

# PRESS RELEASE

22 August 2011

## **Breakthrough in Ricardo Kinergy ‘second generation’ high-speed flywheel technology**

**Following intensive research and engineering development, Ricardo has today announced a breakthrough in its revolutionary Kinergy hermetically sealed high-speed flywheel energy storage device. A significant improvement in the magnetic coupling and gearing system has now taken its efficiency to better than that of a conventional geared drive, consolidating Kinergy’s position as perhaps the most promising high speed flywheel concept currently available**

The subject of nine Ricardo patent families in application, Kinergy represents a step-change advance in mechanical energy storage technology. It is based on a high-speed carbon fibre flywheel operating within a hermetically sealed vacuum chamber at speeds of up to 60,000 rev/min. But unlike current devices in which energy is imported and exported via a drive shaft operating at flywheel speed, Kinergy transfers torque directly through its containment wall using a magnetic gearing and coupling system. This new breed of high-speed flywheel technology offers the prospect of enabling the unit to be sealed for life, thus avoiding the need for high-speed seals and a vacuum pump, and hence reducing costs and maintenance requirements. The consequent weight and space saving potential provides for a competitive packaging envelope, while the ability of the efficient magnetic coupling to incorporate a high gear ratio makes the input and export of torque significantly more manageable than would be the case in a more conventional direct driven high speed flywheel design.

This first Kinergy prototype has resulted from a fast-track engineering development process intended to deliver the unit that will be at the core of the Flybus high-speed flywheel mechanical hybrid powertrain demonstrator vehicle. Following precise balancing of the flywheel rotor during construction and

# PRESS RELEASE

assembly, the unit was installed on a specially constructed dynamometer for development testing. Successive tests have been carried out at increasing speeds and compared with the results of engineering simulations of performance and efficiency. A major thrust of that development has been the elimination of stray magnetic losses in the coupling, and breakthroughs have been made that are critical to the success of the technology.

The 960kJ rated Kinergy system provided for use on Flybus has been developed by Ricardo as part of its involvement in the KinerStor project, which also includes a longer term development process planned for completion towards the end of 2011. This work will focus on the further optimization of the Kinergy system, primarily integration with an improved continuously variable transmission, and with electrical power take-off devices for recharging vehicle batteries. Also being explored are improvements to the design of the magnetic gearbox for better manufacturability and efficiency, and designs for improved component concepts including low loss magnetic bearings and lighter containment systems. The prototype Kinergy system – as delivered to the Flybus project – will be on display at the Ricardo and Torotrak booths at the Cenex LCV2011 event at Rockingham, UK, on 7-8 September 2011.

Commenting on today's announcement Nick Owen, project director for research and collaboration at Ricardo UK, said:

“The efficiency improvements announced today represent a significant milestone in the development of this highly promising Ricardo patented energy storage technology. This next-generation, cost-effective, high energy density flywheel system technology genuinely moves the state of the art forward, offering the prospect of effective mechanical hybridization of low-carbon powertrain applications in all types of vehicles from passenger cars to high speed railway rolling stock.”

## **Ricardo Kinergy research collaborations: Flybus and KinerStor**

Ricardo is currently engaged in two research collaborations through which it is developing and refining its Kinergy high-speed flywheel technology. Each of these projects is supported by an investment from the UK Government-backed Technology Strategy Board with balancing resources provided by the respective research partners. The first of these research collaborations – Flybus – involves the



# PRESS RELEASE

development of a Ricardo Kinergy flywheel energy storage device incorporating a Torotrak patented Continuously Variable Transmission (CVT) for installation in a demonstrator vehicle based on an Optare Solo commercial bus. The Flybus project is being led by Torotrak and includes partners Optare and Ricardo along with support from Allison Transmission.

The KinerStor project led by Ricardo comprises a consortium of industrial partners including CTG, JCB, Land Rover, SKF, Torotrak and Williams Hybrid Power. The project aims to demonstrate the potential of using high-speed flywheel technologies – including both Kinergy and competitor systems – in delivering hybrid systems with the potential for 30 per cent fuel savings (and equivalent reductions in CO<sub>2</sub> emissions) at an on-cost of below £1000, thus enabling the mass-market uptake of hybrid vehicles in price-sensitive vehicle applications.

Ends



# PRESS RELEASE

## NOTES TO EDITORS:

**Ricardo plc** is a global, world-class, multi-industry consultancy for engineering, technology, project innovation and strategy. With almost a century of delivering value, we employ over 1600 professional engineers, consultants and staff. Our people are committed to providing outstanding value through quality engineering solutions focused on high efficiency, low emission, class-leading product innovation and robust strategic implementation. Our client list includes the world's major transportation original equipment manufacturers, supply chain organizations, energy companies, financial institutions & governments. Guided by our corporate values of respect, integrity, creativity & innovation and passion, we enable our customers to achieve sustainable growth and commercial success. For more information, visit [www.ricardo.com](http://www.ricardo.com).

**The Technology Strategy Board** is a business-led government body which works to create economic growth by ensuring that the UK is a global leader in innovation. Sponsored by the UK Government's Department for Business, Innovation and Skills (BIS), the Technology Strategy Board brings together business, research and the public sector, supporting and accelerating the development of innovative products and services to meet market needs, tackle major societal challenges and help build the future economy. For more information please visit [www.innovateuk.org](http://www.innovateuk.org).

## Media contact:

Anthony Smith  
Ricardo Media Office  
Tel: +44 (0)1273 382710  
Fax: +44 (0)1273 880218  
E-mail: [media@ricardo.com](mailto:media@ricardo.com)