Deliverable report

Deliverable No:	D3.2
Dissemination level:	Confidential (CO) – Public Summary
Title:	Report on integration of high pressure chamber investigations into CFD code
Date:	22/10/2020
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 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 the given combustion chamber of the Single Cylinder Engine (SCE). For this, the CFD is used for combustion development and to improve nozzle and bowl design. Hence for a high confidence level in the spray model, the spray model calibration is performed and compared against the High Pressure Chamber (HPC) data. To optimize the combustion system, it is important to capture the correct liquid and gas-phase fuel penetration of the spray. For promoting the fuel-air mixing, the penetration of the liquid phase fuel is very important. However, the higher penetration can also lead to higher emissions if the liquid fuel impinges on the piston bowl wall. Hence, it is important to investigate spray and evaporation performance of the new bio-fuel REDIFUEL the renewable bio-fuel in a High Pressure Chamber (HPC) and afterwards reproduce these results in the CFD.
Diesel and REDIFUEL were investigated at various pressure and temperature boundary conditions inside the HPC that are comparable with part and medium load in-cylinder conditions at the start of injection. The results of the HPC testing were used to calibrate the spray model of the 3D-CFD simulations. The know-how gain from this numerical study will be used to optimize the combustion system layout for the renewable bio-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