

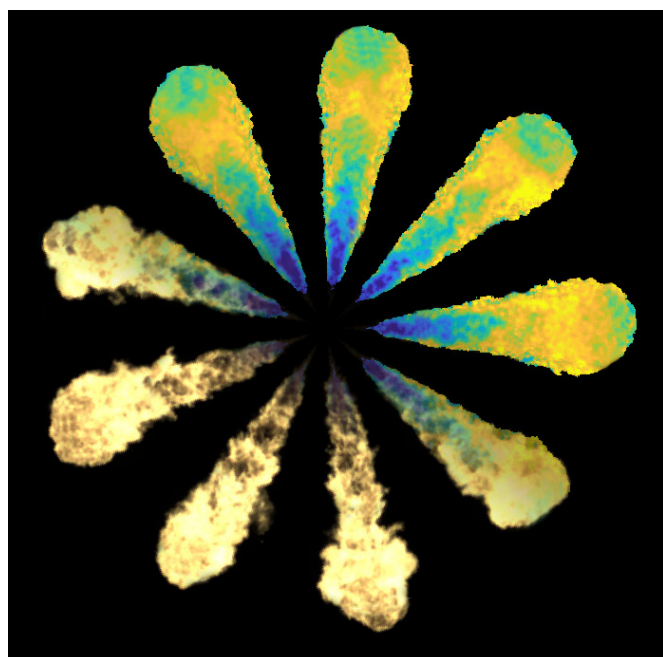
Spray Visualization and Analysis

The visualization and analysis of fuel sprays and gas jets allows the systematic investigation of mixture formation and combustion processes. We analyze atomization, evaporation and combustion phenomena using one of the worlds largest high pressure - high temperature - spray chambers and state of the art measurement equipment.

Large Engine Injection Systems

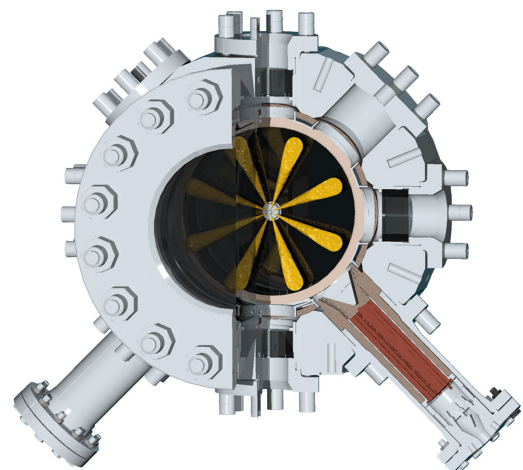
Demands on large engine injection systems are rising as many new fuels like methanol, ammonia, methane and hydrogen are being requested by the market. At the same time fuel suppliers find new feedstocks of bio-fuels and waste to energy fuels that need to be tested and optimized to work efficiently in state of the art fuel systems. We support you by

- Testing components like pumps and separators
- Optimizing fuel compatibility
- Visualizing of combustion process and fuel evaporation
- Optimizing injection strategy



▲ Diesel fuel combustion - original measurement data (left) and processed flame temperature distribution (right)

Spray Chamber



By conditioning of the test bench to 300 °C we ensure a uniform temperature distribution within the measurement volume. Compressed air or nitrogen is heated in continuous-flow heaters to up to 900 °C.

The spray chamber is then continuously scavenged in order to flush fuel vapor and combustion gases and to sustain the homogenous temperature distribution.

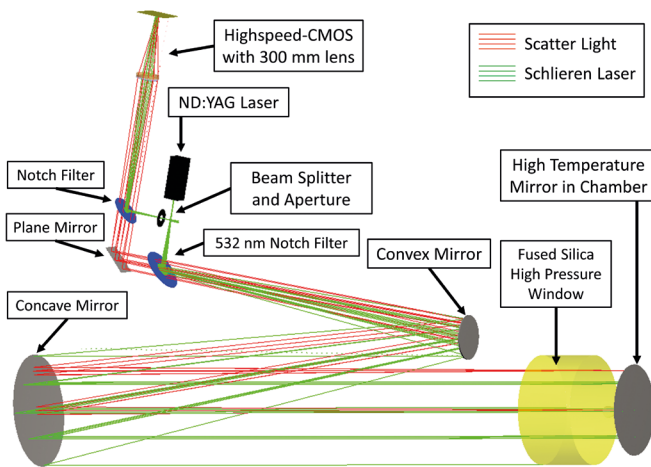
The common rail injector or other test object are passively and actively cooled to ensure stable and comparable operation conditions.

Depending on the task at hand, we operate the injector transiently to inject smallest quantities or generate steady state conditions. Our equipment is specialized for large engine injectors, but can very well be used for heavy duty and non-engine applications.

Technical Data

- Measurement of liquid and gaseous sprays and jets
- Common rail pressures up to 2200 bar
- Gas temperatures up to 900 K
- Gas pressures up to 150 bar
- Window diameter 300 mm
- Suitable for engine bores of approx. 100 - 400 mm
- Liquid fuels: diesel fuel, heavy fuel oil, biofuels, efuels, methanol, ammonia
- Gaseous fuels: methane, hydrogen

Measurement System



▲ Schematic of schlieren scatterlight measurement system

- High speed cameras for detailed tracking of individual spray events
- Schlieren - scatter light optics for simultaneous visualization of liquid and gaseous phase of an evaporating spray
- Color high speed camera for analysis of burning sprays regarding temperature and soot distribution
- PDI – phase doppler interferometer for measurements of droplet velocity and size distribution of light sprays
- Soot luminescence and chemiluminescence for analyzing ignition sites and flame lift-off lengths

Key Benefits for Your Product

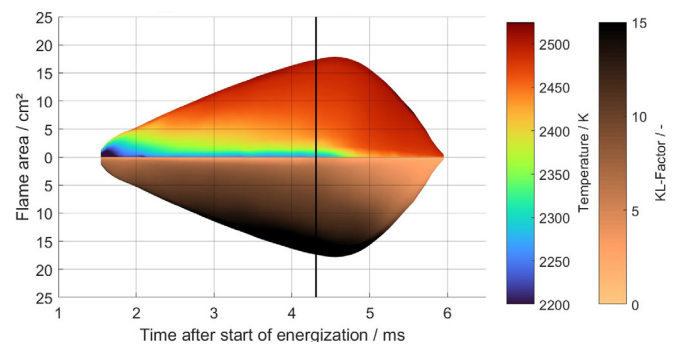
- Analysis of diesel sprays at gas temperatures and densities just like in the engine
- Measurement equipment specialized for large engine applications
- Quantitative information about mixture generation and combustion process
- Choose the right injection strategy based on fact
- Parameterize and validate spray and combustion models
- Support for single cylinder research projects
- Quantitative information about the effects of fuel composition and additives

**Are you interested in further information?
Feel free to contact our friendly experts.
Together we will find a solution for your challenges.**



Measurement and Analysis Procedure

We are able to capture macroscopic properties of the evaporating spray or the gaseous jet using well established planar measurement techniques like schlieren or multicolor pyrometry.



▲ Distribution of temperature and soot in diesel flame throughout combustion duration

Combustion is analyzed quantitatively using planar two color pyrometry. The results are visualized for detailed comparison and evaluation in self developed diagrams in order to characterize the influence of injection equipment, actuation strategy, fuel composition, or fuel additives.



FUEL INJECTION ANALYSIS

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