

# INHALT

## PLENUM

Keynote Lecture: Matter of character or pabulum? The role of IC engines in shaping next-generation powertrains	3
Keynote Lecture: The challenge for fuels for the future	5
Keynote Lecture: Sustainable and increasingly efficient road transport for the next generations – continuous improvement through an integrated approach	7
Passenger car and truck engines – a comparison from a thermodynamics point of view	9

## TEIL I: PKW-MOTORENTECHNOLOGIE

### INNOVATIVE KONZEPTE

3-motor HEV powertrain for super sport	23
Vehicle integration of a new engine concept for 48 Volts – opportunities for efficiency improvement and optimization of the overall system complexity	31

### AUFLADUNG

Heavily downsized gasoline demonstrator	73
Extreme downsizing for gasoline engines – fun to drive with extremely low emissions	91
Potential of air gap motors to realize electrically assisted turbocharging, Cross-Charger® – turbo by wire	109

## ABGASNACHBEHANDLUNG

Influencing factors on particle formation under real driving conditions	129
System influence and requirements for monitoring diesel particulate filters without particulate matter sensors	143

## THERMODYNAMIK DIESELMOTOR

Technologies for (pilot) injection quantity control in modern common rail diesel engines	163
Effect of diesel injector tip deposits on transient spray behavior	185
Concept for lower raw engine emission covering full engine map operation	195

## REIBUNG I

Simulation-based RNT measurements for oil supply optimization at the connecting rod bearing	219
Dynamics and friction of a rolling bearing crankshaft – method and calculation	235
Wear behavior of engine components affected by soot	237

## LADUNGSWECHSEL UND VERBRENNUNG

Passenger car diesel engine for 2020 / 25 – synthesis of classical attributes and novel high-tech innovations	241
Thermodynamic consideration of the Miller cycle on the basis of simulation and measurements	259

## THERMOMANAGEMENT

Assessment of efficient powertrain concepts in real driving conditions	283
---	-----

Thermal management in vehicle integration	307
---	-----

## THERMODYNAMIK OTTOMOTOR

Experimental studies on spark stability in an optical combustion vessel under flowing conditions	327
---	-----

3D CFD simulation of the spark ignition process under the consideration of spark channel deflection, diffusion effects, curvature and detailed chemical kinetics	349
--	-----

Investigation of flame development applying optical metrology in a highly boosted SIDI performance engine for the sports car market	373
---	-----

## REIBUNG II

Optimization of the piston assembly friction	391
--	-----

A novel approach for valve train reduction	409
--	-----

## MODELLBASIERTE STEUERUNG

Advanced model-based diagnosis of internal combustion engines	413
---	-----

Control of predefined diesel combustion processes by a burn-rate model	433
---	-----

## KEYNOTE-VORTRÄGE PKW

The future of RDE	453
-------------------	-----

Current and future challenges in the field of powertrains	455
---	-----

## TEIL II: KRAFTSTOFFE

### QUO VADIS KRAFTSTOFFE?

Energy supply for vehicles – can it be regenerative?	461
Review of combustion engine efficiency improvements and the role of e-fuels	463

### HERSTELLUNG VON KRAFTSTOFFEN I

Alternative fuels in the well-to-wheel debate	487
Synthetic fuels from biomass: Potentials and viability	489
The sun in the tank? Possibilities and limitations of MtG technology from the chemical perspective	505

### HERSTELLUNG VON KRAFTSTOFFEN II

Electric mobility with hydrogen – quiet, efficient and with zero emissions	509
Production of methanol and oxymethylene on an industrial scale	511
Novel methods of synthesis for diesel fuel OME	513

### ERFAHRUNGEN MIT ALTERNATIVEN KRAFTSTOFFEN

Contribution of fuels towards reducing CO <sub>2</sub> emissions in traffic	517
The new Mercedes-Benz EU VI medium-duty CNG engine in bus operation	519

### FORSCHUNG UND MARKTEINSCHÄTZUNG

Oxymethylene ether (OME1) as a synthetic low-emission fuel for DI diesel engines	537
Powertrain mixture 2030 – influencing factors and outlook	555

---

## TEIL III: NFZ-MOTORENTECHNOLOGIE

### RAHMENBEDINGUNGEN UND GRUNDLAGEN

Future HD vehicle requirements due to legislation and effects on CO <sub>2</sub> and air quality	561
Experimental studies of dual-fuel combustion modes for heavy-duty application	577

### GASMOTOREN

Progress in the development of natural gas high pressure direct injection for Euro VI heavy-duty trucks	591
Reduction of in-cylinder emissions on a dual-fuel engine	609
Safeguarding the reliability of natural gas engines for commercial vehicles	627

### MOTORSUBSYSTEME

Controllable cooling system for heavy-duty commercial vehicles	645
Safety concept for a HD on-road waste heat recovery	663
Electrically assisted turbocharging in long-haul truck application	679

### EMISSIONIERUNG

Potential of the SCRF <sup>®</sup> concept for future legislation	709
New combustion system meeting Tier 3 emission standards for emerging markets	725

## MOTORKONZEPTE

Validation of a 4-cylinder engine concept for heavy-duty vehicles with a parameterized model	741
Challenges in the development of high performance engines for the off-highway sector	761

## KEYNOTE-VORTRÄGE NFZ

Robustness-related development of MAN's D38 heavy-duty engine	781
Powertrain technology for commercial vehicles – a look beyond 2020	783