Deliverable report

Deliverable No:	D3.5
Dissemination level:	Confidential (CO) – Public Summary
Title:	Report on combustion system optimization for alcohol blend fuels

Date:	09/03/2021
Version:	FINAL
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Grant Agreement Number:	817612
Project Type:	H2020-LC-SC3-RES-21-2018-development of next generation biofuels and alternative renewable fuel technologies for road transport
Project acronym:	REDIFUEL
Project title:	Robust and Efficient processes and technologies for Drop In renewable FUELs for road transport
Project start date:	01/10/2018
Project website:	www.redifuel.eu
Technical coordination	FEV (DE) (www.fev.com)
Project management	Uniresearch (NL) (http://www.uniresearch.com)

Executive Summary

The overall objective of the REDIFUEL project is to develop and validate a novel and cost-competitive process for sustainable production of renewable diesel that is fully compatible with the EN590 fuel standard. The proposed drop-in biofuel is composed of high-cetane number C_{11}+ bio-hydrocarbons and C_6-C_{11} bio-alcohols, resulting in improved combustion performance and reduced emissions - owing to the share of alcohols which brings fuel bone oxygen in the diesel blend and the paraffinic structure.

One of the major activities in the REDIFUEL project is to use the REDIFUEL as a drop-in fuel and conduct experiments on an existing engine technology to see its effect on efficiency and emissions reduction. The CFD simulations play an important role in understanding the effect of the new bio-fuel on the performance and emissions for a given combustion chamber. The CFD is furthermore used for combustion system development, to improve the nozzle and bowl design. In the present study, the effects of different injection parameters, i.e nozzle cone angle, number of holes, hydraulic flow rate and piston bowl shape on the mixture formation are studied. For modelling the fuel spray, a calibrated spray model from deliverable 3.2 is used. The effect of different piston bowl shape is studied in order to improve mixture formation and combustion performance while reducing emissions.

In VECTO simulation tool driving cycles are defined based on vehicle group (i.e. Long haul, Regional delivery trucks etc). The load points are selected based on the data derived from the VECTO simulation tool for heavy duty engine. Based on the VECTO simulation tool, the HD engine operates ≈ 90% of the times around the cruise point and the best efficiency point. Therefore, both the Diesel and REDIFUEL were investigated at cruise point and best efficiency point with the help of CFD simulation. The know-how gain from this numerical study will be used to optimize the combustion system layout and define hardware for the single cylinder research engine for renewable fuel.

Acknowledgement

H2020-LC-SC3-RES-21-2018-DEVELOPMENT OF NEXT GENERATION BIOFUELS AND ALTERNATIVE RENEWABLE FUEL TECHNOLOGIES FOR ROAD TRANSPORT

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 - FEV – FEV EUROPE GMBH - DE
2 - MPI – MAX-PLANCK-GESELLSCHAFT ZUR FORDERUNG DER WISSENSCHAFTENEV - DE
3 - CSIC – AGENCIA ESTATAL CONSEJO SUPERIOR DE INVESTIGACIONES CIENTIFICAS - ES
4 - VTT – Teknologian tutkimuskeskus VTT Oy - FI
5 - RWTH – RHEINISCH-WESTFAELISCHE TECHNISCHE HOCHSCHULE AACHEN - DE
6 - OWI – OWI Science for Fuels gGmbH - DE
7 - VUB – VRIJE UNIVERSITEIT BRUSSEL- BE
8 - NESTE – NESTE OYJ – FI
9 – MOL - MOL HUNGARIAN OIL AND GAS PLC - HU
10 – INER - INERATEC GMBH - DE
11 – T4F - TEC4FUELS - DE
12 – UNR - UNIRESEARCH BV - NL

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement no. 817612