H₂-enriched fuel on demand for future hybrid powertrains HEFD-HY

Motivation

Emission reduction (excluding CO₂) 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 (H₂, CO, CO₂, CH₄, N₂) to the gasoline to reduce the raw emissions (except CO₂) of an IC-engine
- “Zero”-emission level by using a 3-way catalyst
- Efficiency increase by a mild hybrid powertrain

Infrastructure and background

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

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 (H₂, CO, N₂) for an ICE:

- Reduction of unburnt hydrocarbons and NOₓ
- 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.