

# Press Release

## **Next-generation Stop-Start system substantially broadens range of benefits**

*Stop-start system with new multi-mode, variable ratio drive pulley brings substantial improvements in cost, runs airconditioning with engine-off and delivers CO<sub>2</sub> reduction significantly beyond today's best stop-start technologies*

A new generation of Belt-Integrated Starter Generator (B-ISG)) has been developed by powertrain engineering consultancy Integral Powertrain. The system solves the cost-benefit issues that have slowed the uptake of existing B-ISG technologies by providing starting refinement equivalent to today's very best systems alongside additional benefits such as power to airconditioning while the engine is stopped and reduced losses whilst the engine is running. The total CO<sub>2</sub> reduction achieved by the system is said to be substantially greater than that possible with today's best B-ISG systems.

"Existing B-ISG systems provide refined stop-start operation, but they have significant disadvantages," explains Integral Powertrain technical director Luke Barker. "This is mainly due to the requirement to generate very high torque and transmit it through the accessory belt, which impacts cost, packaging, weight and efficiency. A further issue is that engine-off comfort is compromised unless an expensive electrical airconditioning pump is fitted."

Barker says that Integral Powertrain has developed a practical, low-cost solution that addresses all these issues as well as introducing a substantial range of additional benefits. At its heart is their innovative Variable Ratio Pulley, which packages a two-ratio epicyclic gearbox into the belt drive pulley hub. To start the engine, the high ratio (3.1:1 in the development system) is engaged to substantially reduce the torque requirement, allowing a

medium sized diesel engine to be cranked without the need for a high belt tension and the associated friction and wear. Tests have shown that engine start occurs in less than 0.3 seconds. When the engine is running, the ancillary drive ratio returns smoothly to 1:1 or can be maintained at the high ratio during low engine speed operation if accessory loading is high. The ability to maintain an efficient drive speed enables lighter, more compact ancillaries resulting in further efficiency improvements.

The Variable Ratio Crank Pulley also provides substantial cost savings for vehicles that have an electric drive capability. When the engine is off, the freewheel facility allows the ancillary drive belt to be powered by the motor, allowing belt-driven ancillaries such as hydraulic power steering, airconditioning and coolant pumps to continue to function in the normal way. This eliminates the need to specify electrically-driven ancillaries and provides the additional comfort and safety of continuous operation of these systems during engine-off operation.

Traditional systems also need a substantial electrical machine and inverter, with a large battery or costly ultracapacitor system to provide a high current for fast starting in cold conditions. "Our variable ratio system reduces these costs too," says Barker. "It also allows the use of efficient, cost-effective permanent magnet machines where previously the combination of high stall torque and high maximum speed has made this type of machine impractical for stop-start. This is particularly significant for mild hybrid applications as it enables increased electrical power and efficiency."

Integral Powertrain is developing a new high-efficiency permanent magnet motor specifically for this application. With a diameter of 150mm and integrated low-cost, water cooled power electronics, the new machine can directly replace a standard alternator. As well as starting, the machine (rated at 5-10kW) will provide efficient regenerative braking and torque enhancement at a price that will make it affordable in volume sectors.

The new stop-start system has already successfully completed the first phase of physical testing. "This is an elegant concept that provides tremendous benefits," concludes Barker. "Test results have been extremely impressive, leading to interest from vehicle manufacturers that could see production from around 2012."

[www.integralp.com](http://www.integralp.com)

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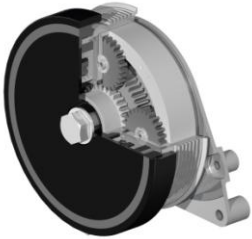

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### Illustrations

A wide range of illustrations is available from the press agent and can also be downloaded from [www.autopresspoint.com](http://www.autopresspoint.com)

	<p>The heart of Integral Powertrain's next-generation stop-start system is an innovative variable ratio pulley that allows substantial improvements in cost and functionality</p>
	<p>The new stop-start system has already successfully completed the first phase of physical testing</p>

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