



Particle Reduced, Efficient Gasoline Engines

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Executive Summary

The Particle Reduced Efficient Gasoline Engine (PaREGEEn) project is a European Horizon 2020 project that has been created with a view to demonstrating a new generation of Gasoline Direct Injection (GDI) engines achieving a reduction in CO₂ emissions of 15% compared to the best equivalent engines in the market in 2016 and control of particle size down to 10nm in size through the adoption of new technologies.

Jaguar Land Rover, in conjunction with Bosch, Johnson Matthey, Ricardo and Honeywell are to deliver a Jaguar XE vehicle in 2019 that will adopt dilute combustion (excess air, external Exhaust Gas Recirculation (EGR), internal exhaust residuals or a combination of all three) with a view to realising the fuel consumption saving equivalent to the CO₂ reduction mentioned in the paragraph above as well as ensuring the vehicle and engine they are applied to is compliant with EU6c emissions regulations with particulate control down to 10nm.

Through a number of Computer Aided Engineering (CAE) and engine test investigations, a new combustion system (of increased compression ratio and higher activity) and new boosting system (Variable Nozzle Turbine (VNT) and electrical compressor) have been selected. Furthermore, a higher energy ignition system and optimised fuel injectors suitable for lean combustion (and reduced particulate formation) have been outlined for use (both supplied by Bosch).

A parallel investigation undertaken in WP2 will result in the finalised specification of an aftertreatment system that is suitable for lean gasoline combustion. To support this, a lean aftertreatment study was undertaken in WP4 with a view to outlining the aftertreatment layout most suitable. By using an in-house simulation tool, an aftertreatment system consisting of a Three Way Lean NO_x Trap (TWLNT), Gasoline Particulate Filter (GPF) and Selective Catalytic Reduction (SCR) utilising urea injection has been outlined. After combining the efficiency gains of each of the new technologies investigated within the concept study phase of WP4, a target Brake Specific Fuel Consumption (BSFC) and engine out NO_x map have been created.

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Project partners:

| # | Partner | Partner Full Name |
|----|---------|---|
| 1 | RIC | RICARDO UK LIMITED |
| 2 | DAI | DAIMLER AG |
| 3 | JLR | JAGUAR LAND ROVER LIMITED |
| 4 | BOSCH | ROBERT BOSCH GMBH |
| 5 | FEV | FEV EUROPE GMBH |
| 6 | JM | JOHNSON MATTHEY PLC |
| 7 | HON | HONEYWELL, SPOL. S.R.O. |
| 8 | JRC | JOINT RESEARCH CENTRE – EUROPEAN COMMISSION |
| 9 | UNR | UNIRESEARCH BV |
| 10 | IDIADA | IDIADA AUTOMOTIVE TECHNOLOGY SA |
| 11 | SIEMENS | SIEMENS INDUSTRY SOFTWARE SAS |
| 12 | LOGE | LUND COMBUSTION ENGINEERING LOGE AB |
| 13 | ETH | EIDGENOESSISCHE TECHNISCHE HOCHSCHULE ZUERICH |
| 14 | UDE | UNIVERSITAET DUISBURG-ESSEN |
| 15 | RWTH | RWTH AACHEN UNIVERSITY |
| 16 | UFI | UFI FILTERS SPA |
| 17 | UOB | UNIVERSITY OF BRIGHTON |
| 18 | GARR | GARRETT–ADVANCING MOTION |



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