Crank angle resolved flow field characterization of a Heavy-Duty (PCCI) Engine

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Introduction
Premixed Charged Compression Ignition (PCCI) uses stratified regions to decrease the rate of heat release (RoHR). A too aggressive RoHR is a serious issue when applying HCCI at higher loads.

In this project the influence of charge stratification on PCCI combustion will be investigated by measuring in-cylinder velocities, concentrations and temperatures.

Charge stratification
Stratifying charge both in temperature and in concentration will be done using:

- Multiple injections
- Multiple fuels
- Combination of port fuel and DI

One-cylinder optically accessible Heavy-Duty engine

- Elongated piston
- Sapphire piston bottom and liner

PIV [Current Implementation]

Ensemble averaged mean velocity fields at several crank angles, engine speeds, compression ratios and engine loads using silicon oil tracer particles.

Outlook

- Time resolved PIV measurements
- Proper Orthogonal Decomposition of the flow fields
- Applying Tracer LIF

The measured and analysed flow fields will be used to validate the computational fluid dynamics (CFD) calculations done with AVBP from Institut Français du Pétrole (IFP).

Acknowledgements
This project is financed by the Dutch Technology Foundation STW, Shell Global Solutions, DAF Trucks, Wärtsilä and TNO Automotive.