



Immediate: 23 April 2013

Energy efficient 48 volt LC Super Hybrid makes its world debut at premier vehicle powertrain event

The Advanced Lead-Acid Battery Consortium (ALABC) and Controlled Power Technologies (CPT) will take centre stage when they showcase their affordable energy efficient low carbon 48 volt LC Super Hybrid technology demonstrator at the International Vienna Motor Symposium, which will be attended this week by some of the world's major vehicle and tier 1 manufacturers.

Employing cost effective low voltage micro-mild hybrid technology the LC Super Hybrid, which is based on a 1.4 litre VW Passat family sized saloon, will be making its global debut at Austria's 34th annual powertrain conference. The well respected Vienna symposium includes keynote presentations from vehicle chief technical officers and board level engineers – including for example Prof. Dr. Martin Winterkorn, chairman of the board, Volkswagen AG.

The 48 volt version of the LC Super Hybrid developed by the UK's award winning Low Carbon Vehicle Champions complements their existing 12 volt technology demonstrator unveiled at the Geneva Motor Show in 2012. The more powerful 48 volt demonstrator offers significant additional functionality including torque assist to the petrol engine for launch and low speed transient acceleration, optimised fuelling during idle and motorway cruise conditions with electric assist 'load point moving' and a leaner fuel calibration, in-gear coast-down and the ability to harvest significantly more kinetic energy from regenerative braking. It cleverly combines cost effective, advanced lead-carbon batteries with CPT's production ready, versatile SpeedStart® motor-generator system.

The vehicle also includes production-ready electric boosting technology sold by technology developer CPT to the major tier 1 supplier Valeo based in France. Other international companies involved are powertrain developer and systems integrator AVL based in Germany, drive belt specialist Mubea also from Germany, and Provector, a leading expert in battery management systems, based in the UK.

The ALABC advanced lead-carbon battery and CPT switched reluctance motor-generator technologies, which have been developed over a number of years are now at a high level of technology and manufacturing readiness. It is anticipated the technologies will appear in the next generation of cars from 2015 onwards, when tighter CO₂ emission limits are imposed. The 48V LC Super Hybrid aims to demonstrate 120g/km, combined with an impressive 0 to 100kph acceleration in less than nine seconds, in a large family car.

“Our 48 volt demonstrator will assist global carmakers in their technical due diligence, engineering validation and industrialisation of 48V-based micro-mild hybrid vehicles that motorists can afford to buy,” says Nick Pascoe chief executive, “particularly as we’re now seeing rapidly maturing definitions of 48 volt architectures by leading international carmakers, supported by the global tier 1 supply base, and increasingly diverse powertrain and vehicle applications coming from the market. We expect to gain an additional 4-8 per cent fuel economy improvement over the 1,450kg kerb weight, 12 volt LC SuperHybrid, which already achieves 50mpg imperial (42mpg US and 5.6l/100km) and 130g/km on the NEDC New European Drive Cycle and significantly more miles per gallon in real world driving – while delivering the performance and driveability of a 2-litre class vehicle.”

“Mild electrification of the powertrain deploying more than 12 volts, but keeping it safely less than 60 volts, combined with new generation advanced lead-carbon batteries, which offer high power density and feature capacitive negative electrodes with added carbon, which have been shown to tolerate the relentless charging and discharging in this micro-mild hybrid application, will be a major factor in providing carmakers with the required energy efficiency and affordability,” says Allan Cooper European projects coordinator at the Advanced Lead-Acid Battery Consortium, commenting on the ability of lead-carbon batteries to absorb very high power (high current) charge pulses of brake energy and provide high current discharge pulses for frequent engine cranking and torque assist. “Most significantly this low voltage micro-mild hybrid technology with lead carbon batteries included can be achieved at a quarter of the add-on costs normally incurred with a full hybrid or electric vehicle.”

Building on the success of their 12 volt technology demonstrator, ALABC and CPT have been at the cutting edge of nominal 48 volt vehicle developments proposed initially by German vehicle OEMs, but increasingly being considered by carmakers globally. The emerging low voltage mild hybrid electrification standards, led by the German VDA, but with vehicle OEM and tier 1 defined variations, provide an ideal solution for reducing carbon emissions, without compromising performance or adding significant manufacturing cost. The new 48 volt standard, therefore, will help in the development of a new generation of affordable super fuel efficient low carbon cars that retain petrol and diesel engines, albeit as radically downsized

powertrains, which could also run on a new generation of man-made and environmentally friendly hydrocarbon fuels.

With EU-led global CO₂ emission targets rapidly converging on 130g/km by 2015 and 95g/km by 2020, President Obama's shake-up of the US car industry, which is aiming for 70-80g/km by 2025 and with 60-70g/km a possible EU target for 2025 or 2030, the auto industry has to achieve continued significant reductions putting pressure on carmakers to come up with ever more innovative and affordable technical solutions.

"Much of this legislation can be accommodated cost effectively through low voltage hybridisation of advanced petrol and diesel engines supported by kinetic and thermal energy recuperation," says Pascoe. "Even battery technology and cost inhibited pure electric vehicles produce the equivalent of 130g/km of carbon dioxide emissions if the electricity is supplied by coal fired power stations, which still provide the dominant source of the world's electricity."

Pascoe says the auto industry has reckoned the additional cost to the motorist of deploying a 48 volt micro-mild hybrid solution to achieve a 30 per cent reduction in CO₂ emissions can be as little as £1,000 (\$1,500) for the equivalent performance of a current 2-litre family sized saloon depending on the base vehicle specification and electrical architecture deployed. This is significantly less than the £5,000 UK plug-in car grant, €7,000 French government subsidy, similar tax incentives provided by many other EU member states, incentives up to 60,000 Yuan (US\$9,700) in China and up to \$7,500 US federal subsidies with specific incentives and tax exemptions for BEVs and PHEVs in a number of US states; an on cost for electric vehicles that would seem to remain unavoidable unless there is a significant chemistry breakthrough to reduce the cost and complexity of the electronic and thermal management requirements of the high energy density Li-ion batteries required for plug-in hybrids and battery electric vehicles.

The 12V LC Super Hybrid vehicle has now been tested extensively and driven by many vehicle OEMs and automotive journalists with enthusiastic responses. ALABC and CPT expect to release comprehensive performance data regarding the 48V vehicle fuel economy and energy management later in the year, after which both vehicles will be available for evaluation and back-to-back comparisons.

Organised by the Austrian Society of Automotive Engineers (Österreichischer Verein für Kraftfahrzeugtechnik or ÖVK) and the Institute for Powertrains and Automotive Technology at Vienna University of Technology, the prestigious International Vienna Motor Symposium, provides a high level global forum for the exchange of ideas about future vehicle propulsion systems.

University Professor Dr. Hans Peter Lenz, chairman of the Austrian Society of Automotive Engineers, and principal host of the Vienna symposium, will chair the plenary opening session on Thursday 25 April, which comprises three keynote speeches by Dr. Volkmar Denner, chairman of the board of management, Robert Bosch GmbH; Toshiaki Tanaka, head of advanced engine development and energy research, Toyota Motor Corporation; and Prof. Dr.-Ing. Peter Gutzmer, chief technology officer, Schaeffler AG.

Professor Lenz will also deliver the closing address following his chairing of the final plenary session on Friday 26 April, which comprises three keynote presentations taking a look into future mobility solutions by Prof. Dr. Thomas Weber, member of the board of management, Group Research & Mercedes-Benz Cars Development, Daimler AG; Dr.-Ing. Herbert Diess, member of the board of management, Development, BMW AG; and Prof. Dr. Martin Winterkorn, chairman of the board, Volkswagen AG.

The conference programme is available to download at http://www.xn--vk-eka.at/veranstaltungen/symposien/2013/34_fachprogramm_en.php. Additional information on the symposium and the Austrian Society of Automotive Engineers is available to download at http://www.xn--vk-eka.at/index_en.htm.

Notes to editors

The LC Super Hybrid technology

The LC Super Hybrid programme was conceived by ALABC and CPT to show that significant CO₂ reduction can be achieved through electric hybridisation at low voltages (12-48 volts) complemented by the major breakthrough of high power density advanced lead-carbon batteries.

The range of technology offers at 12-48 volts the potential of a mass market, petrol-powered, large family car with superb drivability, impressive performance and excellent fuel economy achieved at substantially lower cost than an equivalent diesel or high voltage (200 to 600 volts) hybrid. The relatively low cost low voltage technology enables aggressive yet near-term down-sizing and down-speeding of advanced petrol engines.

The LC Super Hybrid technology, which is backed by more than 10 years of continuous development for the switched reluctance motor-generator technology and 20 years of solid research to achieve the lead-carbon battery breakthrough, has ingeniously delivered a cost effective reduction of CO₂ emissions and fuel consumption without destroying the fun-to-drive factor and high energy density liquid fuel range advantage of gasoline engines.

Highly controllable switched reluctance motor-generators aided by low voltage power electronics and sophisticated control software are not yet currently employed by the automotive industry in mass production. The motors are of simple robust construction using steel, aluminium and copper and by avoiding the use of permanent magnets provide an innovative cost-effective solution to the growing problem of insufficient and ever more expensive rare earth materials.

Controlled Power Technologies (CPT) is an independent, award winning, clean-tech company specialising in the development of cost-effective CO₂ reduction measures for the global automotive industry that avoid major redesign of the powertrain or vehicle electrical system. Its core competencies include low voltage power electronics, advanced control software and the application of low voltage electrical machines to vehicle powertrains.

CPT's elite team of development and application engineers is currently focused on bringing three switched reluctance automotive technologies to market readiness. Cobra is a potent water cooled electric supercharger for commercial vehicle and off highway applications. SpeedStart is a powerful water cooled starter-motor and generator able to provide torque assist to the engine and harvest kinetic energy. Also under development is the CPT technology known as Tigers, which is a water-cooled turbine integrated exhaust gas energy recovery system.

Currently recruiting more development and application engineers to increase its UK engineering team from 35 to 50 people, CPT is working closely with major vehicle manufacturers in Europe, the US and Asia as well as prominent universities and leading independent consulting engineers to develop a range of cutting edge automotive technologies focused on low voltage hybridisation and energy recovery.

The company is a spin-off from the advanced powertrain development team established in the UK more than 10 years ago by Visteon, a spin out from Ford, when electric supercharging and other switched reluctance motor technology applications were first mooted, and its technology development partner Emerson Corporation, whose motor business has since been acquired by Nidec. CPT was established in 2007 as a management buy-in funded by venture capital to acquire this advanced powertrain business.

The company comes with a highly experienced team of automotive engineers and is backed by a number of prominent investors specialising in the energy and environmental sectors. Further information on CPT is available at www.cpowert.com.

The **Advanced Lead-Acid Battery Consortium** (ALABC) is an international research consortium formed in 1992 to advance the capabilities of the valve-regulated lead-acid battery in order to help electric and hybrid electric vehicles become a reality. The research resources of the

world-wide membership of ALABC are pooled to carry out a large program of research and development that would otherwise not be possible. The ALABC is managed by the International Lead Zinc Research Organization (ILZRO) based in North Carolina. The International Lead Association (ILA), which is responsible for directing the lead-related activities of ILZRO, is headquartered in London.

ALABC membership currently stands at over 70 organisations. It continues to expand this membership as it enters a new phase of its research and development this year. Details of the new research program were unveiled at the consortium's 20th anniversary celebration held at the European Lead Battery Conference in Paris in September. Further information is available at www.alabc.org.

Ends

ALABC/CPT media contact: For a test drive of the new 48V LC Super Hybrid technology demonstrator or to request a media interview with Allan Cooper or Nick Pascoe, please contact Rob Palmer on +44 7768 242761 or email: rpalmer@palmerpr.com. High resolution images of thumbnails below and previous announcements can be downloaded at www.newspress.co.uk. Additional pictures will be taken at the Vienna symposium.



Pic 1 -- 12V and 48V LC Super Hybrid technology demonstrators pictured at AVL facility prior to dispatch to Vienna symposium. They are both based on a VW Passat 1.4-litre TSI model.



Pic 2 -- 12V and 48V LC Super Hybrid demonstrators feature an electric supercharger developed by CPT and acquired by Valeo for high volume production



Pic 3 -- 12V and 48V LC Super Hybrid technology demonstrators feature CPT's multiple patent protected SpeedStart motor generator technology (top right) and Mubea belt tensioner



Pic 4 -- 12V and 48V LC Super Hybrid both feature Exide Orbital advanced lead-carbon batteries. Picture shows 12V installation with test equipment, which is eliminated in a production car.