

## WORLD'S FIRST LIQUID AIR ENGINE COMMERCIAL VEHICLE DEMONSTRATION SECURES GOVERNMENT FUNDING.

A consortium of the Dearman Engine Company (DEC), MIRA, Air Products and Loughborough University has won an IDP8<sup>1</sup> grant from the Technology Strategy Board, the UK's innovation agency, to build and test a liquid air engine fitted in a commercial vehicle.

The project will demonstrate the Dearman Engine - an innovative heat engine that uses liquid nitrogen as a "fuel" - on a refrigerated truck providing zero-emission cooling and power during 2014. An Industrial Advisory Board representing fleet operators will advise the consortium partners and review the benefits of the technology to their fleets.

Cooling currently accounts for up to 20% of a refrigerated vehicle's fuel consumption. With a commercial engine likely to cost approx. £3,000, independent research has shown that the technology has the potential of a payback in 12 months of operation through savings in fuel; and delivers a 90% reduction in CO<sub>2</sub> emissions from the refrigeration cycle. With global sales of refrigerated transport equipment experiencing double-digit growth, and predicted to exceed £6bn annually by 2015, this investment places the UK at the forefront of innovation in this important market.

Says Dearman Founding Director and CEO, Toby Peters, *"This Technology Strategy Board supported project means that the Dearman Engine solution will be in a vehicle next year and is on track to be tested at MIRA before the end of 2014 prior to full on-road field trials."*

Looking to broader applications of the technology, Peters added, *"By validating all the key systems of the Dearman Engine in a mobile environment, alongside re-fueling and other vehicle management procedures, this project will support further applications for the technology such as waste heat recovery from internal combustion engines and zero-emission propulsion."*

Says Colin Garner, Professor of Applied Thermodynamics, Loughborough University, *"The COOL-E LCV IDP8 Technology Strategy Board supported project is an excellent opportunity to demonstrate the on-vehicle potential of this exciting liquid air technology. The University's School of Mechanical and Manufacturing Engineering has an international reputation for being at the forefront of technological innovation and for maintaining extensive links with industry, and we are delighted to be the academic partner for this exciting project."*

*(cont'd overleaf)*

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<sup>1</sup> Run by Technology Strategy Board, Department of Business and Science and Office for Low Carbon Vehicles (OLEV), Low Carbon Vehicles Innovation Platform Integrated Delivery Programme Competition 8 (LVC IDP8) is specifically to fund proof of concept for disruptive technologies in low carbon vehicles.

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The concept of “liquid air” sprang to prominence in May 2013 with a ground-breaking report from the Centre for Low Carbon Futures, *Liquid air in the energy and transport systems: Opportunities for industry and innovation in the UK*, launched at the Royal Academy of Engineering. The report found that liquid air could reduce diesel consumption in buses or freight vehicles by 25% using a liquid air / diesel hybrid which DEC aims to demonstrate later next year.

MIRA’s Commercial Manager for Future Transport Technologies and Intelligent Mobility, Chris Reeves, said: *“MIRA is proud to lead a project delivering the world’s first demonstration of a liquid air engine in a commercial vehicle. Liquid air is an exciting new energy vector and has the potential to make a major contribution to the low carbon challenge facing the transport sector.”*

Added Toby Peters, *“MIRA has put together a strong consortium of respected partners who have confidence in the technology and are helping us develop it. It’s a big tick endorsing an exciting UK technology that has a major role to play in delivering low carbon transport.*

*“Air Products are excited to be part of the IDP8 project title COOL-E, contributing with cryogenic engineering in transport technologies. As a worldwide supplier of industrial gases, equipment and technology, winning in energy, environmental and emerging markets with unrivaled innovation are part of our Company’s strategy, so a perfect reason for Air Products to join this project,”* said Jon Trembley, Technology Manager, Cryogenic Applications, Global Merchant Gases, Air Products.

*Ends*

**The Dearman Engine Company will be exhibiting at LCV2013, Millbrook Proving Ground 4-5<sup>th</sup> September**

- On 4<sup>th</sup> September, we are part of the SME and microenterprise Technology Showcase in Hall 2, supported by the Department for Business, Innovation and Skills (BIS), the Technology Strategy Board and the Carbon Trust.
- For both days, we are hosted by Productiv on stand C2-36/45 in Hall 2.

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## NOTES

### THE DEARMAN ENGINE

The creation of archetypal British inventor, Peter Dearman, the Dearman Engine operates by boiling liquid air/nitrogen (the main component of air) to produce high-pressure gas that can be used to drive a piston engine, creating shaft power. When liquid air is re-gasified, it expands 700 times. The novelty of the Dearman Engine lies in the use of a heat exchange fluid (HEF) delivering extremely rapid rates of heat transfer and expansion within the engine. It is described by some as an “internal steam engine”. The HEF, a glycol/water mix, can then be used either for cooling or to harness waste heat.

Along with providing cold and power another unique benefit of the Dearman Engine lies in its ability to simultaneously harness low-grade waste heat from sources of 100°C or less. Because of its very low starting temperature (-196°C), the Dearman Engine is able to capture waste heat from the radiator/cooling loop and convert it to power at very high efficiency. This is a unique benefit of liquid air technologies.

The technology has multiple applications including a stand-alone zero-emission vehicle engine; a high-yield low-grade heat energy recovery system hybridized with a diesel engine, and a cost-effective zero-emission combined power and cooling solution.

The Dearman Engine Company was founded in late 2011 to develop and commercially exploit the technology. It is working with Ricardo, E4tech and a group of UK Universities.

### IDP8 CONSORTIUM PARTNERS

**MIRA Ltd** - is a leading independent provider of research, product engineering and test services, primarily in support of the automotive industry, which is underpinned by continuous investment in the most advanced technologies. MIRA is focused on the short, medium and long-term goals of the strategy for a “Smarter, Safer and Greener” attitude towards transportation and the need to be transported. MIRA has extensive knowledge and experience in the field of low carbon vehicles and has been at the forefront of low carbon vehicle design and implementation for more than a decade. MIRA works extensively with governments and the automotive supply chain to accelerate the introduction of low carbon vehicle technologies.

**Air Products** (NYSE:APD) - provides atmospheric, process and specialty gases; performance materials; equipment; and technology. For over 70 years, the company has enabled customers to become more productive, energy efficient and sustainable. More than 20,000 employees in over 50 countries supply innovative solutions to the energy, environment and emerging markets. These include semiconductor materials, refinery hydrogen, coal gasification, natural gas liquefaction, and advanced coatings and adhesives. In fiscal 2012, Air Products had sales approaching \$10 billion. For more information, visit [www.airproducts.com](http://www.airproducts.com).

Air Products is participating to deploy and develop capabilities relevant to Dearman future liquid air (nitrogen) transport technologies. Air Products will contribute support and expertise to the ‘on’ and ‘off’ vehicle cryogenic systems.

**Loughborough University** - is one of the country’s leading universities, with an international reputation for research that matters, excellence in teaching, strong links with industry, and unrivalled achievement in sport and its underpinning academic disciplines.

The University was awarded the coveted ‘Sunday Times University of the Year 2008-09’ title, and is consistently ranked in the top twenty of UK universities in national newspaper league tables. It has been voted ‘England’s Best Student Experience’ for six years running in the Times Higher Education league, and in recognition of its contribution to the sector, the University has been awarded six Queen’s Anniversary Prizes.

It is a member of the 1994 Group of 11 leading research-intensive universities. The Group was established in 1994 to promote excellence in university research and teaching. Each member undertakes diverse and high-quality research, while ensuring excellent levels of teaching and student experience.

### About the Technology Strategy Board

The Technology Strategy Board is the UK’s innovation agency. Its goal is to accelerate economic growth by stimulating and supporting business-led innovation. Sponsored by the 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.