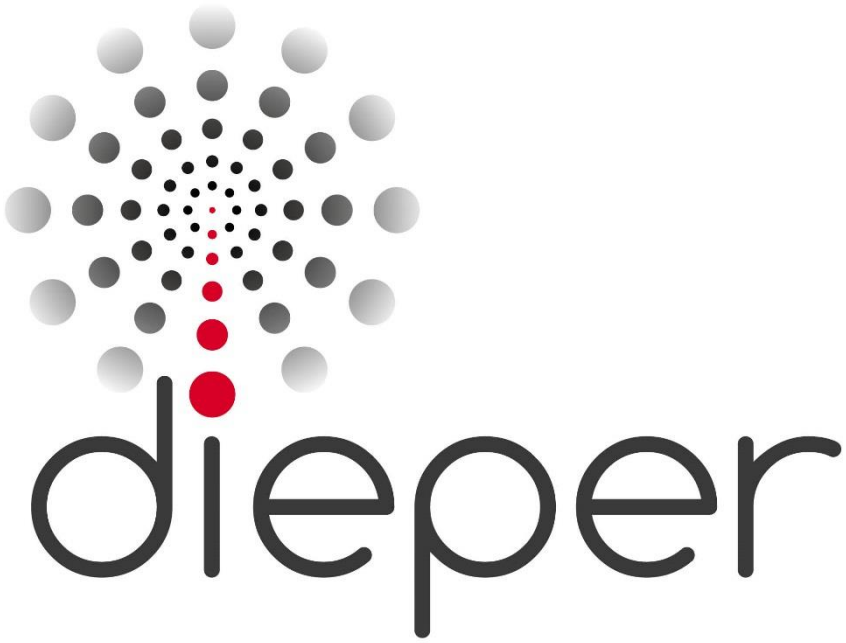

Diesel efficiency improvement with Particulates and emission Reduction

EUROPEAN COMMISSION
Horizon 2020

GA No. 723976

Deliverable No.	dieper D5.3	
Deliverable Title	Database of size, number and chemical composition (likely origin) of PN emissions	
Deliverable Type	REPORT	
Dissemination level	Confidential – member only (CO)	
Written By	Ezio Mancaruso (CNR)	2018-09-30
Status	**Final**	2018-12-21
Checked by	Richard King, Ricardo, Work Package Leader, WP5	2018-12-20
Submitted to Work Package Leaders		2018-12-11
Approved by WPLB		2018-12-20

H2020-GV-2016-INEA - Diesel efficiency improvement with Particulates and emission Reduction
Acknowledgement:

The author(s) would like to thank the partners in the project for their valuable comments on previous drafts and for performing the review.

Project partners:
1 – AVL – AVL List GmbH – AT
2 – REN – Renault SAS – FR
3 – IFP – Energies nouvelles – IFPEN – FR
4 – CMT – Universitat Politecnica de Valencia – ES
5 – JM – Johnson Matthey Plc – UK
6 – CONTI – Continental Automotive France SAS – FR
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15 – UNR – Uniresearch BV – NL
16 – CRF – Centro Ricerche SCPA – IT

Disclaimer:
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 723976.

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Document Change Log

Name	Date	Comments
V0.1	2018-10-30	First draft of document
V0.2	2018-11-15	Initial comments from reviewer
V0.3	2018-11-26	Update in response to reviewer's comments
V0.4	2018-11-30	Additional comments and input from Jon Andersson (Ricardo)
V0.5	2018-12-06	Update in response to reviewer's comments
V0.6	2018-12-07	Formatting update and further comments from Jon Andersson (Ricardo)
V0.7	2018-12-10	Update in response to reviewer's comments
V0.8	2018-12-11	Draft issued to Work Package Leaders Board
V1.0	2018-12-21	Submitted to EC

Document Distribution Log

Version	Date	Distributed to
V0.2, 0.3, 0.5, 0.7	See above	Jon Andersson (Ricardo Global Technical Expert, Emissions Measurement & Standards, and WPL DownToTen)
V0.8	2018-12-11	Work Package Leaders Board
V1.0	2018-12-21	Submitted to EC

Verification and approval

Name	Name	Date
Verification Final Draft by WP leader	Richard King	2018-12-20
Approval Final Deliverable	Work Package leaders Board	2018-12-20

Executive summary

This report details the results achieved in Task 5.5 of WP5 by Istituto Motori (part of the National Research Council (CNR), Naples, Italy) and gives information about the size, number and chemical composition of the particles emitted by the baseline exhaust after-treatment system of the Iveco Daily F1C, 3litre, 4-cylinder, engine. It is the same engine and aftertreatment used in the Iveco Daily vehicle to be used for the dieper LCV demonstrator vehicle, and the same as the vehicle tested in Johnson Matthey laboratory as part of WP3.

Figure 1-1 shows the exhaust after-treatment system of the engine. It consists of a Diesel Oxidation Catalyst (DOC) and Passive/Active Diesel Particulate Filter (DPF) system, both integrated in the same canister, and a Selective Catalytic Reactor (SCR), with a one-meter length exhaust pipe connecting the DPF to the SCR. In this pipe, a urea injector is set up and a mixer helps distribute the injected urea in the exhaust gas moving toward the SCR. In the same canister, SCR and Clean-Up Catalyst (CUC) elements are placed. The EATS tested in Istituto Motori was set up to replicate the installation in the baseline LCV demonstrator vehicle.

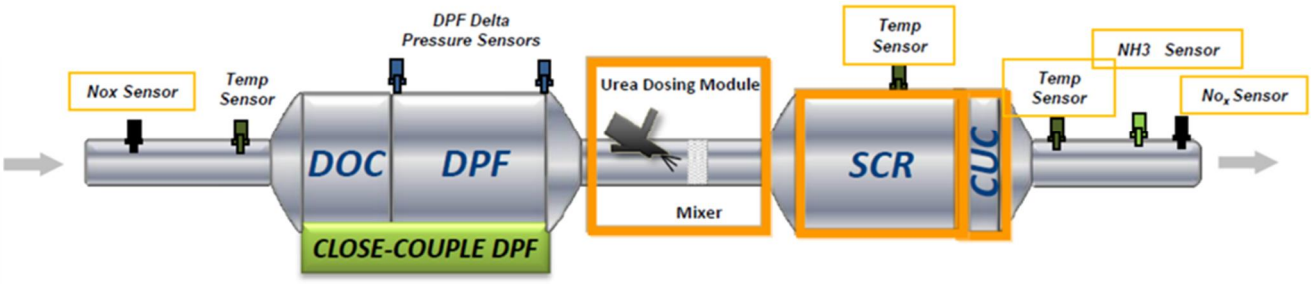

Figure 1-1: Exhaust after treatment system of the F1C engine tested at Istituto Motori

Measurements were performed at steady state conditions of the WLTC cycle in Warm-Up, Full Load, Filter Loading and Regeneration operating conditions.

This report contains information about the tests performed and the measurements of sub 23mm diesel particles. This includes, in-cylinder combustion analysis, soot size function distribution and particle number measurements. The source, timing and number of sub 23nm diesel particle emissions from raw exhaust up to the exit of the exhaust pipe, downstream of the standard EATS have been assessed. This data will be the baseline for the determination of performance of the new EATS system for demo vehicle.

The DPF system has shown good performance in the operating conditions tested. In particular, DPF efficiency greater than 96% in the reduction of the sub 23nm particles has been measured at full load across the speed range, and greater than 99% 40s after the start of the engine in the warm-up period at 2000rpm and 50% accelerator pedal position. During DPF regeneration a reduction of up to 88% of the particles < 23nm is recorded. Urea injection was found to affect the physical properties of the particles at the exit of the SCR. The chemical analysis showed that the particles consist mainly of agglomerated solid carbonaceous material and volatile organic compounds. Solid carbon originates during combustion; it is oxidized into the cylinder and residue is exhausted in the form of solid agglomerates. A tiny fraction of the fuel, and atomized and evaporated lube oil, appear as volatile. The soluble organic fraction contains mainly polycyclic aromatic hydrocarbons; while the insoluble part of the particles presented several elements originating in the lubricating oil, fuel additives and wear of piston rings and engine components.

6 Risk Register

6.1 Risk Register

There are no risks in the risk register associated with D5.3.

6.2 Quality Assurance

The Work Package Leaders Board is the body for quality assurance. The procedure for review and approval of deliverables is described in the deliverable report D1.1 – "Risk Management Plan". The quality will be ensured by checks and approvals of WP Leaders Board, see front pages of all deliverables.

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8 Acknowledgment

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 723976.