



Press Release

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SAE Stand 2029

New second generation Zeroshift transmission launched at SAE is world's most efficient automatic

Innovative design allows engine downsizing, improved fuel consumption and reduced emissions, all at lower cost than traditional planetary automatics

Zeroshift Ltd, winner of the Frost & Sullivan 2007 European Powertrain Company of the Year Award, is launching its second generation automatic gearbox technology at the SAE World Congress (Detroit, April 16 - 19). The latest version uses a new drive ring system, combined with other developments, to deliver reductions in cost, weight and packaging volume as well as improving durability, fuel economy, emissions and refinement. The technology provides a compact, low-cost fully automatic transmission that changes ratio with zero torque interruption, making it as smooth as a traditional planetary automatic. Applications include passenger cars, commercial vehicles, off-highway vehicles and motorcycles.

"The second generation system incorporates the knowledge gained from five years of rigorous development," explains managing director Bill Martin. "Further design innovations, plus our experience with prototype vehicles, CAE analysis and rig testing, has allowed us to create a highly efficient design that is now ready for integration with vehicle development programmes."

Zeroshift technology provides a fully automatic transmission using the majority of components from any proven manual transmission. Unlike conventional Automated Manual Transmissions (AMTs), the Zeroshift system changes gear with no torque interruption, providing improved performance, refinement and passenger comfort. The company estimates that, in a typical

mixed drive cycle, the system should also generate a fuel economy saving of at least two percent compared with a manual transmission and seven percent compared with a six speed planetary automatic.

Zero torque interruption allows either improved acceleration or engine downsizing. As well as further reducing weight and cost, engine downsizing can lead to significant additional fuel economy and emissions improvements because the engine will operate more efficiently with wider throttle openings. Engine downsizing is expected to become one of the most important solutions to global CO₂ reduction, particularly where new, tough legislative standards are being implemented.

The Zeroshift transmission is cheaper to manufacture than a Dual Clutch Transmission (DCT) or a sophisticated planetary automatic and the shift mechanism can be built into an existing manual gearbox so it can be assembled on the related manual transmission production lines.

“The cleverness of the Zeroshift transmission is in the design innovation and the control systems. This makes it mechanically so simple that only a few workstations will have to be modified to accommodate a choice of components,” explains Martin. “For an established manufacturer of manual gearboxes, it is an extremely affordable way to offer a high-quality fully automatic transmission.”

Future enhancements already in development will include production packaging of the control electronics and electric actuation of the drive rings using brushless DC motors. A system incorporating these and other enhancements is expected to be running in a demonstration vehicle during 2007.

New technology

The first generation Zeroshift transmission was pneumatically operated and used six drive elements - specially contoured metal ‘bullets’ - to engage and disengage the drive gears in a similar manner to dog clutches, replacing the synchromesh found in a conventional gearbox. In the second generation system, these have been replaced by a pair of interlocking rings, each incorporating the three drive elements in a single forged component and operated by shift forks.

When shifting from neutral, ring one is engaged to take up drive while ring two is engaged within a few degrees of revolution to take up backlash. The next shift is made with ring two taking up the drive and ring one taking up the backlash. As ring two is unloaded during the change, it requires less than one twentieth the axial force required by a conventional synchromesh. The control system, also developed and calibrated by Zeroshift, coordinates gearshift actuation, engine management and clutch operation to provide full control over the driveline during gear shifting.

Refinement and durability have been further improved through careful design of the working surfaces. One side of the drive element has a retention angle to take up the drive, whilst the opposite side has a ramp face to smoothly disengage drive. Shift forces have also been reduced: from around 100N in the first generation system (compared with typically around 1,000N for a conventional AMT) to just 40N. These very low forces mean that all components can be manufactured from proven light-weight materials with no additional surface treatment.

The second generation system uses simplified actuators with lighter rails and new light-weight shift forks. Sophisticated CAE analysis also allows the total packaging volume to be reduced, providing a valuable reduction in gearbox length (dependent on application) compared with a manual or conventional AMT transmission.

“We believe that Zeroshift technology provides the best features of each automatic transmission type - the shift quality of a planetary automatic, the vehicle performance and tuneability of a DCT, and the cost and packaging of the best AMTs,” concludes Bill Martin. “One of the biggest benefits, though, has to be the cost-effective improvements in fuel economy and consequently CO₂ emissions. It’s a significant step forward that helps to provide a solution for one of the biggest challenges facing today’s automotive industry.”

A technical paper on the second generation transmission will be available following publication at the SAE World Congress. SAE 2007-01-1307, R P G Heath and A J Child.

About Zeroshift

Zeroshift is a privately owned British innovation company, specialising in the development and application of power transmission and electronic control solutions across a wide range of transport industries. In 2005, the firm appointed Charles Matthews, former CEO of Rolls Royce Cars and CEO of Cosworth, as chairman and the following year appointed Bob Dover, former chairman and CEO of Aston Martin, Jaguar and Land Rover, as a non executive director.

Zeroshift's main area of IP is an innovative system that replaces the conventional synchromesh in an Automated Manual Transmission (AMT) to provide an affordable, highly fuel-efficient, zero torque interruption fully automatic transmission.

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Illustrations

Pictures are available electronically from the press agent or can be downloaded from www.autopresspoint.com

	Data from testing a Zeroshift transmission fitted to a Ford Mustang was used to ensure durability
	Two drive rings are used to provide gear changes with zero torque interruption and no backlash
	The new Zeroshift control rings
	Bill Martin, managing director of Zeroshift
	Bill Martin, managing director of Zeroshift, outside the company's new offices and technical centre
	Zeroshift has recently moved to an impressive 12,000 sq.ft facility in Milton Keynes

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