



Press Release

Potential breakthrough in hybrid system costs could lead to high volume applications

New modular approach offers highly effective hybrid solution for mainstream applications with low investment, low risk and minimal impact on existing vehicle hardware.

Widespread adoption of hybrid technology has been held back until now by the high investment and piece costs involved, coupled with uncertainty over future demand. To help address these challenges and make hybrid systems commercially viable for high volume application, a consortium led by powertrain engineering consultancy Integral Powertrain is developing a modular hybrid system that offers a technology ladder from micro hybrid to full plug-in hybrid electric vehicle (PHEV) while minimising investment in either new hardware or new vehicle architecture. Integral Powertrain's partners in the project include Jaguar Land Rover, electronics specialist Smart Power Solutions and transmission specialist Drive System Design. Funding has been provided as part of the Technology Strategy Board's Integrated Delivery Programme by both the Department for Transport and the Technology Strategy Board. Work on the Ultra Cost-Efficient Hybrid Powertrain (UCEHP) project began in July 09, based around a conventional transverse engine and gearbox layout.

In the first step, for micro hybrid applications, the consortium uses Integral Powertrain's variable ratio (VR) crankshaft pulley and high efficiency brushless permanent magnet B-ISG (Belt Integrated Starter Generator) to provide stop-start capability that is substantially improved over existing micro hybrids. "The VR pulley allows the use of a lower torque motor for a given engine size and permits cost effective, refined and extremely fast stop-start operation even with large diesel engines," explains Integral Powertrain technical director Luke Barker. Compared to other B-ISG micro hybrids, this system has a lower overall cost because the on-cost of the VR pulley is more than compensated for by significant savings in the motor, motor drive, electrical storage and FEAD (front end accessory drive) systems resulting from the lower torque requirement.

The second step towards full hybridisation requires only the upgrading of the on-board electrical storage capacity to enable air conditioning use while the engine is stopped; achieved by the B-ISG driving the compressor while the VR pulley freewheels on the crankshaft. Use of the B-ISG in this way provides a much lower cost alternative than an electric air conditioning compressor, potentially saving hundreds of Euros per vehicle. The relatively high power ISG machine combined with the increase in electrical storage capacity also increases the potential for regenerative braking. "Typical CO₂ savings for this configuration are 8-10 percent on the NEDC test," advises Barker.

Full hybrid functionality is achieved by the addition of a second brushless permanent magnet traction motor integrated with a conventional low cost AMT (automated manual transmission) and a further upgrade in battery capacity. Active control of the two electrical machines endows the simple AMT with enhanced gear shift quality and provides rapid and refined transition between different operating modes because the high power ISG allows the necessary control of engine speed; a key feature that is not apparent in other systems. The hybrid capabilities include electric-only drive at light load/low speed conditions and improved regenerative energy recovery. Compared to conventional powertrains, this arrangement has been shown to offer typical CO₂ savings of 25-30 percent. Barker continues, "The UCEHP strategy allows conversion of existing low cost powertrains to full hybrid capability with minimal impact on proven hardware or vehicle architecture, dramatically reducing development risk and both engineering and capital investment."

The consortium program will address the engineering of all key sub-systems together with the control strategy covering battery management, IC engine and electrical machines. In particular, detailed simulation will be employed to optimise cost to benefit ratio and to ensure refined gear shifting and mode switching. First hardware will be on test in Q2 2010.

Barker concludes, "This technology promises three key benefits: a cost effective electric ancillary drive, super fast engine restart performance and the means whereby a low cost AMT with a single dry clutch can provide similar functionality to the expensive CVT power split transmissions seen on current hybrid vehicles," concludes Barker.

Integral Powertrain Ltd.

www.integralp.com

Integral Powertrain was founded in 1998 and has an extensive track record of delivery of successful powertrain engineering consultancy projects for many of the worlds Vehicle OEMs and Tier 1 suppliers. Its expertise covers design, simulation, prototyping, test and production validation of engines, control systems and powertrain installation systems. Integral Powertrain has been working in electric motor and inverter applications for automotive pressure charging and ISG systems for more than 5 years and has developed extensive in-house experience of motor design, simulation and system integration.

Drive System Design Ltd.

www.drivesystemdesign.com

Drive System Design, formed in 2007, is an innovative engineering design and development company with experience of both consultancy and OEM transmission engineering, specializing in providing a full range of transmission and driveline design, engineering support and test equipment. Drive System Design is able to manage the full development programme of rig and vehicle testing for transmission and driveline systems.

Jaguar Land Rover

www.jaguarlandrover.com

Jaguar Land Rover is one of the world's leading manufacturers of premium vehicles with a turnover in excess of £7,000 million. Now under the ownership of Tata Motors Ltd, the company is investing £800M in sustainable technologies. To accelerate these technologies to production, a Hybrid Centre of Competence has been set up to cover both research and development of hybrids. Technologies such as stop/start systems developed by the group have already entered production and will be followed by both micro and full hybrids.

Smart Power Solutions LLP

www.smartpowersolutions.com

Smart Power Solutions, founded in 2001, offers a comprehensive electronics engineering service for all stages of a project from concept through to manufacture, undertaking a variety of general electronics development work and providing specialist services in the areas of variable speed drive and switched mode power supply. Application experience covers automotive, appliance and industrial products and main areas of expertise are motor technologies, power supply technologies, power electronics, microcontroller/DSPs, digital & analogue design, design for product safety & EMC compliance, electromagnetic design and modelling and simulation.

Technology Strategy Board

The Technology Strategy Board is a business-led executive non-departmental public body, established by the government. Its role is to promote and support research into, and development and exploitation of, technology and innovation for the benefit of UK business, in order to increase economic growth and improve the quality of life. It is sponsored by the Department for Business, Innovation and Skills (BIS). For further information please visit www.innovateuk.org.

The project was funded from the first funding activity under the Low Carbon Vehicle Innovation Platform's Integrated Delivery Programme (IDP). This is a five year programme which will integrate the innovation chain, from the science base, through collaborative R&D to fleet level demonstration. The IDP has secured £100m of public sector funding – from the Technology Strategy Board, Department for Transport, Engineering and Physical Sciences Research Council (EPSRC), Advantage West Midlands (AWM) and One North East (ONE). Contributions from commercial partners will match the public funding, bringing the total amount available for investment to £200 million. This will support two further competitions in 2009, with further competitions anticipated thereafter.

Press Enquiries

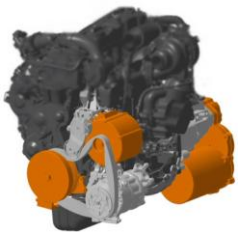

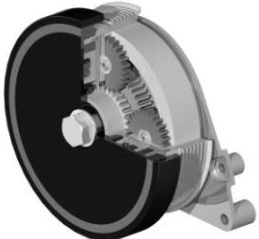
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Illustrations

A wide range of illustrations is available from the press agent and can also be downloaded from www.autopresspoint.com

	<p>Arrangement of the key elements of the UCEHP showing the VR pulley on the crankshaft end, the B-ISG on the cylinder block and the traction motor integrated with the transmission</p>
	<p>Integral Powertrain's technical director, Luke Barker, says the UCEHP project offers full hybrid functionality with greatly reduced development risk and manufacturing investment</p>
	<p>One of the key elements of the UCEHP is Integral Powertrain's innovative variable ratio pulley that allows significant improvements in cost and functionality</p>

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