

GRAZ UNIVERSITY OF TECHNOLOGY

**Institute of Thermodynamics and
Sustainable Propulsion Systems (iTnA)**

Large Engines Competence Center (LEC)

Conference Directors:

Univ.-Prof. Dr. Helmut EICHLSEDER

Ao. Univ.-Prof. Dr. Andreas WIMMER

Programm des 20. Symposiums *Program of the 20th Symposium*

**SMTP: Nachhaltige Mobilität,
Transport und Energieerzeugung**

**SMTP: Sustainable Mobility,
Transport and Power Generation**

4. – 5. September 2025

- Innovative Verbrennungskonzepte für zukünftige Kraftstoffe (Wasserstoff, Ammoniak, Methanol und andere erneuerbare Kraftstoffe) und Anwendungen für alle Arten von Motoren, von Kleinmotoren über Pkw- und Schwerlastmotoren bis hin zu Großmotoren /
Innovative combustion concepts for future fuels (hydrogen, ammonia, methanol and other renewable fuels) and applications to all types of engines, from small engines to passenger car and heavy duty engines to large engines
- Elektrifizierung von Antriebssystemen /
Electrification of propulsion systems
- Brennstoffzellentechnologie für mobile und stationäre Anwendungen /
Fuel cell technology for mobile and stationary applications
- Dekarbonisierung der Stromerzeugung und des Verkehrs sowie die Herstellung von PtX-Kraftstoffen /
Decarbonization of power generation and transport as well as the production of PtX fuels
- Neue Simulationswerkzeuge und angewandte Messtechnik /
New simulation tools and applied measurement technologies

Congress Graz

Sparkassenplatz 1, A-8010 Graz

www.itna.tugraz.at/SMTP

Mittwoch / Wednesday 3. September 2025

BESICHTIGUNGEN / VISITS

17:00

Besichtigung des Institutes für Thermodynamik und nachhaltige Antriebssysteme und des LEC – Large Engines Competence Center, TU Graz (kostenlos).

Treffpunkt: Campus Tu Graz, Inffeldgasse 13, A-8010 Graz
Visit to the Institute of Thermodynamics and Sustainable Propulsion Systems and the LEC – Large Engines Competence Center, Graz University of Technology (free of charge).
Meeting point: Campus Tu Graz Inffeldgasse 13, A-8010 Graz



BEGRÜSSUNGSEMPFANG / WELCOME RECEPTION

19:00

Begrüßungsempfang im Congress Graz

Welcome Reception at Congress Graz
(Eingang / Entrance: Sparkassenplatz 1, A-8010 Graz)



Donnerstag / Thursday 4. September 2025

STADTFÜHRUNG / CITY TOUR



18:30

Altstadtführung durch Graz (Kulturhauptstadt 2003)

Guided city tour through Graz
Treffpunkt / Meeting Point:
Congress Graz
Sparkassenplatz 1, A-8010 Graz

Die Führung endet beim Konferenzdinner
The tour ends at the conference dinner

KONFERENZDINNER / CONFERENCE DINNER



19:30

Konferenzdinner auf Einladung des Landes Steiermark und der Veranstalter
Conference dinner by invitation of Province Styria and the organizers

Einlass nur mit Einladung ab 18:45 Uhr
Admission by invitation only from 6:45 p.m.

8:00 **Registrierung / Registration**

8:45 **Begrüßung / Opening**
Prof. Helmut EICHLSEDER, ITnA / TU Graz, AT
Prof. Horst BISCHOF, Rektor TU Graz, AT

Saal / Hall „Steiermark“

Saal / Hall „Steiermark“

SESSION: PLENARY SESSION I
Vorsitz / Chairman: Prof. Helmut EICHLSEDER; ITnA / TU Graz, AT

9:00 **Nachhaltige Mobilität: Die Zukunft des Antriebs von Nutzfahrzeugen**

Sustainable Mobility: Navigating into the Future of Commercial Vehicle Powertrains
Lukas WALTER, Bernhard RASER, Rolf DÖBEREINER
AVL List GmbH, Graz, AT

09:30 **Re-evaluating Maritime Fuel Pathways: LNG's Intermediate Role and Hydrogen's Realization Constraints Towards 2040**

Kang-Ki LEE¹, Tuan DONG², Monica CANEPA²,
Alessandro SCHÖNBORN², Shinsuke MURAKAMI³
¹Zollner Energy Systems GmbH, Kiel, DE
²World Maritime University, SE
³AVL List GmbH, AT

10:00 Kaffeepause im Ausstellungsbereich

10:00 Coffee Break in the Exhibition Area



PARALLELSEKTIONEN
PARALLEL SESSIONS
Saal / Hall „Steiermark“



SESSION: HEAVY DUTY APPLICATIONS
Vorsitz / Chairman: Prof. Christian TRAPP; ITnA / TU Graz, AT

10:30 **Zero Emission in der Mobilität - Eine Analyse zur Einordnung**
Zero Emission in Mobility – An Analysis for Classification
Andreas KUFFERATH¹, Hans HITZ¹, Stefan HAUSBERGER²,
Christiane SCHNEIDER³, Nicola TOENGES³
¹Robert Bosch GmbH, Stuttgart, DE, ²ITnA / TU Graz, AT,
³AVISO GmbH, DE

11:00 **FAW – CO₂ freie Antriebstechnologien für schwere Nutzfahrzeuge**
FAW - Zero Carbon Key Technology Path for Heavy-Duty Commercial Vehicles
Thorolf SCHATZBERGER, Ping GUO, Li HONGGUANG¹,
Xu GUANGFU, Changcheng LIU,
Xinran CUI
R&D / FAW, Austria GmbH, AT

11:30 **Praxistaugliche und wettbewerbsfähige Wasserstoffmotoren für Baumaschinen – Hyllay**
Practical and Competitive Hydrogen Engines for Non-Road Applications – Hyllay
Eberhard SCHUTTING, Paul CHRISTOFORETTI, Peter KAPPACHER,
Georg KERN, Helmut EICHLSEDER
ITnA / TU Graz, AT

12:00 Mittagessen „Stefaniensaal“



SESSION: DECARBONIZATION STRATEGIES
Moderation: Ulrich WALTER; DE

10:30 **The New X-DF-A and X-DF-M Engines from WinGD: Delivering Solutions for the Decarbonisation of International Shipping**
German WEISSER, Barbara GRAZIANO, Andrea PASTORE,
Sebastian HENSEL
WinGD Ltd., Winterthur, CH

11:00 **Solutions to Speed up the Transition of the Large Engine Segment**
Jens Olaf STEIN¹, Jörg FETTES¹, Kurt SCHRATTBAUER¹,
Rene SCHIMON¹, Josef FRANK¹, Roland FORTENBACH¹,
Marko BABIC²
¹Robert Bosch AG, Hallein, AT, ²Robert Bosch GmbH,
Stuttgart, DE

11:30 **Overall System Simulation: A Key Element for the Implementation of Decarbonization Strategies**
Gerhard PIRKER¹, Bernhard THALER¹, Michael WOHLTHAN¹,
Nicole WERMUTH^{1,2}
¹LEC GmbH, Graz, AT, ²ITnA / TU Graz, AT

12:00 Lunch „Stefaniensaal“

PARALLELSEKTIONEN / PARALLEL SESSIONS

Saal / Hall „Steiermark“



SESSION: HYBRID POWERTRAINS

Vorsitz / Chairman: Prof. Christian BEIDL, TU Darmstadt, DE

- 13:45 Range Extender: A Bridging Technology for the Future of Electromobility**
Christian MARTIN, Günter FRAIDL, Paul KAPUS
AVL List GmbH, Graz, AT
- 14:15 Hybridized Propulsion Systems for Challenging Commercial Vehicle Applications**
Thomas KÖRFER¹, Joschka SCHAUB², Peter ZWAR², Markus EHRLY², Arne MÜLLER², Tobias VOSSHALL³
¹FEV Group GmbH, DE, ²FEV Europe GmbH, DE, ³FEV Vehicle GmbH, DE
- 14:45 Emissionskonzept und Applikation für einen PKW Wasserstoff-Magermotor Hybrid Antriebsstrang**
Emission Concept and Calibration for a Lean Burn Hydrogen Engine Hybrid Powertrain in a Passenger Car Application
Roman PELZETTER¹, Markus PEPLER¹, Buomsik SHIN², Claudius SCHÜCK¹, Tobias RABE³, Patrick GAILLARD⁴, Emmanuel LAIGLE⁴, Christian TOMANIK⁵
¹Hyundai Motor Europe Technical Center GmbH, DE, ²Hyundai Motor Company, KR, ³Robert Bosch GmbH, DE, ⁴Aramco Fuel Research Centre, FR, ⁵Umicore AG & Co. KG, DE

15:15 Kaffeepause im Ausstellungsbereich

SESSION: FUEL CELLS

Vorsitz / Chairman: Prof. André KULZER; Universität Stuttgart, DE

- 15:45 Simulationenmethodik in der Brennstoffzellenentwicklung – von der Stack-Modellierung zur KI-basierten Schädigungsberechnung**
Simulation Methodology in Fuel Cell Development - from Stack Modelling to AI-based Degradation Analysis
Stefan HELD¹, Simon ENZ¹, Claus REULEIN¹, Detlef HIEMESCH¹, Josef HONEDER²
¹BMW Group München, DE, ²BMW Motoren GmbH, Steyr, AT
- 16:15 Challenges of Fuel Cell and Hydrogen Technology in the Field of Mobile Machinery and Heavy-Duty Applications**
Alexander TRATTNER^{1,2}, Patrick PERTL², Christian ZINNER²
¹ITnA / TU Graz, AT, ²HyCentA Research GmbH, Graz, AT
- 16:45 Brennstoffzellentechnologien für mobile Anwendungen - ein ganzheitlicherer Ansatz**
Fuel Cell Technologies for Mobile Applications - a more Holistic Approach
Thomas von UNWERTH
TU Chemnitz / Hzwo e.V. / HIC gGmbH, DE

PARALLELSEKTIONEN / PARALLEL SESSIONS

Saal / Hall „Kammermusiksaal“



SESSION: AMMONIA ENGINES

Moderation: Ulrich WALTER; DE

- 13:45 Exploring Ammonia Combustion Strategies in Large Bore Four-Stroke Engines**
Valentin SCHARL¹, Dominik WINKLER¹, Max JUNGEMANN¹, Christian KUNKEL¹, Kay MAHLER², Phillip THORAU²
¹Everllence SE, Augsburg, DE, ²WTZ Roßlau gGmbH, Dessau-Roßlau, DE
- 14:15 Experimental Investigations of the Factors Influencing High-Pressure Dual-Fuel Ammonia Combustion in a High-Speed Engine**
Phillip THORAU¹, Karsten STENZEL¹, Christian REISER¹, Bert BUCHHOLZ²
¹WTZ Roßlau gGmbH, Dessau-Roßlau, DE, ²LKV / Universität Rostock, DE
- 14:45 N₂O and NH₃ Emissions from an Ammonia ICE. And how to Get Rid of them with Precious Metal Catalysts**
Marcus BONIFER, Christian BREUER, Stefan NOTTELMANN
Heraeus Precious Metals GmbH & Co. KG, Hanau, DE

15:15 Coffee Break in the Exhibition Area

SESSION: HYDROGEN ENGINES AND AMMONIA CRACKING

Moderation: Ulrich WALTER; DE

- 15:45 Hydrogen Combustion Concept Development for High Performance Power Generation in the 5MW Segment**
Zita BAUMANN, Robert BÖWING, Álvaro DÍEZ, Bernadet HOCHFILZER, Alexander ZUSCHNIG, Clément LEROUX
INNIO Jenbacher GmbH & Co OG, AT
- 16:15 Maximizing the Performance of H₂-ICEs via Advanced Combustion, EGR and Lubricating Oil Technologies**
Emmanuela SOTIROPOULOU¹, Luigi TOZZI¹, Keisuke GOMA², Hiroshi IWASAKI², Ryoya ISHIKUMA², Christian TRAPP³, Keith BROOKS⁴, Matthias HUSCHENBETT⁵
¹Prometheus Applied Technologies, Fort Collins (CO), USA, ²Industrial Power Alliance Ltd., Oyama, JPN, ³ITnA / TU Graz, AT, ⁴Altronic, Girard (OH), USA, ⁵HOERBIGER, Wien, AT
- 16:45 Ammonia Cracking Solutions for Decarbonisation of the Shipping Industry**
Eduardo BIALES, Aritz ARRIZABALAGA, Guillermo GARCÍA-MIGUEL, Tomás CRESPO, José MEDRANO
H2SITE, Bizkaia, ES

Freitag / Friday

PARALLELSEKTIONEN / PARALLEL SESSIONS

Saal / Hall „Steiermark“



SESSION: COMBUSTION CONCEPTS FOR FUTURE FUELS

Vorsitz / Chairman: Prof. Hermann ROTTENGRUBER; U. Magdeburg, DE

- 9:00** **Methanol Diffusive Combustion Initiated by Spark-Ignited Methanol Pilot Injection**
Takayuki FUYUTO, Kenji FUKUI, Yoshiyuki MANDOKORO, Reiko UEDA, Kazuaki NISHIKAWA, Teruaki KONDO, Yoshifumi WAKISAKA
Toyota Central R&D Labs., Inc., JP
- 9:30** **Optimized Cylinder Head Design and In-Cylinder Charge Motion Definition as Key-Enabler for Multi-Fuel Operation of Future Sustainable Internal Combustion Engines**
Thomas KÖRFFER¹, Avnish DHONGDE², Lukas VIRNICH², Aleksandar BOBERIC²
¹FEV Group GmbH, DE, ²FEV Europe GmbH, DE
- 10:00** **Methodology for the Development of Passive Prechamber Spark Plugs for use in Ultra-Lean Light-Duty Hydrogen Engines**
Christian TRAPP¹, Vishal JOSHI², Ahmad ALKEZBARI², Saraschandran KOTTAKALAM³, Gregor ROTTENKOLBER³, Markus NENZEL³
¹ITnA / TU Graz, AT,
²Universität der Bundeswehr München, DE
³Hochschule Esslingen, DE

10:30 Kaffeepause im Ausstellungsbereich

SESSION: FUELS

Vorsitz / Chairman: Prof. Bernhard GERINGER, Österreichischer Verein für Kraftfahrzeugtechnik (ÖVK), AT

- 11:00** **Untersuchungen von Ethanol- und Etherkraftstoffen für Ottomotoren in Vorbereitung einer E20-Markteinführung in Europa**
Investigations of Ethanol and Ether containing Fuels for Otto Cycle Engines in Preparation for an E20 Market Introduction in Europe
Karsten MICHELS, Max SCHÜTTENHELM, Arnd SCHMIDT, Thomas GARBE
Volkswagen Aktiengesellschaft, Wolfsburg, DE
- 11:30** **Bosch DFT - Digital Fuel Twin Application In The Field**
Marko BABIC¹, Michael STORCH¹, Erik SCHUENEMANN¹, Gabriel Ioan ARCAS²
¹Power Solutions, Robert Bosch GmbH, Stuttgart, DE,
²Power Solutions, Robert Bosch S.R.L., Cluj-Napoca, RO
- 12:00** **Renewable Fuels - What's next, Outlook, New Technologies and Regulation**
Mats HULTMAN
Neste Corporation, Stockholm, SE

12:30 Mittagessen „Stefaniensaal“

5. September 2025

PARALLELSEKTIONEN / PARALLEL SESSIONS

Saal / Hall „Kammermusiksaal“



SESSION: COMPONENTS FOR FUTURE FUEL APPLICATIONS

Moderation: Ulrich WALTER; DE

- 9:00** **The ALL-IN Zero Project Progresses Towards Flexible Fuel Power Generation Technology with Zero Emissions**
Ricardo NOVELLA
CMT València / Universitat Politècnica de València, ES
- 9:30** **Development Challenges of a High-Pressure Dual-Fuel PTX Platform For Large Engines**
Vladyslav SAZONOV, Katharina SCHMID, Markus PAOLI, Michael WILLMANN
Woodward L'Orange GmbH, Stuttgart, DE
- 10:00** **Exhaust Gas Aftertreatment for Methanol Dual-Fuel Engines**
Daniel PEITZ, Enno ESSER
Hug Engineering AG, Elsau, CH

10:30 Coffee Break in the Exhibition Area

SESSION: COMBUSTION DEVELOPMENT AND VIRTUAL TESTING

Moderation: Ulrich WALTER; DE

- 11:00** **A Performance Investigation of Ethanol Port Fuel Injection with Diesel Dual Fuel Combustion for Locomotive Applications**
Antonio TRIANA-PADILLA¹, Adam KLINGBEIL¹, Thomas LAVERTU¹, Jayakar VIJAYASELVAN¹, Sven WARTER², Jannik ALDAG³
¹Wabtec Corporation, Pittsburgh (PA), USA,
²LEC GmbH, Graz, AT, ³ITnA / TU Graz, Graz, AT
- 11:30** **Experimental Investigations on Medium Pressure Direct Gas Injection on a Medium-Speed Dual-Fuel Single-Cylinder Engine**
Manuel GLAUNER, Pascal SEIPEL, Jules DINWOODIE, Sebastian CEPELAK, Bert BUCHHOLZ
LKV / Universität Rostock, DE
- 12:00** **Virtual Testing and Calibration as an Efficiency-Enhancing and Evolutionary Methodology in Large Engine Development**
Robert STRASSER¹, Georgina Llopart VAZQUEZ¹, Sven Christian FRITZ², Sven CORTÈS², Sven CORTÈS², Philipp MAYINGER²
¹AVL List GmbH, Graz, AT,
²Rolls-Royce Power Systems, Friedrichshafen, DE

12:30 Lunch „Stefaniensaal“

Freitag / Friday 5. September 2025

PARALLELSEKTIONEN / PARALLEL SESSIONS

Saal / Hall „Steiermark“



SESSION: COMBUSTION CONCEPTS

Vorsitz / Chairman: Prof. Michael GÜNTHER;
RPTU Kaiserslautern-Landau, DE

- 14:00 Methoden zur Untersuchung lastbegrenzender Verbrennungsanomalien in der Brennverfahrens-entwicklung eines Wasserstoff Nutzfahrzeugmotors**
Hydrogen Combustion Engines for Heavy Duty Applications – Methodologies to Investigate Load Limiting Combustion Anomalies
Jonathan ZIEGLER, Matthias BLESSING, Andreas SCHNEIDER,
Hagen WALTER, Marilou TONN
Daimler Truck AG, DE
- 14:30 Numerical Study on the Mixture Formation and Combustion of Ammonia and Hydrogen in a Spark-Ignition Engine**
Sandro SILVESTRI^{1,2}, Bouzid SEBA^{1,2}, Brijesh Rakeshbhai KINKHABWALA², Heiko KUBACH², Thomas KOCH²
¹Liebherr Machines Bulle SA, CH
²Karlsruhe Institute of Technology, DE
- 15:00 KTM LC8 - Die Thermodynamikentwicklung des neuen V2-Hochleistungsmotors von KTM**
KTM LC8 - Thermodynamic Development of the New V2-High-Performance Engine of KTM
Michael VIERTLMAYR, Christian MAYRHOFER,
Helfried SORGER, Peter GORBACH
KTM Forschungs- und Entwicklungs GmbH, Mattighofen, AT

15:30 Kaffeepause im Ausstellungsbereich

ENDE DER PARALLELSEKTIONEN

END OF PARALLEL SESSIONS

Saal / Hall „Steiermark“



SESSION: PLENARY SESSION II

Vorsitz / Chairman: Prof. Andreas WIMMER; TU Graz / LEC GmbH, AT

- 16:00 Advanced Low-Carbon Fuels for Mobility**
Karsten WILBRAND, Felix BALTHASAR, Roger CRACKNELL,
Andreas KOLBECK, Renate UITZ-CHOI
Shell Global Solutions GmbH, Hamburg, DE

PARALLELSEKTIONEN / PARALLEL SESSIONS

Saal / Hall „Kammermusiksaal“



SESSION: PANEL DISCUSSION

Moderation: Ulrich WALTER; DE

- 14:00 Panel Discussion: "The Green Transformation of High-Power Applications - Opportunities, Risks and Necessary Framework Conditions for a Timely Implementation"**
- Keynote**
Falk NICKEL, CIMAC Austria / Miba Bearing Group, AT
- Panelists**
Andreas KUNZ,
INNIO Jenbacher & Co OG, Jenbach, AT
Sebastian HENSEL,
WinGD Ltd., Winterthur, CH
Rick BOOM,
CIMAC / Woodward Nederland B.V., NL
Antonio TRIANA-PADILLA,
Wabtec Corporation, Pittsburgh (PA), USA
Nicole WERMUTH,
LEC GmbH / iTnA / TU Graz, Graz, AT

15:30 Coffee Break in the Exhibition Area

- 16:30 Toyota's Multi-Pathway Strategy towards Carbon Neutrality**
Gerald KILLMANN
Toyota Motor Europe, BE

- 17:00 20. Symposium - Rückblick, Ausblick und Schlussworte**
Closing Words
Helmut EICHLSEDER¹, Andreas WIMMER^{1,2}
¹iTnA / TU Graz, AT, ²LEC GmbH, Graz, AT

AUSSTELLUNG / EXHIBITION

- A3PS
- Convergent Science GmbH
- Dewetron GmbH
- Geislinger GmbH
- H2Site
- HOERBIGER Wien GmbH
- HyCentA Research GmbH
- iTnA TU Graz
- KS Engineers
- LEC GmbH
- Robert Bosch AG
- Shell Global Solutions (Deutschland) GmbH
- VIRTUAL VEHICLE Research GmbH
- WTZ Roßlau



DEWETRON



LEC DATA CHALLENGE 2025

During the 4th LEC Data Challenge, students and practitioners of various disciplines who are enthusiastic about data were invited to develop a data-driven solution to a practical problem in the field of large engines.

This year, the task was to develop a data-driven solution that accurately predicts key engine performance parameters for a wide range of engine control parameter settings.

*The top five teams were invited to present their approaches to an expert jury.
For more information, feel free to visit
www.lec.at/datachallenge.*

*The LEC Data Challenge 2025 is
sponsored by **INNIO Jenbacher**,
KS Engineers, **WinGD Ltd.**, and **LEC**.*



ALLGEMEINE HINWEISE / GENERAL INFORMATION

KONFERENZORT / LOCATION:

CONGRESS GRAZ, Saal Steiermark, Kammermusiksaal,
Hall Steiermark, Kammermusiksaal
Sparkassenplatz 1, A-8010 Graz
<https://mcg.at/locations/congress-graz>

WLAN-ZUGANG / Wi-Fi-ACCESS:

SSID: SMTP25#
Password: congressgraz

DATUM / DATE:

4.-5. September 2025

TAGUNGSLEITUNG / CONFERENCE DIRECTORS:

Univ.-Prof. Dr. Helmut Eichlseder
Ao.Univ.-Prof. Dr. Andreas Wimmer

VORTRAGSDAUER / PRESENTATION LENGTH:

Jeweils 20 Minuten, anschließend 10 Minuten Diskussion
20 minutes, followed by a discussion of 10 minutes

KONFERENZSPRACHEN / CONFERENCE LANGUAGES:

Englisch (deutschsprachige Beiträge im Saal Steiermark werden
simultan übersetzt)
*English (German contributions in the Steiermark hall will be translated
simultaneously)*

TAGUNGSUNTERLAGEN / CONFERENCE PROCEEDINGS:

Tagungsband der Vorträge in Englisch
Proceedings in English

ORGANISATION / ORGANIZATION:

Institut für Thermodynamik und nachhaltige Antriebssysteme
Institute of Thermodynamics and Sustainable Propulsion Systems
Large Engines Competence Center

KONTAKT / CONTACT:

Elisabeth Holler
Tel. +43/316-873-30023
E-Mail: elisabeth.holler@ivt.tugraz.at
Technische Universität Graz / Graz University of Technology
A-8010 Graz, Inffeldgasse 25 C/V

VORANKÜNDIGUNG / PRE-ANNOUNCEMENT

21. TAGUNG / 21st SYMPOSIUM

**SMTP: Nachhaltigkeit in Mobilität, Transport und
Energieerzeugung**

SMTP: Sustainable Mobility, Transport and Power Generation

16. – 17. September 2027

Congress Graz

Sparkassenplatz 1, A-8010 Graz