

LONG RUN

D4.1 – Thermodynamic analysis and 1-D simulations

Innovation Action

EUROPEAN COMMISSION
Grant Agreement No. 874972

HORIZON 2020 PROGRAMME
Topic LC-GV-04-2019
Low-emissions propulsion for long-distance trucks and coaches

Deliverable No.	LONGRUN D4.1	
Related WP	4	
Deliverable Title	Thermodynamic analysis and 1-D simulations	
Deliverable Date	2020-12-31	
Deliverable Type	REPORT	
Dissemination level	Confidential – member only (CO)	
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Approved by	Lukas Virnich	2021-03-03
Status	Final	2021-03-04



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 874972.

Publishable Summary

WP4 develops an advanced 40t long haul truck operated on bio-methane. The work in LONGRUN focuses on the improvement of an existing stoichiometric natural gas (NG) engine, which includes a new exhaust aftertreatment system and a mild electrification of the powertrain.

The base engine for this development is the FPT Cursor13 Euro VI NG spark ignited engine (IL6, 338kW-2000 Nm). This engine was analyzed and assessed with focus on turbocharging, gas exchange and optimization of the thermodynamic cycle. 1-D engine cycle simulations were carried out with the integrated IC engine simulation software AVL BOOST™.

In principle, the stoichiometric combustion concept with spark ignition of the current production engine has been retained. However, the Brake Thermal Efficiency (BTE) of the engine was systematically raised by measures such as improved scavenging and turbo charging and the integration of EGR, turbo compound and a waste heat recovery (WHR) system. Additionally, an optimized valve timing was chosen, which specifically considers a late intake valve closing event.

In total, all measures of improved air handling achieved a BTE improvement of approximately 3 percent points which meets the estimated target of the investigation.

Additionally, investigations on friction reduction and Waste Heat Recovery (WHR) showed a possible BTE improvement of 1.5 percent points.

8 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:

#	Partner	Partner Full Name
1	FEV	FEV EUROPE GMBH
2	DAF	DAF TRUCKS NV
3	FPT	FPT INDUSTRIAL SPA
4	FORD	FORD OTOMOTIV SANAYI ANONIM SIRKETI
5	IRIZAR	IRIZAR S COOP
6	IVECO	IVECO S.p.A.
7	VOLVO	VOLVO TECHNOLOGY AB
8	VDL	VDL ENABLING TRANSPORT SOLUTIONS BV
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10	AVL	AVL LIST GMBH
11	EATON	EATON ELEKTROTECHNIKA SRO
12	GARR	GARRETT MOTION CZECH REPUBLIC SRO
13	IDIADA	IDIADA AUTOMOTIVE TECHNOLOGY SA
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15	AVL	AVL MTC MOTORTESTCENTER AB
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17	PRIMA	PRIMAFRIO SL
18	SHELL	SHELL GLOBAL SOLUTIONS (DEUTSCHLAND) GMBH
19	SIE	SIEMENS INDUSTRY SOFTWARE SAS
20	TECHNA	FUNDACION TECHNIALIA RESEARCH & INNOVATION
21	TOTAL	TOTAL MARKETING SERVICES
22	UMIC	UMICORE AG & CO KG
23	UNR	UNIRESEARCH BH
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25	CHALM	CHALMERS TEKNISKA HOEGSKOLA AB
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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 874972. The information and views set out in this publication does not necessarily reflect the official opinion of the European Commission. Neither the European Union institutions and bodies nor any person acting on their behalf, may be held responsible for the use which may be made of the information contained therein.