



Particle Reduced, Efficient Gasoline Engines

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Written By	Andreas Manz, Roman Grzeszik, Jan Geiler (BOSCH)	2018-03-28
Checked by	Andreas Manz (BOSCH)	2018-03-28
Approved by	Andreas Manz (BOSCH) Cor van der Zweep (Uniresearch) Simon Edwards (RIC) - Coordinator	2018-03-31 2018-04-04 2018-03-31
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Summary

The further optimization of combustion concepts and reduced pollutant formation of modern gasoline engines requires advanced measurement and simulation methods, as well as a fundamental understanding of the underlying physical-chemical relationships of in-cylinder processes. The variety of sub-processes during mixture formation (atomization, evaporation and mixing) and combustion (ignition, flame front propagation and pollutant formation) running at very small characteristic time scales for reaction kinetic mechanisms (e.g. ignition delay times in a few μs) necessitate detailed and individual in-situ as well as non-reactive measurement techniques. Therefore, experimental analysis is performed using contactless optical measurement techniques in combination with analytical modelling and numerical simulation, which contribute significantly to the understanding of the cause and effect relationships. These optical diagnostics methods are well tested under laboratory conditions and established in the development process. However, the adaption to specific problems of engine processes is difficult due to the specific boundary conditions (pressure, temperature, soot formation during combustion etc.).

Within WP1 (Advanced Combustion Technologies), the fundamentals of the PaREGEEn project in terms of causal relationships that lead to emissions such as PN are addressed by experiments and simulations. This intermediate report focuses on the optical diagnostics methods that are used and adapted for the analysis of injection and mixture formation processes as well as combustion and soot formation. Measurements at various test rigs have been performed and used for validation of simulation models that have been developed within WP1. Some experimental results are given exemplarily. For detailed information it is referred to the corresponding WP1 reports (Jüngst N., 2017), (Frapolli, 2018) and (Thomas V., 2018). Finally, the initial application of the Bosch advanced ignition system is introduced. Measurements with the system will follow in the second half of the PaREGEEn project.

Appendix A – Acknowledgement

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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
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