

Single cylinder activities on H2 combustion – Overview

LONGRUN Advisory Board Meeting

21st of November 2022

Online meeting

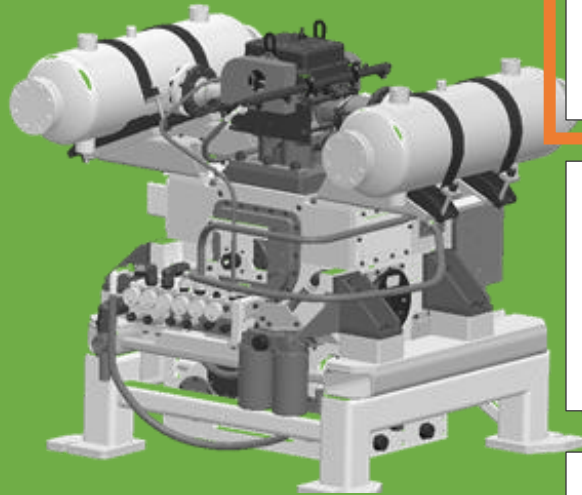
Kai Deppenkemper

FEV



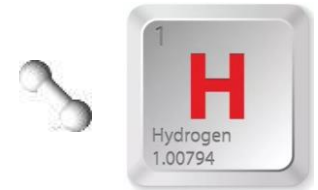
FEV Heavy-Duty Single Cylinder Engine Activities

FEV HD Single Cylinder Engine



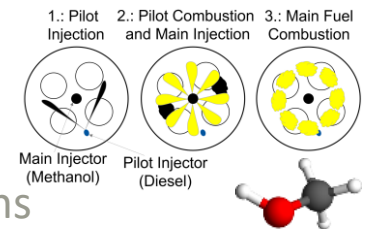
DI Hydrogen Spark Ignited Combustion

- Thermal efficiency increase
- Reduced NO_x engine-out, e.g. <70 % of Eu VI-E level



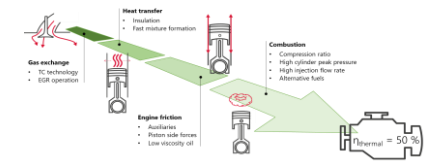
Optimized Dual Fuel (liq/liq) Combustion

- Combustion performance evaluation of Methanol/Diesel fuel
- Assessment of efficient integration for future long-haul applications



Diesel Combustion Optimization for Highest Thermal Efficiencies

- Increased work on cylinder, e.g. faster heat release
- Reduced heat losses, e.g. thermal insulation

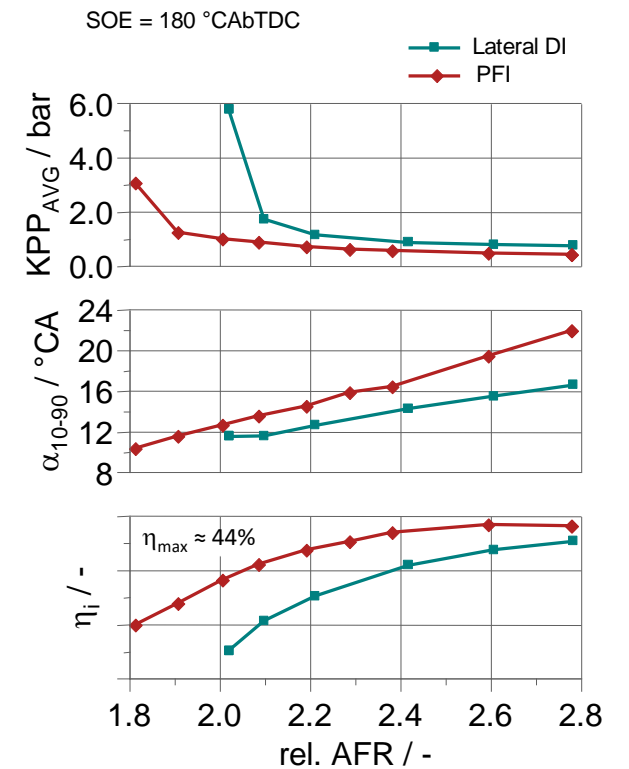
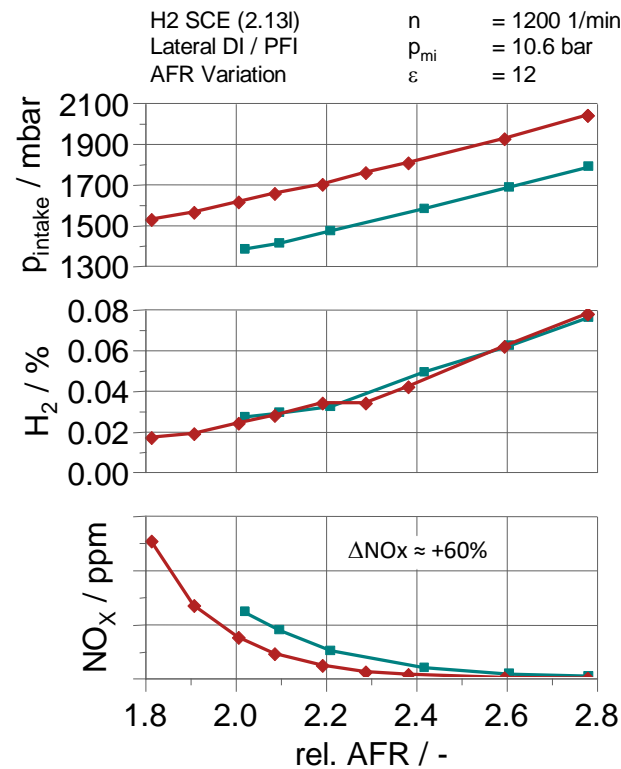


ST2.2.2.3: Direct injection Hydrogen Spark Ignited Combustion – SCE testing

Hydrogen Research Activities - Results

- Richer operation requires ignition retardation due to strong knock
- H₂-slip increases with higher AFRs
- Decreasing NO_x emissions with higher AFRs
- Higher base NO_x emissions than PFI engine variants caused by mixture inhomogeneity
 - Increased volumetric efficiency makes significantly higher AFRs possible

High AFRs required for high efficiencies and low NO_x emissions



Innovations and exploitations

- Publication:
 - “Experimental and numerical investigation of a direct injection spark ignition hydrogen engine for heavy-duty applications” at International Journal of Hydrogen Engines
- Patent: DE 102021005224.2
 - Cylinder head-integrated spray nozzle for hydrogen direct injection

Q&A

Thank you



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