Event: SIA 2019 Powertrain & Electronics

Title: Hybrid Petrol Advanced Combustion Engine – Advanced Boosting System for Extended Stoichiometric Operation and Improved Dynamic Response

Technical Paper: 2019-01-0325

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Abstract

The HyPACE (Hybrid Petrol Advanced Combustion Engine) project is a part UK government funded research project established to develop a high thermal efficiency petrol engine optimised for hybrid vehicle applications. The project combines the capabilities of a number of partners (Jaguar Land Rover, BorgWarner, MAHLE Powertrain, Johnson Matthey, Cambustion and Oxford University) with the target of achieving a 10% vehicle fuel consumption reduction, whilst still achieving a 90 to 100 kW/litre specific power rating. The project also evaluated innovative new after-treatment systems that may be required in order to meet forthcoming global emissions regulations in hybrid vehicle applications.

The donor engine for the project was Jaguar Land Rover's new Ingenium 4-cylinder petrol engine. For the HyPACE project the engine was updated with a revised combustion system, generating higher charge motion, together with a 48 V variable geometry turbine eTurbo™ and a low-pressure exhaust gas recirculation system, both supplied by BorgWarner. This paper presents results from the engine testing that demonstrates the capability of the updated engine to deliver; higher efficiency, improved dynamic response and stoichiometric operation at up to 90 kW/litre. Results from testing of the new after-treatment systems and the simulation activities conducted to predict fuel consumption benefits of this new hybrid powertrain are also discussed.