Schell, J.; Vogel, F.; Dietrich, P. (PSI)
Boulouchos, K. (ETHZ)
Soltic, P. (EMPA)
Pfender, C. (Behr GmbH)

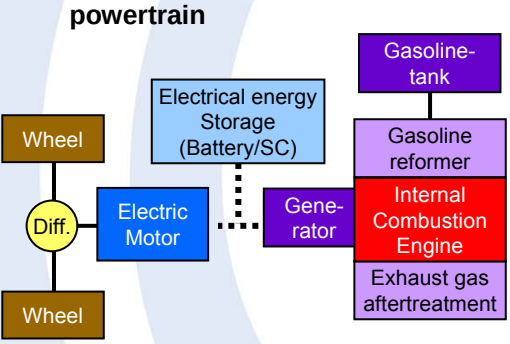
H_2-enriched fuel on demand for future hybrid powertrains HEFD-HY

Motivation

Emission reduction (excluding CO_2) of an IC-engine to a virtually "zero"-level accuracy and simultaneously **increase the efficiency**

Concept

- **On-board production of hydrogen** by reforming gasoline
- **Addition of the reformer gas** (H_2, CO, CO_2, CH_4, N_2) to the gasoline to reduce the raw emissions (except CO_2) of an IC-engine
- "Zero"-emission level by using a **3-way catalyst**
- Efficiency increase by a **mild hybrid powertrain**



Research focus

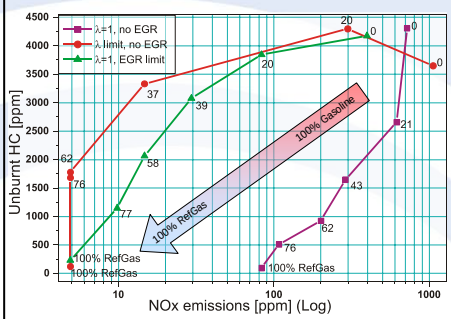
- **Sulphur resistant** reforming catalyst
- **Integration** of the reformer, auxiliary components and the IC-engine
- **Understanding and optimizing** the **interaction** between reformer, engine combustion and 3-way-catalyst
- Powertrain **model development**

Objective

- Development of an **engine-catalyst system** including an **on-board reformer** for commercial gasoline
- Demonstration on a **full size engine**

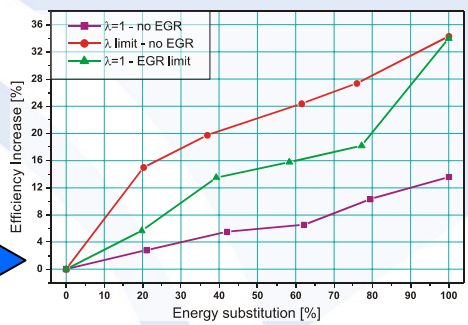
Preliminary Results

Partial substitution of gasoline by a synthetic mixture of reformer gas components (H_2, CO, N_2) for an ICE:



Reduction of unburnt hydrocarbons and NO_x

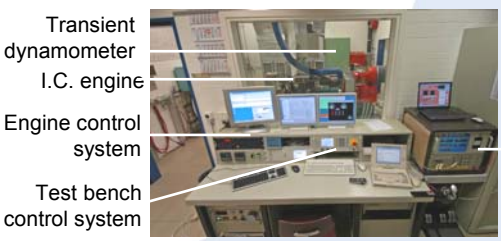
Increase in engine efficiency



Results from: E. Conte **Combustion of reformer gas/gasoline mixtures in spark ignition engines: A concept for near-zero emission transportation;** Dissertation Nr. 16 539, ETH Zürich, 2006.

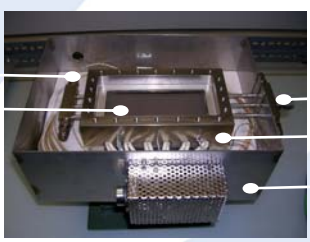
Infrastructure and background

Collaboration between different research institutes (ETHZ, EMPA, PSI) and BEHR (automotive air conditioning and engine cooling systems)



Transient engine dynamometer for real-time hybrid vehicle emulation

Real-time vehicle emulation system



Optically accessible channel reactor for kinetic investigations of coated catalysts

Behr's compact heat exchanger as basis for the reformer design

Contact
Dr. Frédéric Vogel (PSI)
Frederic.vogel@psi.ch
+41 56 310 21 35