Active Research at the ETH - Zürich

LAV
Laboratorium für Aerothermochemie und Verbrennungssysteme
Aerothermochemistry and Combustion Systems Laboratory

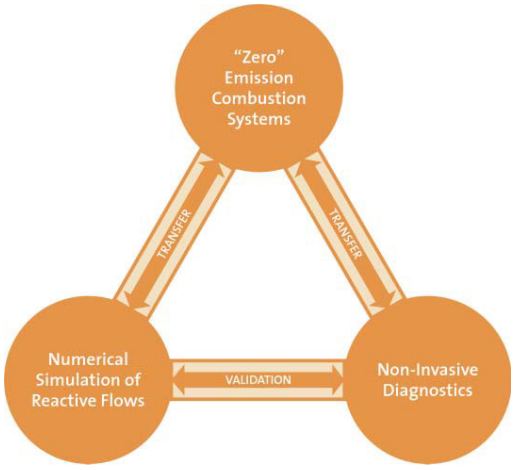
Overview

The research at the Laboratory for Aerothermochemistry and Combustion Systems focuses primarily on the investigation of chemically reactive flows, through the use of numerical simulations and non-invasive, optical diagnostics. These tools enable the fundamental physical processes of turbulent combustion to be modelled, as well as provide a means by which these models can be validated.

Our application-orientated research uses the knowledge from fundamental investigations to optimize combustion systems (knowledge and technology transfer), with the ultimate goal of realising "Zero" Emission Technologies.

A particular focus of the Laboratory is the formation and destruction of particulate matter in commonly used combustion systems, such as the diesel internal combustion engine. Both experimental and numerical investigations are being used to understand the fundamental processes of particulate matter generation and oxidation, keeping in mind the ultimate goal of providing feasible Zero Emission Technologies.

Applied Research



Fundamental Research

Current Topics

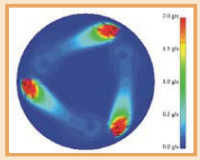
Experimental Research Group

- *Experimental Characterization and Numerical Simulation of Hydrothermal Flames (Beat Ineichen, Chidambaram Narayanan, Christos Frouzakis)*
- *A Miniaturised, Fiber Optic Sensor for In-Cylinder Measurements of Soot Concentration and Temperature (Stephan Kunte, Peter Obrecht, Beat Ineichen)*
- *Optical Diagnostics Applied to Diffusion-Controlled High Pressure Combustion (Rania Margari, Stephan Kunte)*
- *Optical Diagnostics Applied to Homogeneous Charge Compression Ignition Combustion (Andreas Escher)*
- *Time-Resolved Measurements of Soot Formation and Oxidation in a Diesel Engine using a Sampling Probe (Pascal Wilhelm)*
- *Origin and Control of Thermoacoustic Instabilities in Premixed Flames (Daniel Fritsche, Marc Füri)*
- *Investigation of Turbulent Combustion in SI-Engines with Hydrogen-Gasoline Mixtures (Enrico Conte)*
- *HERCULES - High Efficiency Engine R&D on Combustion with Ultra-Low Emissions for Ships (Kai Herrmann)*
- *Ultra-High-Energy-Density Convertor for Portable Energy (Bruno Schneider)*

FUNDAMENTALS

APPLICATIONS

Numerical Research Group



- *Direct Numerical Simulation of Reactive Flows (Christos Frouzakis)*
- *Direct Numerical Simulation of Cellular Instabilities in a Diffusion Jet (Luzi Valär)*
- *Entropic Lattice Boltzmann (Ilya Karlin, Santosh Ansumali, Nikolaos Prasianakis)*
- *Large-Eddy Simulation of Turbulent, Non-Isothermal Jets with Varying Densities (Marco Küng, Gianmarco Pizza)*
- *Numerical Simulation of Laminar and Transitional Flame Instabilities (Redha Rais)*
- *Simulation of Turbulent Combustion Using the RANS/CMC-Method (Yuri Wright)*
- *Numerical Simulation of Fuels Suited to Homogenous Charge Compression Ignition Combustion (Gabriel Barroso)*
- *Modelling and Optimization of Diesel Engine Emissions using Bio-Inspired Algorithms (Marco Warth, Peter Obrecht)*
- *A Virtual Soot Sensor for Diesel Engines Operating under Steady-State and Transient Conditions (Patrick Kirchen)*
- *Prediction of the Autoignition and Flame Propagation in Natural Gas Engines (Christian Lämmle)*
- *Energy Navigator (Fabrizio Noembrini, Aikaterini Kartsoni)*

External Partners

- *ABB Turbo Systems AG*
- *Alstom*
- *AVL*
- *Bosch GmbH*
- *Common Rail Technologies*
- *DaimlerChrysler*
- *FVV - Forschungsvereinigung Verbrennungskraftmaschinen*
- *IVECO Motorenforschung*
- *Kistler Instruments AG*
- *EPFL*
- *EMPA*
- *Paul Scherrer Institut*
- *University of Thessaloniki*
- *University of Cambridge*
- *Schweizer Nationalfonds*
- *Research Comission ETH Zürich*
- *Bundesamt für Energie und BUWAL*
- *KTI (Comission for Technology and Innovation)*

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