

# Oil system developed for greener, more fuel efficient mild hybrid vehicles

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Credit: University of Nottingham

The concept for a novel oil system has been developed by a researcher at The University of Nottingham as part of a bid to advance greener, more fuel-efficient, mild hybrid technology for vehicles of the future.

Paul Shayler, Ford Professor of Mechanical Engineering at the University, is behind the oil system which is part of the Government-backed ADEPT (advanced diesel-electric powertrain) project.

ADEPT aims to introduce advanced 48v mild hybrid powertrain architecture capable of delivering near full hybrid-scale diesel fuel efficiency and reduced CO<sub>2</sub> emissions at significantly lower cost.

ADEPT is led by Ricardo and research partners including The University of Nottingham, Ford Motor Company, Controlled Power Technologies, Advanced Lead Acid Battery Consortium and Faurecia

Emissions Control Technologies UK Ltd.

Following almost three years of intensive testing, ADEPT has successfully applied advanced mild hybrid technologies with intelligent 48V electrification into a Ford Focus demonstrator.

The control strategies deployed have been developed based on extensive vehicle systems simulation work. This includes work to progress the oil system concept by Professor Shayler which can be exploited using 48v oil pump technology.

Professor Shayler, Head of the Thermofluids Research Group, in the Faculty of Engineering at Nottingham, said: "Before ADEPT, we discovered we could reduce the friction in some parts of the engine by supplying these with lubricating oil at lower pressures than normal. At the same time, we needed to continue to supply oil to other parts of the engine at the higher oil pressures used in conventional oil systems.

"During the ADEPT project we have demonstrated the practicality of this approach to improving engine fuel economy. It works particularly well under the important urban driving conditions experienced during most vehicle journeys. The new concept controls total flow in the [oil](#) system and, for the first time, varies the flow distribution to meet local needs."

## **Ford Focus demonstrator**

The baseline vehicle for the ADEPT research and development programme is based on an already downsized and competitively fuel-efficient diesel Ford Focus ECONetic 1.5TDCi.

The final ADEPT demonstrator vehicle, which has now been completed, provides the fullest implementation of systems to be carried out by the

team.

## **Showcasing the results**

The final results of ongoing vehicle road and laboratory tests will be revealed for the first time at the Low Carbon Vehicle Event in London in September. The project partners also intend to make the vehicle available for ride and drive demonstrations at LCV2016.

Intelligent electrification enables highly aggressive engine downsizing and down-speeding beyond what may normally be possible other than through more expensive hybridization approaches.

## **Ultra-low emissions & fuel savings**

By basing the system on 48V electrical architecture, the ADEPT project aims to achieve a highly optimal cost and performance trade-off, including ultra-low emissions, while also delivering significant fuel savings.

The integration of hybrid and emissions control systems has the potential to deliver up to a 10-12 per cent reduction in fuel consumption. The technology can also be delivered at lower costs than a more traditional approach of optimising each system separately.

With sophisticated electronic control of the powertrain systems, torque assist can be used to ensure that performance is maintained – or improved upon – throughout the duty cycle while also reducing fuel consumption.

This is achieved through the use of torque assist from electrically-harvested energy, temporarily stored in a 48v advanced lead-carbon

battery with a high rate partial state-of-charge capability similar to a supercapacitor, in combination with 48v electrified ancillaries.

The recovered energy is stored in the advanced lead-carbon battery pack, providing a high power, high endurance, easily recyclable, lithium-free energy storage solution at a competitive cost.

The ADEPT powertrain includes a range of electrical ancillaries powered from the 48V system rather than directly from the engine, including for example, the vehicle air conditioning compressor.

Provided by University of Nottingham

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