Spray and Combustion Analysis of E-Fuels at Diesel Engine Conditions

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Abstract

FVTR operates a high pressure - high temperature - spray and combustion chamber for the analysis of fuel sprays in marine combustion engines. The injection chamber allows the observation of fuel sprays through a 300 mm diameter quartz glass window. It allows chamber gas pressures up to 100 bar and gas temperatures up to 900 K. The penetration, atomization, mixing, evaporation and combustion of fuel sprays are analyzed using different measurement techniques:

- Schlieren Scatterlight Technique
- 2D Highspeed 2 Color Pyrometry
- Photomultiplier for global OH-Chemiluminescence detection
- Local spray force measurement using pitot tube Sensor

The test bed is used in public and commercial research projects for the analysis of injectors and nozzles in order to assess specific spray phenomena, the analysis of spray and combustion using non diesel fuels like HFO, E-fuels, ULSFO, fuel water emulsion. The test bed allows the visualization of gaseous fuels and thus analysis of high pressure methane direct injection. The most common use case is to explain specific engine phenomena in parallel measurement campaigns with single cylinder engine tests.
The current poster will focus on a project, concerning the development of a smart injector within a BMWi funded research project. Here the test bed is used for spray analysis in conjunction with e-fuels and nozzle aging states to provide a database for the intelligence algorithms. Strongly connected to this project is the overarching initiative to characterize the influence of synthetic fuels on the hydraulic injector function, the spray and mixture formation and the ignition and combustion. In a further step it is planned to specifically optimize the engine performance to the specifics of modern fuels using nozzle design and injection strategy.

Keywords: Spray, Combustion, Chamber, EFuels, Aging, Wear, Marine Diesel Engine

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