



# REWARD

REal World Advanced Technologies for Diesel Engines

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<b>Written By</b>	Giorgio Rustici (CRF) Marco Tonetti (CRF)	
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**Project partners:**

- 1 - AVL - AVL List GmbH - AT
- 2 - REN - Renault SAS - FR
- 3 - VCC - Volvo Car Corporation - SE
- 4 - CRF - CRF SCpA - IT
- 5 - CNRIM - Istituto Motori – Consiglio Nazionale delle Ricerche (CNR) - IT
- 6 - JM - Johnson Matthey Plc - UK
- 7 - RIC - Ricardo Plc - UK
- 8 - SCF - Schaeffler AG - DE
- 9 - LMM - Le Moteur Moderne - FR
- 10 - DELPHI - Delphi Automotive Systems Luxembourg S.A. - LU
- 11 - UNR - Uniresearch BV - NL
- 12 - IFPEN - IFP Energies Nouvelles - FR
- 13 - VIF - Virtual Vehicle Research Center - AT
- 14 - CTH - Chalmers Tekniska Högskola - SE
- 15 - CTU - Czech Technical University - CZ
- 16 - UPVLC - Universitat Politecnica de Valencia – Motores Termicos – ES

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## Publishable Executive summary

The Subtask 3.2.2 is devoted to the optimization of the CRF multicylinder engine, based on the 1.6 l – Family B platform. The engine has been progressively updated with the outcomes from Subtask 3.2.1. A full engine calibration under steady state conditions has been developed and the engine has been assessed in terms of efficiency, emissions and combustion noise.

Main new engine contents are the improved EGR system with both Low Pressure and High Pressure cooled EGR and a completely new combustion system together with a new FIE with increased maximum fuel pressure.

The features of the new combustion system have been defined on the basis of simulation activity and an experimental campaign performed in the subtask 3.2.1: based on these activities a reduced hydraulic flow rate nozzle and new bowl shape (larger and stepped) has been selected.

The 1,6L engine updated with the new hardware, has been installed on a test bench and calibrated at different engine coolant temperatures (40°C, 70°C and 90°C) in order to cover a wide range of different working conditions. A DoE procedures has been used to optimize calibrations with the goal to minimize Fuel Consumption and NOx Emissions while keeping specific constraints regarding Combustion Noise, Combustion Stability and Smoke emissions.

Thanks to these improvements the new engine shows a BSFC improvement up to 4% in warm conditions together with an evident reduction of Hydrocarbon (HC) and Soot emissions and improvements in terms of Combustion Noise. No penalties in terms of maximum rate power/torque has been observed.

A complete engine calibration has been implemented in ECU and released for the next activity where the engine will be installed on a demo vehicle and integrated with the newly defined aftertreatment. This activity will be part of the WP2.

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