



News release

## Lotus Omnivore Research Engine Unveiled

Lotus reveals flex-fuel engine concept to maximise fuel efficiency when running on renewable fuels or gasoline

Lotus Engineering, the world-renowned automotive consultancy division of Lotus Cars Limited, unveils its latest research into engine efficiency at the 79<sup>th</sup> International Geneva Motor Show. The Omnivore engine concept has the potential to significantly increase fuel efficiency for sustainable alcohol based fuels, which increases the prospect of a greater amount of vehicle miles travelled using renewable fuels. On display will be the single cylinder research engine monoblock that demonstrates the novel architecture designed for high thermal efficiency when fuelled on any alcohol based fuel or gasoline.

The Omnivore concept features an innovative variable compression ratio system and uses a two-stroke operating cycle with direct fuel injection. It is ideally suited to flex-fuel operation with a higher degree of optimisation than is possible with existing four stroke engines.

The engine concept features a monoblock construction that blends the cylinder head and block together eliminating the need for a cylinder head gasket, improving durability and reducing weight. In this case, the application of a monoblock is facilitated by the absence of the requirement for poppet valves. A novel charge trapping valve in the exhaust port allows asymmetric timing of exhaust flow and continuous variation of the exhaust opening point.

The variable compression ratio is achieved by the use of a puck at the top of the combustion chamber. This simple, yet effective system moves up and down affecting the change in geometric compression depending on the load demands on the engine.

Mike Kimberley, Chief Executive Officer of Group Lotus plc said: "We are delighted to unveil this major milestone in the development of an engine configuration for a new breed of more efficient multi-fuel engines. The automotive sector is focusing on its environmental obligations to improve efficiency, minimise reliance on fossil fuels and reduce harmful emissions and Lotus continues to be an industry leader through our work on all aspects of future fuels. Sustainable alcohol based fuels have the potential to reduce the overall CO<sub>2</sub> footprint of internal combustion engines towards zero and for this reason, need to be embraced as future fuels for road transport."

In this collaboration with Queen's University Belfast and Orbital Corporation Limited Australia, with sponsorship from DEFRA/DECC and DOE NI through the Renewables Materials LINK programme, Lotus Engineering is currently in the final stages of commissioning the Omnivore single-cylinder research



News release

engine. It uses the Orbital FlexDI™ fuel injection system which produces fine in-cylinder fuel preparation irrespective of fuel type, and together with air pre-mixing allows efficient two-stroke combustion and low-temperature starting, whilst offering singular opportunity for advanced HCCI control.

The Omnivore programme is another development of Lotus' research into understanding the complex combustion processes involved in running an engine on mixtures of alcohol based fuels and gasoline, which included the Lotus Exige 270E Tri-fuel, unveiled at the International Geneva Motor Show in 2008. This research is vitally important for a successful transition from today's fuels to the more efficient sustainable fuels of the future.

Geraint Castleton-White, Head of Powertrain at Lotus Engineering said, "The absence of poppet valves in two-stroke engines makes the incorporation of a variable compression ratio system relatively straightforward. Our research into these systems on four-stroke engines has led us to the conclusion that while thermodynamically it is a desirable technology to incorporate, practically it is very difficult, particularly taking into consideration production feasibility. This two-stroke engine could solve these practical difficulties and simultaneously permits a much larger range of compression ratio adjustment, with the potential to perform at a much higher efficiency when running on renewable fuels."

## NOTES

### **About Group Lotus plc:**

The main operating subsidiary of Group Lotus plc is Lotus Cars Ltd, which has two operating divisions - Lotus Engineering and Lotus Cars. Lotus Engineering is an internationally recognised automotive engineering consultancy based in Norfolk, UK. Global facilities include those in Michigan (USA), Kuala Lumpur (Malaysia), China and offices in Germany and Japan, with rapid expansion in new territories such as South East Asia and the Gulf States.

Lotus Engineering provides comprehensive and versatile consultancy services to many of the world's OEMs and Tier 1 suppliers, offering a full engineering service from initial concept and project design through development and integration of the complete vehicle to meet all worldwide markets and customers to full production. This includes third party 'niche vehicle' engineering and manufacture worldwide.

Lotus Cars builds world class, prestige, high performance sports cars for sale in 37 countries. These include the iconic Lotus Elise, the Exige and Europa. Lotus is a global high-tech company, expanding rapidly and committed to driving forward technology for both Lotus Cars and its Engineering clients, spearheading research into such areas as hybrids, electric vehicles and renewable fuels.

### **About Renewable Materials LINK**

LINK supports collaborative research between industry and the science and engineering research base. Under the Renewable Materials programme, the government co-finances private-sector led innovative, pre-commercial R&D investment in furthering the non-food uses of renewable materials to support



sustainable development. This research was sponsored by DEFRA (Department for Environment, Food & Rural Affairs, DECC (Department of Energy & Climate Change and DOE NI (Department of the Environment Northern Ireland).

For further details:

<http://defrafarmingandfoodscience.csl.gov.uk/unit/floatingpage.cfm?id=19>

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News release