other demanding sectors including electric, off-highway and industrial vehicles. With facilities in every region, including the USA, China, India, Italy, Russia and the UK, Oerlikon Graziano can support customers locally with an appropriate level of technology from single gears through to complete driveline systems and vehicle integration. All activities build on Oerlikon Graziano’s innovative approach to design, rigorous test and development and world-leading expertise in high-quality, low-volume manufacture.

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Photographs

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Oerlikon Graziano will show the world’s fastest shifting synchromesh transmission from the 700bhp Lamborghini Aventador at the CTI Shanghai symposium

The eDCT is part of a family of EV transmissions developed by Oerlikon Graziano to be displayed at the CTI Shanghai symposium