FINAL PROGRAM

CIMAC CONGRESS 23

BUSAN, JUNE 12 –16, 2023

Meeting the Future of Combustion Engines

30th CIMAC WORLD CONGRESS

Combustion Engine Technology for Ship Propulsion | Power Generation | Rail Traction

CONTENT

Join us in Busan!

Usually every three years, the CIMAC World Congress and the accompanying exhibition is held in one of our member countries. But due to COVID-19, the congress had to be postponed from 2022 to 2023. It will now be held from June 12 to 16 in Busan.

The Congress is a unique opportunity to keep up to date with what is happening in the internal combustion engine industry and along the value chain, to talk to other professionals from all over the world, to stay in dialogue and to discuss the topics that interest us most or that are particularly pressing on our minds and to the industry.

South Korea will host the 30th edition of the Congress since the founding of the association back in 1951. This proud tradition proves how important and how indispensable this global meeting is. South Korea is hosting the CIMAC Congress for the first time. This choice has been wisely made. The country and its important shipbuilding industry have asserted themselves on the world market and have continuously occupied a leading position for a long time. We are very pleased to be hosted in Busan with its outstanding port: Its depth and low tidal differences have helped Busan become the largest container handling port in the country and the fifth largest in the world.

The 2023 Congress is taking place under special auspices. Our industry is facing enormous, perhaps historically unique challenges, so a holistic professional exchange along the value chain about the state of the art is imperative. A central focus of this year's Congress will lie on identifying the best and realistic ways for the industry to quickly reduce emissions, on addressing greenhouse gas emission targets, on the onset of digitalization in shipping, on developing alternative fuels, and on bringing more clarity to the discussion about future fuels in the industry - all in all challenges that require collaboration within the industry and beyond more than ever before. We look forward to your contribution and to seeing you at the 2023 CIMAC Congress in Busan, where the Congress will provide a perfect opportunity to meet manufacturers, component suppliers, shipyards, research professionals, contractors, customers, and colleagues from across the industry around the world.

Presentations, flanked by the exhibition, poster sessions and the traditional technical tour, will highlight the latest product and technology developments and the value they bring to customers. Strong focus will lie on scientific research that will form the basis for the next generation of technology solutions, and the needs of markets to ensure a sustainable, environmentally friendly and economically viable future will be addressed. In addition, the Congress with its outstanding program including new formats such as pecha kucha presentations will provide a unique opportunity to do business and build lasting networks. Panel discussions and keynote presentations will challenge us to broaden our perspectives.

Once again – Welcome!

Marko Dekena
Vice-President Technical Program

Jonas Åkerman
Vice-President Technical Program

Welcome to Busan!

We are looking forward welcoming you to Busan, and we hope you will enjoy this wonderful city. Korea is an extremely modern country, but at the same time committed to its traditions. This is particularly evident in Busan, the country's second largest city.

The combination of old and new can be found here at every turn. Outstanding meeting facilities such as the BEXCO Convention Center, where the CIMAC Congress will be held, are just minutes from sandy beaches and historic mountain trails. Huge temple complexes that have endured for millennia are located amidst some of Asia's tallest residential skyscrapers. The city's natural features and rich history have enabled Busan to develop into a first-rate tourist city and established it as a hotspot for international conventions. Add to this the pleasant climate: Busan has four distinct seasons, but it is never too hot nor too cold.

We promise, there is a lot to see and do in Busan - be sure to check out the optional tours in the program and take advantage of what the city has to offer.

On behalf of the National Member Association of Korea – KOFCE (KOrea Federation of Combustion Engines), we hope you enjoy your visit to Busan!

Kwang Heon An
Congress President

Ji Hyoub Cha
NMA Korea Secretary General

Welcome to the CIMAC Congress 2023 Together for a Common Future!

The International Council on Combustion Engines-CIMAC-cordially invites you to the 30th CIMAC Congress from 12 to 16 June 2023 in Busan, Korea.

The internal combustion engine has promoted industrial development and brought great convenience to people's life since its invention. Large combustion engines are essential to the global economy, particularly in maritime transportation, the energy and the rail sector. The years since the last CIMAC Congress have been very extraordinary and demanding. Our industry and our community have weathered this ordeal.

Today's CIMAC is a vigorous and attractive organization, it has become the leading global association of our industry. CIMAC provides a global platform for discussion through a range of events, while the CIMAC Congress is one of the most important international events. 72 years ago, when the first CIMAC Congress took place in Paris in 1951, industry pioneers came together with professionals from institutes and universities, to generate new ideas and discuss the future development of combustion engines. This tradition has been kept throughout the last seven decades. This year, the CIMAC Congress once again brings together the large engine industry's stakeholders. The leading experts from all over the world are actively participating in our congress and adding their new knowledge and contributions to our broad field.

Our call for papers met with a gratifyingly broad response. We received more than 500 proposals for abstracts competing for over 250 presentations at the CIMAC Congress. Social events and technical tours will further support the excellent networking possibilities in Busan. More than 800 experts from all parts of the world came to Vancouver in 2019. We are confident we will welcome a similarly high number of participants in Busan.

Today is a time of grave challenges, but also a time of great hope. I believe that the CIMAC Congress 2023 will be a grand gathering where we can see the competition of ideas, enlightenment of wisdom, building of consensus and facilitation of development, and will surely lead the development of global ICE technology and industry towards a new direction.

CIMAC sincerely invites you to the 30th CIMAC Congress and we are looking forward to meeting you in Busan.

Donghan Jin
President of CIMAC

CONGRESS OVERVIEW

Day	Time	Acitivties
Sunday June 11, 2023	14:00 – 18:00	Congress Information Desk
	14:00 – 18:00	Speakers' Preparation (Room 106)
Monday June 12, 2023	**10:00 – 11:30**	**Opening Ceremony (Auditorium)**
	10:00 – 17:40	Exhibition & Poster Sessions
	12:00 – 18:00	Speakers' Preparation (Room 206)
	12:40 – 13:40	Lunch
	13:40 – 15:00	**Technical Sessions**
	15:10 – 15:40	Pecha Kucha Presentations
	15:10 – 15:40	Poster presentation by the author
	15:40 – 16:00	Coffee Break
	16:00 – 17:40	**Technical Sessions**
	18:30	**Welcome Reception at Paradise Hotel Busan**
Tuesday June 13, 2023	08:00 – 18:00	Speakers' Preparation (Room 106)
	09:00 – 17:40	Exhibition & Poster Sessions
	09:00 – 10:40	**Technical Sessions**
	10:40 – 11:20	Coffee Break
	11:20 – 12:40	**Technical Sessions**
	12:40 – 13:40	Lunch
	13:40 – 15:00	**Technical Sessions**
	15:10 – 15:40	Pecha Kucha Presentations
	15:10 – 15:40	Poster presentation by the author
	15:40 – 16:00	Coffee Break
	13:40 – 15:00	**PANEL Digitalization**
	16:00 – 17:40	**Technical Sessions**
	18:30	**Accelleron Evening**
Wednesday June 14, 2023	08:00 – 18:00	Speakers' Preparation (Room 106)
	09:00 – 17:40	Exhibition & Poster Sessions
	09:00 – 10:40	**Technical Sessions**
	10:40 – 11:20	Coffee Break
	11:20 – 12:40	**Technical Sessions**
	12:40 – 13:40	Lunch
	13:40 – 15:00	**PANEL Defossilization COLLIN TRUST Keynote**
	15:00 – 16:00	Coffee Break
	16:00 – 17:40	**Technical Sessions**
Thursday June 15, 2023	08:00 – 16:00	Speakers' Preparation (Room 106)
	09:00 – 17:40	Exhibition & Poster Sessions
	09:00 – 10:40	**Technical Sessions**
	10:40 – 11:20	Coffee Break
	11:20 – 12:40	**Technical Sessions**
	12:40 – 13:40	Lunch
	13:40 – 15:20	**Technical Sessions**
	15:10 – 15:40	Poster presentation by the author
	15:20 – 16:00	Coffee Break
	16:00 – 17:30	**FINAL PANEL**
	18:30	**Gala Dinner at Busan Hilton Hotel**
Friday June, 16, 2023	**07:30 – 13:30**	**Technical Tours (Half day)**

Optional Tours
June 12 - 15, 2023

Posters are on display all day, the author's presentation time is shown in the program.
Note: Congress Information Desk will be open from Monday to Thursday from 08:00 - 18:00.

TOPICS AND SESSIONS

1. Digitalization and Connectivity
   - 1.1. Leveraging Vessel Connectivity
   - 1.2. Process Optimization and Predictive Maintenance
2. System Integration and Hybridization
   - 2.1. Ship Hybrid Propulsion
   - 2.2. Hybrid System Engineering
3. Electrification and Fuel Cells Development
   - 3.1. Marine Fuel Cell Applications
4. Controls, Automation, Measurement & Monitoring
   - 4.1. Controls and Sensing
   - 4.2. Monitoring and Fault Diagnostics
5. Emission Reduction Technologies - Exhaust Gas Aftertreatment Solutions
   - 5.1. Scrubbers
   - 5.2. Particle Filtration
   - 5.3. SCR Technology
   - 5.4. GHG Reduction (ammonia combustion & slip reduction)
6. Emission Reduction Technologies - Engine Measures & Combustion Development
   - 6.1. GHG Reduction (H2 combustion & transition outlook)
   - 6.2. PM/BC Reduction
   - 6.3. Engine Measures
7. Fuels - Conventional Fuels
   - 7.1. Test methodologies to predict fuel performance
   - 7.2. Fuel development
8. Fuels - Alternative & New Fuels
   - 8.1. Development aspects for using ammonia/methanol as a fuel
   - 8.2. Future Fuel systems aspects
   - 8.3. Biofuels / Future Fuels storage, supply and handling
9. Lubricants
   - 9.1. Zero-carbon Fuel Lubricants
   - 9.2. Gas Engine Lubricants
10. New Engine Developments – Diesel
    - 10.1. 2-Stroke Engines
    - 10.2. 4-Stroke Diesel Engines (1)
    - 10.3. 4-Stroke Diesel Engines (2)
11. New Engine Developments - Gas
    - 11.1. New Gas Engine Development
    - 11.2. New Gas Engine Technology
12. New Engine Developments - Dual Fuel
    - 12.1. dual fuel engines
13. New Engine Developments - Alternative Fuels & other New Engine Concepts
    - 13.1. Methanol Engine Technology
    - 13.2. Hydrogen and Ammonia Engine Technology
    - 13.3. Alternative Fuel Concepts & Platforms
14. Engine Component Developments - Fuel Injection & Gas Admission
    - 14.1. "LIQUID" or Conventional Diesel
    - 14.2. "GAS" or Alternative/New Fuels
15. Engine Component Developments – Components
    - 15.1. Advanced Component Integration
    - 15.2. Auxiliary Equipment Systems
16. Engine Component Developments - Tribology
    - 16.1. Bearings
    - 16.2. Piston, Rings & Liner
17. Engine Component Developments - Turbochargers & Air/Exhaust Management
    - 17.1. Next Generation Turbochargers & Intake Systems
    - 17.2. Air-/Exhaust Management for Alternative Fuels
18. Basic Research & Advanced Engineering - New Concepts
    - 18.1. Basic Research & Advanced Engineering - New Concepts
19. Basic Research & Advanced Engineering - Simulation Technologies
    - 19.1. Engine Thermodynamics 1
    - 19.2. Engine Thermodynamics 2
20. Basic Research & Advanced Engineering - Mechanics, Materials Research
    - 20.1. Mechanics and Materials
21. Basic Research & Advanced Engineering - Visualizations
    - 21.1. Future Fuel Spray and Combustion
    - 21.2 Engine System Thermodynamics & Visualization

Monday - June 12, 2023

13:40 – 15:00

Accelleron (R205)

21 Basic Research & Advanced Engineering - Visualizations

21-4 Future Fuel Spray and Combustion

Chair: Long Liu (Harbin Engineering University)

362
Characterization of future fuels using an optically accessible rapid compression machine
Gerhard Pirker, LEC GmbH

416
Optical experiments on ammonia combustion in spark-ignition engines with enhanced turbulence
Jiaying Pan, Tianjin University

620
Investigation of Post-injections for Emission Reduction of Diesel-piloted Ammonia Spray Combustion
Valentin Scharl, Technical University of Munich, Chair of Thermodynamics

501
Investigation of the Spray Characteristics under Conditions of Marine Diesel Engine using Image Processing Technique
chen an, harbin engineering university

INNIO (R104-110)

5 Emission Reduction Technologies - Exhaust Gas Aftertreatment Solutions

5-1 Scrubbers & CCS

Chair: Kati Lehtoranta (VTT Technical

463
Investigations on combined scrubbing & particle filtration technologies for maritime applications
Uwe Etzien, University of Rostock - Chair of Piston Machines and Internal Combustion Engines

182
Effects of Membrane filtration on the emission load of EGCS water from various fuels
Dennis Fischer, BOLL & KIRCH Filterbau GmbH

545
The bench test research of Higee-based Marine exhaust gas cleaning system
Shien Tu, Shanghai Marine Diesel Engine Research Institution

379
Experimental study on the performance of an impinging scrubber
Wenbo Zhang, China Shipbuilding Power Engineering Institute Co., Ltd

OMT (R101-103)

2 System Integration & Hybridization

2-1 Ship Hybrid Propulsion

Chair: Hinrich Mohr (GasKraft Engineering)

651
Optimization of Complex Energy Systems as an Enabler for Sustainable Shipping Solutions
Bernhard Thaler, Large Engines Competence Center Graz

419
EEDI Amendments using Ship Operational Profile in order to avoid Too Low Engine Reserve Power
Congbiao Sui, Harbin Engineering University

090
Z-PELLER electrification and optimization for decarbonization
Yota Harada, IHI POWER SYSTEMS Co., Ltd.

328
Development of a Free-Running Model Test Methodology for Evaluation of a Full-Scale Ship Propulsion
OLEKSIY BONDARENKO, National Maritime Research Institute of Japan

Robert Bosch (R201-202)

11 New Engine Developments - Gas

11-1 New Gas Engine Development

Chair: Stephan Laiminger (Innio Jenbacher)

017
Further NOx-thermal efficiency trade-off improvement with lean pre-chamber
Yoshinori Kaji, DAIHATSU DIESEL MFG.CO.,LTD.

091
Development of a low-speed four-stroke gas engine
Satoru Higashikawa, The Hanshin Diesel Works, Ltd.

415
Development of the next Generation Gas Engine with Increased Efficiency and Reduced Emissions
Francisco Lopez Gutierrez, Innio Jenbacher GmbH

448
Guascor Energy's new E-Series lean-burn gas engine – First field experiences
Iñaki Iruretagoyena, Guascor Energy

12:40 - 13:40 Lunch

Monday - June 12, 2023

16:00 – 17:40

Accelleron (R205)

8 Fuels - Alternative & New Fuels

8-3 Biofuels / Future Fuels storage, supply and handling

Chair: German Weisser (Winterthur Gas & Diesel)

562
Impact of alternative fuels on ship design - A shipbuilders perspective
Erik-Jan Boonen, DAMEN

390
Filtration Technologies for Future Fuels
Joern Grotepass, Boll & Kirch Filterbau GmbH

133
All you need to know about Biodiesel Fuel oil blends (VLSFOs) quality as a marine fuel
Sara Rezaee, Viswa Group

373
Comparison of exhaust gas emissions of a marine engine burning different blends of bio-VLSFO
Philippe RENAUD, CMA Ships

INNIO (R104-110)

5 Emission Reduction Technologies - Exhaust Gas Aftertreatment Solutions

5-3 SCR Technology

Chair: Daniel Peitz (HUG Engineering)

243
Development and Application of an Intelligent SCR System combining Engine and SCR Control
Panagiotis Kyrtatos, Vir2sense GmbH

380
A study on deterioration mechanism of SCR catalyst during bypass operation for marine diesel engine
KEN KAWABE, YANMAR HOLDINGS CO., LTD.

430
IACCSEA – Learning lessons from IMO III
Ilkka Saarinen, International Association for Catalytic Control of Ship Emissions to Air (IACCSEA)

Impuls Discussion
Learning lessons from IMO III

OMT (R101-103)

18 Basic Research & Advanced Engineering - New Concepts

18-1 New Concepts

Chair: Bert Buchholz (University of Rostock, LKV)

103
Progress and prospect of combustion studies on low- and zero-carbon fuels
Koji Takasaki, Kyushu University & National Maritime Research Institute, Japan

012
Evaluation of a virtual medium-speed engine on methanol using spark-ignition
Yi-Hao Pu, Ghent University

396
Initial investigations into ammonia combustion at conditions relevant for marine engines
Kai Herrmann, University of Applied Sciences and Arts Northwestern Switzerland (FHNW)

673
Simulation of High Pressure Diesel Pilot-Initiated Ammonia Combustion in Two-Stroke Marine Engine
Nathan Peters, MAHLE Powertrain

Robert Bosch (R201-202)

11 New Engine Developments - Gas

11-2 New Gas Engine Technology

Chair: Patrick Frigge (FPE GmbH)

082
Influence of blend ratio on turbocharging & combustion in HS gas eng. applications with CH4/H2 blend
Raphael Ryser, Accelleron, Turbo Systems Switzerland Ltd

114
Combustion Process Optimization for Wood Gas Engine of a Biomass Power Plant
Jure Galović, Institute of Powertrains and Automotive Technology, Vienna University of Technology

573
Consideration of Combustion Improvements of Lean-burn Gas Engine with Pre-combustion Chamber
Elsayed Abdelhameed, Kyushu University

Impuls Discussion
Hydrogen - the fuel for all future gas engines?

15:40 – 16:00 Coffee Break

Monday - June 12, 2023

15:10 – 15:40

Poster exhibition

25 Poster presentation by the author

003 **Research of a China II-compliant marine diesel engine using two-stage turbocharging and EGR system**
Xiannan Li, Shanghai Marine Diesel Engine Reserch Institute

011 **The corrosion behavior of steels in contact with metal doped biodiesel-diesel blends**
Katriina Sirviö, University of Vaasa

026 **Miller cycle combined with EGR on the transient response performance of turbocharged diesel engine**
Zhilong Hu, Shanghai Marine Equipment Research Institute

150 **True Worth Index represents the real price of the fuels purchased**
Ganesh Natarajan, The Viswa Group

168 **Study on Cavitation Characteristics of Common Rail Injector Control Valve**
Hanwen Zhang, Harbin Engineering University

194 **Analysis of gaseous emission and SFOC characteristic with SAC coolant temp. for two-stroke engine**
Sanghoon Kim, Korean Register

197 **Effects of in-cylinder flow on natural gas mixing and combustion process in a dual-fuel engine**
Menghao Ma, Tianjin University

209 **Modern sensor signals in networks**
Andreas Buchholz, Dr. E. Horn. GmbH & Co. KG

211 **Influence of resonant intake system on cylinder consistency of marine high turbocharged diesel engin**
yang shuqiao, 711 Research Institute of China Shipbuilding Corporation

225 **Collaborative optimization of EGR and Miller cycle of two-stage turbocharged marine diesel engine**
Ziqiang Chen, Shanghai Jiao Tong University

276 **The Influence of Dual Electric Turbo Compound System on the Performance of Marine Diesel Engine**
Rui Liu, Shanghai Jiao Tong University, Shanghai Marine Diesel Engine Research Institute

301 **High-power power electronic converter for Electrification of ship power system**
Xuan Yang, Shanghai Marine Diesel Engine Research Institute

654 **Development of High Performance Stationary GEO and Establishing Its Long Drain Capability**
YOGESH KUMAR SHARMA, Indian Oil Corporation Ltd

369 **Reduction of CO2 emissions in shipping through use of drop-in fuel components from bio-based waste**
Fanny Langschwager, Rostock University

Posters are on display all day, the author's presentation time is shown in the program.

Tuesday - June 13, 2023

09:00 – 10:40

Accelleron (R205)

13 New Engine Developments - Alternative Fuels & Other New Engine Concepts

13-2 New concepts hydrogen and ammonia engine technology

Chair: Daniel Chatterjee (Rolls-Royce Power Systems)

203
ABC completes the upgrade of its DZ-engines into hydrogen dual fuel and spark ignition
Luc Mattheeuws, Anglo Belgian Corporation NV

231
Safe and efficient engine operation with Ammonia
Kaj Portin, Wärtsilä

606
Widening the operation limits of a SI engine running on neat ammonia
Mads Carsten Jespersen, Technical University of Denmark

667
Decarbonization of high-power systems: ammonia-hydrogen and ammonia-diesel combustion in HS engines
Nicole Wermuth, LEC GmbH

589
Developing the MAN B&W dual fuel ammonia engine
Stefan Mayer, MAN Energy Solutions

INNIO (R104-110)

5 Emission Reduction Technologies - Exhaust Gas Aftertreatment Solutions

5-2 Particle filtration

Chair: Stefano Ghetti (FEV GmbH)

549
DPF+SCR ultra low emission solution for medium speed diesel engines
Daniel Peitz, HUG Engineering

637
Simulation based layout of a highly efficient aftertreatment system for a large diesel engine
Thomas Kammerdiener, AVL List GmbH

555
Reducing particle emissions from marine engines – fuel choices and technology pathways
Kati Lehtoranta, VTT Technical Research Centre of Finland

577
Emissions Prediction and Control of Marine Diesel Engine Based on Real-Time Combustion Analysis
Ziqiang Chen, Shanghai Jiao Tong University

Impuls Discussion
Black Carbon IMO Update

OMT (R101-103)

1 Digitalization & Connectivity

1-1 Leveraging Vessel Connectivity

Chair: Eero Lehtovaara (ABB Marine and Ports)

548
The Path towards Autonomous Shipping from the Perspective of the Propulsion System
Peter Krähenbühl, Winterthur Gas & Diesel Ltd.

148
Implementing Fleet Digitalization: Systems, applications and lessons learned.
Nikolaos Kyrtatos, Propulsion Analytics

570
WiDE – an example on how digitalization creates value for ship operators
Rudolf Holtbecker, Winterthur Gas & Diesel

647
Technological challenges and solutions for the 2030/2050 Chemical Parcel Tanker
Jose Gonzalez, Stolt Tankers

527
MAN-ES Automation Features on Demand
Casper Olesen, MAN Energy Solutions

Robert Bosch (R201-202)

12 New Engine Developments - Dual Fuel

12-1 dual fuel engines

Chair: Dominik Schneiter (Winterthur Gas & Diesel)

146
MAN ES 49/60DF - Maximum performance from the modular system
Ingo Wilke, MAN Energy Solutions

292
Development of Marine Dual Fuel Engine (EY26DF)
Nobuyuki Higa, YANMAR POWER TECHNOLOGY CO., LTD.

100
Significant performance improvements by using a low-pressure EGR system for the new X-DF2.0
Fridolin Unfug, Winterthur Gas & Diesel

187
Service experience on dual fuel MAN B&W two-stroke engines in relation to cylinder condition
Jesper Mark Pedersen, MAN Energy Solutions

514
WinGD X92DF engine service experience
Konrad Räss, Winterthur Gas & Diesel

12:40 - 13:40 Lunch

Tuesday - June 13, 2023

11:20 – 12:40

Accelleron (R205)

8 Fuels - Alternative & New Fuels

8-2 Future Fuel systems aspects

Chair: Dirk Bergmann (Accelleron, Turbo Systems Switzerland Ltd.)

412
Power-to-X - From Decentralized e-Fuel Production to the Defossilization of High-Power Applications
Daniel Chatterjee, Rolls-Royce Power Systems

019
A comprehensive hydrogen value chain for a sustainable energy transition
Florian Gruschwitz, MAN Energy Solutions

411
The role of gas engines in a future energy market with sustainable fuels
Stephan Laiminger, Innio Jenbacher

348
Preparing for future demands - the CSSC Global 2-stroke Test Center
Sebastian Hensel, Winterthur Gas & Diesel

INNIO (R104-110)

6 Emission Reduction Technologies - Engine Measures & Combustion Development

6-2 PM/BC Reduction

Chair: Masayoshi Kawakami (JICEF)

124
Development of Black Carbon Zero System for Marine Diesel Engines
Minoru Tsuda, National Fisheries University

002
Cooled Spray combustion for particulate matter reduction in a large-bore single-cylinder engine
Adam Klingbeil, Wabtec Corporation

310
Influence of post-injection strategy on physiochemical characteristics of diesel particulate matter
Xu Lyu, Tianjin University

073
Renewable diesel fuel effects on a Tier 3 GE ES44C4 locomotive
Christopher Stoos, Southwest Research Institute

OMT (R101-103)

2 System Integration & Hybridization

2-2 Hybrid System Engineering

Chair: Elias Boletis (Wärtsilä)

229
"H-Flex-E" -First industrial scale green hydrogen production, storage and energy reconversion system
Kenneth Widell, Wärtsilä

308
Modeling of wind/PV hybrid generation system with LH2-superconducting magnetic energy storage
Fan Zhang, Tianjin University

413
Investigation on Matching Design and Strategy Optimization of Ship Hybrid Power System
Zunhua Zhang, Wuhan University of Technology

293
Research on energy management strategy and simulation of hybrid power system for ocean-going ships
Rongpei Zhang, China Shipbuilding Power Engineering Institute Co., Ltd.

Robert Bosch (R201-202)

24 Pecha Kucha Session

Moderator: CIMAC

PECHA KUCHA
The detailed program for the 8 pecha kucha presentations in this session can be seen on page 14.

15:40 – 16:00 Coffee Break

Tuesday - June 13, 2023

11:20 – 12:40

Robert Bosch (R201-202)

24 Pecha Kucha Session

032
Electronic pressure regulator (EPR) for smart crankcase ventilation systems
Niclas Nowak, UT99 AG

033
Establishing a future-proof automation system architecture for modern maritime industrie
Juergen Ammer, MAN Energy Solutions

048
A new look on the maritime propulsion roadmap – Exploring co-development with the off-road sector
Magnus Hellström, Åbo Akademi University

622
Research on abnormal injection fault diagnosis technology of high-pressure common rail fuel system
Yilin Liu, Harbin Engineering University

644
The development of novel measurement techniques as enablers for cleaner and more robust engines
Bernhard Rossegger, LEC GmbH

081
Real-time gas quality analyzer for advanced gas engine control enabling performance optimization
Alexander Levchenko, HEINZMANN GmbH & Co. KG

640
Efficient vibration analysis of IC engine-based small- and medium-size marine propulsion systems
Tigran Parikyan, AVL List GmbH

679
Integration of energy saving technologies on merchant vessels
Elias Boletis , Enarete Marine & Bound for Blue

Tuesday - June 13, 2023

13:40 – 15:00

Accelleron (R205)	INNIO (R104-110)	OMT (R101-103)	Robert Bosch (R201-202)
0 PANEL - DIGITALIZATION	**9 Lubricants**		**7 Fuels - Conventional Fuels**
	9-2 Gas engine lubricants		7-2 fuel development
	Chair: Marinus Hoogerbrugge (AVL List GmbH)		Chair: Kjeld Aabo (MAN Energy Solutions)

PANEL

Ship as a data eco system
CIMAC Strategy Group Digitalization

Panelists perspectives:
Engine Manufacturers
Suppliers
Ship Owner/Operators
Classification Societies
Seafarers

094

Effects of engine operating parameters on natural gas engine oil life
Fred Girshick, Infineum USA, L.P.

286

Dual fuel engine oil solutions to help enable a lower carbon future
john palazzotto, Chevron Oronite

497

LNG, mature solution as a Marine fuel: new generation of lubricants for current and future needs
Valerie DOYEN, TotalEnergies

668

A New Generation of High-Performing Cylinder Oils for 2-stroke Diesel and Dual Fuel Engines
Luis Garcia, Shell Global Solutions (Deutschland) GmbH

290

Microfine Carbon blends as fuel for Marine engines
rumman ahmed, Arq ltd

635

Development of a Surrogate Fuel Model for HFO under Marine Engine-relevant Conditions
Xiong Qian, Harbin Engineering University

653

The influence of Fuel Type and Loads on Particulate Emissions from Marine Diesel Engine
ang sun, Harbin Engineering University

CIMAC WG 7

WG7-Positioning on the alternative fuels replacing conventional fossil fuels

12:40 - 13:40	Lunch

Tuesday - June 13, 2023

15:10 – 15:40

Poster exhibition

25 Poster presentation by the author

611 **Research of a China II-compliant marine diesel engine using two-stage turbocharging and EGR system**
Xiannan Li, Shanghai Marine Diesel Engine Reserch Institute

645 **The corrosion behavior of steels in contact with metal doped biodiesel-diesel blends**
Katriina Sirviö, University of Vaasa

675 **Miller cycle combined with EGR on the transient response performance of turbocharged diesel engine**
Zhilong Hu, Shanghai Marine Equipment Research Institute

170 **True Worth Index represents the real price of the fuels purchased**
Ganesh Natarajan, The Viswa Group

024 **Performance and energy flow of a high power density hybrid engine under different Miller timings**
Peng Wang, Shanghai Jiao Tong University

324 **Tribology in engine parts design considering the characteristics of operating regime**
Hyang Lee, Hyundai Heavy Industries

355 **The retrofit investigation of medium-speed marine engine using methanol as primary fue**
Lijun Guo, Shanghai Marine Diesel Engine Research Institute

449 **Experimental observation of the combustion characteristics of methanol/air by turbulent jet ignition**
Lijia Zhong, Tianjin university

473 **Design and Validation of Methanol fuel Injection System for the 6CS21 middle-speed Marine Engine**
Xiaoli Yang, CSSC(Chongqing) Southwest Equipment Research Institute Co., Ltd.

494 **A study on the vibration transmission of lubricated crosshead pairs in high-duty diesel engines**
Shuo Liu, Shanghai Jiao Tong University

559 **An Advanced Method for Estimating the Impacts of 'Scrubber' Effluent Discharge**
Dayang Wang, Exponent, Inc.

564 **Lubricant impacts on piston deposit formation in the Enterprise marine diesel research engine**
Brian Kaul, Oak Ridge National Laboratory

580 **Design and experimental study of intelligent cooling system of highly intensified marine diesel engine**
Bo Zhang, Naval University of Engineering

604 **Study on NOx Prediction Model for Diesel Engine Control Based on Combustion Characteristic Parameter**
Jiancun Hu, Shanghai Jiao Tong University, Shanghai Marine Diesel Engine Research Institute, National Engineering Research Center of Special Equipment and Power System for Ship and Marine Engineering

Posters are on display all day, the author's presentation time is shown in the program.

Tuesday - June 13, 2023

16:00 – 17:40

Accelleron (R205)

13 New Engine Developments - Alternative Fuels & Other New Engine Concepts

13-1 New concepts methanol engine technology

Chair: Matthias Auer (MAN Energy Solutions)

340
Experimental Study on the Conversion of Marine Diesel Engine to Methanol Engine Fuel
Yuqi Jiang, Shanghai Marine Diesel Engine Research Institute / China Ship Research and Development Academy

535
The development and certification of a single fuel high speed marine CI engine on methanol
Magnus Svensson, Lund University

438
Methanol combustion concept alternatives for new build and retrofit of 4-stroke medium speed engines
Juho Repo, Wärtsilä

523
MAN B&W two-stroke methanol-powered engines for small and large container vessels in the A.P Moller Maersk fleet – experience and new development
Kjeld Aabo, MAN Energy Solutions.

655
Development of carbon-neutral fuel engine: HiMSEN methanol engine
YONGSEOK LEE, Hyundai Heavy Industries

INNIO (R104-110)

6 Emission Reduction Technologies - Engine Measures & Combustion Development

6-3 Engine Measures

Chair: Dieter van der Put (FEV GmbH)

018
Analysis and optimization of the combustion process of DF engines using highly fluctuating gas qualies
Karsten Schleef, University of Rostock

062
Additive technology - Enabling smooth engine operation of fuel / water mixes to reduce NOx emissions
Marcel Harhausen, BASF SE

433
Methane emission reduction technologies for medium-speed dual-fuel engines
Hyunchun Park, HD Hyundai Heavy Industries

270
Wärtsilä ultra-low emission gas engine technology
Diego Delneri, Wärtsilä

183
EEXI – Best practices for compliance
Fabian Kock, DNV

OMT (R101-103)

1 Digitalization & Connectivity

1-2 Process Optimization and Predictive Maintenance

Chair: Marco Coppo (OMT SpA)

069
Enhancement of large engine technology through machine learning
Constantin Kiesling, LEC GmbH

138
Towards the digital engine: benefits and integration of the OMT Intelligent Injection System
Marco Coppo, OMT SpA

600
Adaptive Operating Condition Fault Diagnosis of Marine Diesel Engine based on Transfer Learning
Jia Hu, Wuhan university of technology

283
An analysis of Marine Cybersecurity Standards and the Secure Development Lifecycle
Christopher Sundberg, Woodward, Inc.

CIMAC Whitepaper
Perspectives on powering shipping through sustainable energy

Robert Bosch (R201-202)

16 Engine Component Developments - Tribology

16-2 Piston, Rings & Liner

Chair: Alexander Leitner-Audoui (Innio Jenbacher GmbH)

215
Novel Findings on Oil Transport Pathways Leading to the Lube Oil Ignition in Industrial Gas Engines
Philipp Köser, Rolls-Royce Power Systems

264
Simulation and Experimental Verification of Tribological Property Evaluation in Journal Bearing
Sicong Sun, Wuhan University of Technology

316
Simulation Analysis and Test Verification of Piston Ring Tension Distribution
Xuan Ma, Harbin Engineering University

265
Dynamic and tribological characteristics of piston assembly linked by piston secondary motion
Yongqiang Wang, Harbin Engineering University

185
Analytical Study on Involvement of Temperature in Friction and Scuffing of Sliding Surface in Engine
Mitsuhiro Soejima, Kyushu Sangyo University

10:40 – 11:20 Coffee Break

Wednesday - June 14, 2023

09:00 – 10:40

Accelleron (R205)

17 Engine Component Developments - Turbochargers & Air/ Exhaust Management

17-1 Next generation Turbochargers & intake systems

Chair: Dino Imhof (Accelleron, Turbo Systems Switzerland Ltd.)

057
Next generation axial turbocharger fit for a carbon-neutral world
Alexander Mutter, Accelleron, Turbo Systems Switzerland Ltd.

043
Development of a high flow (TCF) and a high pressure (TCP) radial turbocharger series
Manuel Stork, MAN Energy Solutions

047
A new versatile TC platform for modern HS diesel engines – From product concept to validation
Michael Gisiger, Accelleron, Turbo Systems Switzerland Ltd.

042
High Cycle Fatigue – Advanced development and design methods for increased robustness
Sebastian Spengler, MAN Energy Solutions

531
Large Engine Electro-Hydraulic Lost-Motion Intake VVA System
John Schwoerer, Cummins Engine Components - Valvetrain Technologies

INNIO (R104-110)

10 New Engine Developments - Diesel

10-3 4 Stroke diesel engines 1

Chair: Michael Sturm (Caterpillar Motoren GmbH & Co. KG)

038
Performance prediction and optimization methodology based on a meta-model of HiMSEN engines
Jonghwoo Park, Hyundai Heavy Industries

145
MAN ES 175D - The most efficient and most powerful marine high-speed engine in the world
Ingo Wilke, MAN Energy Solutions

162
The new CSPI high speed H175 engine series for marine applications
Teng Liu , China Shipbuilding Power Engineering Institute Co., Ltd

060
GHG emissions reductions for North American railroads
Steven Fritz, Southwest Research Institute

OMT (R101-103)

13 New Engine Developments - Alternative Fuels & Other New Engine Concepts

13.3 New concepts alternative fuels and platforms

Chair: Christoph Kendlbacher (Robert Bosch Powertrain Solutions,

049
MAN Energy Solutions – Four-stroke engine solutions for low-carbon and carbon-free fuels
Matthias Auer, MAN Energy Solutions

144
Argon Power Cycle (APC) – The way to zero emission ICEs
Lukas Kniestedt, WTZ Roßlau gGmbH

181
Defossilized Fuels for Future Non-Road Cargo Transport
Stefano Ghetti, FEV GmbH

080
Turbocharging of large engines in decarbonization scenarios: impact for the most likely fuels
Raphael Ryser, Accelleron, Turbo Systems Switzerland Ltd

105
Assessment of combustion concepts and operational limits of net-zero carbon fuels
Harald Schlick, AVL List GmbH

Robert Bosch (R201-202)

19 Basic Research & Advanced Engineering - Simulation Technologies

19-1 Engine Thermodynamics 1

Chair: Ioannis Vlaskos (Winterthur Gas & Diesel)

028
Empirical model of uniflow scavenging for a long-stroke marine low-speed diesel engine
junwei Li, Shanghai Jiao Tong Univisity

363
0D modeling of ignition and combustion processes for H2/ CH4 blends in open chamber gas engines
Thomas Oppl, LEC GmbH

426
Numerical Study of NH3-Diesel Combustion in a Retrofit for Marine Engines using Detailed Kinetics
Till Mante, University of Rostock (Chair of Piston Machines and Internal Combustion Engines)

575
Simulation Analysis of Oscillation Cooling of Oil-cooled Piston in Highly Intensified Diesel Engine
Ziying Fan, Harbin Engineering University

10:40 – 11:20 Coffee Break

Wednesday - June 14, 2023

11:20 – 12:40

Accelleron (R205)	INNIO (R104-110)	OMT (R101-103)	Robert Bosch (R201-202)
24 Pecha Kucha Session	10 New Engine Developments - Diesel	4 Controls, Automation, Measurement & Monitoring	19 Basic Research & Advanced Engineering - Simulation Technologies
	10-1 4 stroke diesel engines 2	4-1 Controls and Sensing	19-3 Engine Thermodynamics 2
Moderator: CIMAC	Chair: Michael Sturm (Caterpillar Motoren GmbH & Co. KG)	Chair: Joonas Holmi (Wärtsilä)	Chair: Mingfa Yao (Tianjin University)
PECHA KUCHA **The detailed program for the 8 pecha kucha presentations in this session can be seen on page 20.**	**058** **A new modular medium-speed engine family** Koen Christianen, Anglo Belgian Corporation	**666** **The benefit of fully integrated microgrid controls solutions incorporating reciprocating gas engines** Herbert Kopecek, Innio Jenbacher GmbH	**106** **Modelling of dual-fuel combustion in a large two-stroke engine using an advanced CFD-chemical model** Kar Mun Pang, MAN Energy Solutions
	177 **Performance development and experiment of a high power twostage sequential turbocharge diesel engine** Zhong Jie, Shanghai Marine Diesel Engine Research Institute	**004** **Significant aftertreatment cost reduction with high precise AFR control for gaseous-fueled engines** Dr. Yi Han, WOODWARD, INC.	**406** **A New Combustion Model and its CFD Simulation in an Ammonia/Diesel Dual-Fuel Low-Speed Marine Engine** Haifeng Liu, Tianjin University
	261 **Performance Development of New SMDERI CS21 4-stroke Medium Speed Diesel Engine** Rui Liu, Shanghai Jiao Tong University, Shanghai Marine Diesel Engine Research Institute	**639** **High-pressure common rail system injection rate observer design using DLQR control** Bingxin Liu, Harbin Engineering University	**166** **A mapping approach for efficient CFD simulation of dual fuel marine engine with pre-chamber** Ying Ye, Tianjin University
		147 **Combustion Control based on Low Cost Vibration Sensors for Variable Fuel Otto Engines** Klaus Schmid, AVAT Automation GmbH	**240** **Numerical Simulation for Discrete Multi-component Lubricating Oil Spray** Yuan Fang, Institute of Internal Combustion Engines, Dalian University of Technology
12:40 - 13:40	Lunch		

Wednesday - June 14, 2023

11:20 – 12:40

Accelleron (R205)

24 Pecha Kucha Session

677 **Evolution of two-stroke marine engine lubricants**
Natascha Horn, Castrol

370 **Prevention of sliding bearing damages by detecting mixed friction conditions with Bearomos 2020**
Horst Brünnet, Schaller Automation Industrielle Automationstechnik GmbH & Co. KG

676 **Engine Mounted Generator - The New PTO system for propulsion engine**
YungJoon Ju, Hyundai Heavy Industries

638 **The Impact of Future fuels on lubricating oil formulation**
James Dodd, Infineum UK Ltd

559 **An Advanced Method for Estimating the Impacts of 'Scrubber' Effluent Discharge**
Dayang Wang, Exponent, Inc.

547 **Medium speed engine oils optimized for ultra low emission profiles**
Daniel Peitz, HUG Engineering

678 **Methanol - A Future Proof Maritime Fuel**
Chris Chatterton, Methanol Institute

040 **Development of DF engine control system including virtual commissioning and adaptive AFR control**
Sunghoon Ko, Hyundai Heavy Industries

Collin Trust sponsored
Keynote Speech
13:40 – 15:00

Collin Trust sponsored Keynote Speech

Perspectives on powering shipping through sustainable energy

As an expert in sustainable energy and transportation, Mr. Tunér will share his insights on how global shipping can contribute to a better world through the use of sustainable energy sources.

Global shipping plays a crucial role in energy-efficient transportation, but its current dependence on fossil fuels also contributes significantly to negative impacts on health, environment, and climate. With more than 5 billion tons of oil consumed every year, reducing the negative impact from the use of fossil fuels is an enormous task. Sustainable energy options for shipping are crucial, and Mr. Tunér will discuss how these options can be used to maximize impact with the available natural resources at the lowest cost.

During his presentation, Mr. Tunér will provide insights into the different energy sources and their potential availability, climate impact, functionality, and costs. He will also discuss why using several of these energy sources in parallel is advantageous. His speech will put the sustainable energy options in context by the scales of the challenges and the opportunities.

About Collin Trust
The Collin trust was established in the 1990's, originally in the UK, and its purpose is the handling of a financial non-profit donation made by the Swedish late Prof. Lars Th. Collin (1925 – 2013), Gothenburg. The Trust organizes and sponsors Colin Trust Lectures, to foster education of the concerned public. This lecture is to be delivered at an international reputation on contemporary environmental issues. To present his/her own view, or an organization's view on important developments in the field of energy/energy conservation and/or related matters.

Dr. Martin Tunér
Martin Tunér Ph. D.
Assistant Dean for Doctoral Education
International Advisor
Professor, Combustion Engines
Faculty of Engineering, LTH
Lund University

Dr. Martin Tunér is full Professor at the Department of Energy Sciences at Lund University and holds a position as Vice-Dean of the Faculty of Engineering at Lund University.

Wednesday - June 14, 2023

16:00 – 17:40

Accelleron (R205)

17 Engine Component Developments - Turbochargers & Air/Exhaust Management

17-2 Air-/Exhaust Management for alternative fuels

Chair: Silvio Risse (Kompressorenbau Bannewitz

068
Alternative fuels and their consequences for exhaust gas turbocharging
Steffen Käseberg, Kompressorenbau Bannewitz GmbH

096
Status of MET turbochargers for alternative fuels to reduce GHG emissions
Yushi Ono, Mitsubishi Heavy Industries

212
Switching Process Control of Two-stage Sequential Turbocharging System for Marine Diesel Engines
Ling Leng, Shanghai Jiao Tong University

213
Optimization of S-CO2 Brayton Cycle for Low-Speed Marine Diesel Engine Flue Gas Waste Heat Recovery
Liangtao XIE, Wuhan University of technology

247
Data-driven prediction of compressor aerodynamic noise in a marine diesel engine turbocharger
Chen Liu, College of Power and Energy Engineering, Harbin Engineering University

INNIO (R104-110)

10 New Engine Developments - Diesel

10-2 2 stroke engines

Chair: Mathias Moser (MAN Energy Solutions)

099
The latest technological development of the J-ENG UE engine for zero emission and digital transformation
Katsumi IMANAKA, JAPAN ENGINE CORPORATION

149
MAN B&W Two-Stroke Engine Design Update incl. the Newly Developed High-Efficient 10.6 Engine Series
Lars Ascanius, MAN Energy Solutions

464
New compact engines from WinGD tailored to the changing needs of modern vessels
Marc Spahni, Winterthur Gas & Diesel

046
LP EGR system for a two-stroke engine
Hoick Lee, Hyundai Heavy Industries

079
Operation of two-stroke main engines with reduced viscosity cylinder oil to improve fuel consumption
Mark Embleton, Maersk Oil Trading

OMT (R101-103)

6 Emission Reduction Technologies - Engine Measures & Combustion Development

6-1 Greenhouse Gas reduction (H2 Combustion and Challenge)

Chair: Dieter van der Put (FEV GmbH)

084
Combustion characteristics of low-flashpoint fuels and ammonia in the internal combustion engine
Youngmin Woo, Korea Institute of Energy Research

072
Greenhouse gas reduction through hydrogen fumigation on a 1-MW Tier 2 Caterpillar 3512 diesel engine
Christopher Stoos, Southwest Research Institute

291
Prechamber Combustion: Enabling the Competitive Carbon-Neutral ICE
Emmanuella Sotiropoulou, Prometheus Applied Technologies

192
Preliminary study on China's ship power to meet the challenge of carbon emission reduction
Dongming Zhang, Tianjin University, Shanghai marine diesel engine research institute

652
Greenhouse Gas Emissions Reduction on High-Speed Large Engines
Gareth Estebanez, AVL List GmbH

Robert Bosch (R201-202)

16 Engine Component Developments - Tribology

16-1 bearings

Chair: Franz Koch (N/A)

009
DPLE – Digital product lifecycle engineering for hydrodynamic bearings
Falk Nickel, Miba Bearing

025
Bearing testing and validation to optimize bearing design for different engine applications
ZHIFENG ZHANG, Miba Precision Components (China) Co., Ltd.

075
Diagnosis of abnormal lubrication conditions to prevent seizure of crosshead bearings
Tatsumi Kitahara, Kyushu University

234
Research on the effect of the preload of the main bearing bolts on the performance of the diesel engine main bearings
Chen Guangku, Harbin Engineering University

295
A new real-time condition monioring method for engine bearings
Motohiko Koshima, Daido Metal Co., Ltd

15:40 – 16:00	Coffee Break

Thursday - June 15, 2023

09:00 – 10:40

Accelleron (R205)

5 Emission Reduction Technologies - Exhaust Gas Aftertreatment Solutions

5-4 GHG Reduction - Ammonia combustion & slip reduction

Chair: Stefano Ghetti (FEV GmbH)

141
MAN Energy Solutions – Technologies to reduce methane slip of dual fuel engines
Mathias Moser, MAN Energy Solutions

440
Ammonia as a fuel – a role for catalytic components.
Joseph McCarney, Johnson Matthey

101
Fundamental study of the effect of stratified NH3 injection system for nitrogen compounds reduction
Hiromichi Oba, Japan Engine Corporation

274
From LNG to CCUS, how the methane pathway can be a shortcut to the decarbonization of large containers
Philippe RENAUD, CMA Ships

629
Methane slip emissions from LNG vessels - review
Niina Kuittinen, VTT Technical Research Centre of Finland

INNIO (R104-110)

8 Fuels - Alternative & New Fuels

8-2 Development aspects for using ammonia/methanol as a fuel

Chair: German Weisser (Winterthur Gas & Diesel)

236
The effect of injection strategy on combustion and emissions of ammonia Marine engine
Yue Wu, Harbin Engineering University

113
Development of premixed ammonia combustion strategy with minimum emissions for marine diesel engines
Yoichi Niki, National Institute of Maritime, Port and Aviation Technology

420
Effects of Fuel Ratio and Injection Strategy on Ammonia -Diesel Engine
Zunhua Zhang, Wuhan University of Technology

624
Research on combustion and emission characteristics of marine ammonia engine
Song Zhou, Harbin Engineering University

521
Methanol as an energy carrier – latest technological advances
Martti Larmi, Aalto University

OMT (R101-103)

21 Basic Research & Advanced Engineering - Visualizations

21-2 Engine System Thermodynamics & Visualization

Chair: Gerhard Pirker (LEC GmbH)

313
Experimental visualization of gas-liquid two-phase flow in a real-size piston model
BING LIANG, Harbin Engineering University

095
Visualization of cavitation behavior in a fuel injection valv
Ryosuke Fukuda, Mitsui E&S

511
Use and benefits of advanced simulation tools for the development of exhaust aftertreatment systems
Christian Lieber, Hug Engineering

221
Effect of SO2 on absorbents for Onboard Carbon Dioxide Capture
Jianjun Ren, Harbin Engineering University

Robert Bosch (R201-202)

15 Engine Component Developments - Components

15-2 Auxiliary Equipment Systems

Chair: Keitaro Hironaka (IHI Power Systems)

016
Smarter sealing for a safer tomorrow – obtaining information of a gasket with novel technology
Jaakko Niukkala, TT Gaskets

064
Development of a valve train system with a hydraulic lash adjuster (HLA) for large engines
Hiroyuki Katayama, DAIHATSU DIESEL MFG.CO.,LTD.

208
The effect of increasing Peak Firing Pressure on the reliability of cylinder head of diesel engine
ZOU HAO, Dalian CRRC Diesel Engine Co.,Ltd

279
Innovative lube oil filtration concept for combustion engines
Andreas Nußbaum, Boll & Kirch Filterbau GmbH

489
The reliability design of tribological system meeting for the future clean engine
Yihu Tang, 1. Shanghai Jiaotong University 2. SMDERI

10:40 – 11:20	Coffee Break

Thursday - June 15, 2023

11:20 – 12:40

Accelleron (R205)	INNIO (R104-110)	OMT (R101-103)	Robert Bosch (R201-202)
3 Electrification and Fuel Cells Development	**7 Fuels - Conventional Fuels**	**4 Controls, Automation, Measurement & Monitoring**	**14 Engine Component Developments - Fuel Injection & Gas Admission**
3-1 Marine Fuel Cell Applications	7-1 Test methodologies to predict fuel performance	4-2 Monitoring and Fault Diagnostics	14-2 "GAS" or alternative/new fuels
Chair: Marco Thömmes (Rolls-Royce Power Systems)	Chair: Charlotte Rojgaard (Bureau Veritas VeriFuel)	Chair: Sai Venkataraman (Woodward)	Chair: Rune Nordrik (Bergen Engines AS)
454 **Road to zero global warming from high powered merchant marine propulsion systems** Dominik Schneiter, Winterthur Gas & Diesel	**008** **Demonstrating significant fuel consumption and emissions savings with combustion improver additives** Adrian Bourdeaux, Infineum UK Ltd	**102** **New generation oil mist detection system for prevention of crankcase explosions in large ICE** Alexander Levchenko, HEINZMANN GmbH & Co. KG	**088** **Low-pressure (SOGAV) gas admission of H2 and NH3** Rick Boom, Woodward
366 **TCO comparison between fuel cells and Diesel engines - example of PEMFC APU for large vessel** Jeremy Dalton, Ricardo	**014** **The fuel oil spin test: a method to help fuel users predict sludge issues at the fuel oil separator** Dewi Ballard, Infineum UK Ltd	**244** **Selective hydrogen and methane online monitoring in the crankcase of large 4-stroke engines** Horst Brünnet, Schaller Automation Industrielle Automationstechnik GmbH & Co. KG	**055** **Fuel injection and admission systems for liquid and gaseous bio- and e-based fuels for large engines** Jens Olaf Stein, Robert Bosch AG
085 **Fuel cells for future marine propulsion systems** Clemens Mair, AVL List GmbH	**131** **Long term storage stability issues of very low sulfur fuels, a major problem for shipowner** Sara Rezaee, Viswa Group	**116** **Accident-based FMECA study of Cruise ship Lubrication system using Type-2 Fuzzy expert System** SHOAIB AHMED, Shanghai Jiao tong University, China	**104** **Methanol port fuel injection for medium speed application: injector development and engine design** Arianna Sorrentino, Heinzmann GmbH & Co. KG
118 **Simulation-Driven Development of PEM Fuel Cell Systems for Maritime Applications** Victoria Damerow, Freudenberg Fuel Cell e-Power Systems GmbH	**669** **Presence of Organic Chlorides in Bunker Fuel** Sara Rezaee, Viswa Group	**627** **Condition Based Monitoring for Large Bore Medium Speed Engines using a Digital Twin, ML and Big Data** Rik De Graeve, ABC	**128** **Development & Simulation of "HP Gas-and/or hydrogen-DI-Injectors" for combustion engines** Erich Vogt, DUAP AG

12:40 - 13:40 Lunch

Thursday - June 15, 2023

13:40 – 15:20

Accelleron (R205)	INNIO (R104-110)	OMT (R101-103)	Robert Bosch (R201-202)
9 Lubricants	**14 Engine Component Developments - Fuel Injection & Gas Admission**	**15 Engine Component Developments - Components**	**20 Basic Research & Advanced Engineering - Mechanics, Materials Research**
9-1 Zero carbon fuel lubricants	14-1 "LIQUID" or conventional diesel	15-3 Advanced component integration	20-1 mechanics and materials
Chair: Christer Wik (Wärtsilä)	Chair: Rick Boom (Woodward)	Chair: Falk Nickel (Miba Gleitlager Austria GmbH)	Chair: Feng Wang (SMDERI)
066 **Lubricants enabling shipping's alternate fuels and journey to decarbonisation** Lawrie Peck, Lubrizol	**063** **Injection rate control strategy with Bosch Smart CR Injector for optimized injection performance** Thibault Henrion, Robert Bosch, Powertrain Solutions, Large Engines	**023** **Joint development of the bearing system for AVL's new high-speed engine platform** Gunther Hager, Miba Gleitlager Austria Gmbh	**352** **Study on The Wear Map of Cylinder Liner Based on Various Operating Parameters** Baofeng Zhang, Harbin Engineering University
467 **The Role of Marine Lubricants in Lowering the Carbon Intensity of Maritime Transport** Rik Cleophas, Chevron Oronite	**120** **PtX fuels for combustion engines: flexible injection concepts for all applications** Michael Willmann, Woodward L'Orange	**245** **Powertrain innovation – Development Speed vs. Reliability?** Andreas Thalhammer, Geislinger GmbH	**436** **Impact of hydrogen on iron- and nickel-based valve spindle materials** Oliver Lehmann, Märkisches Werk
126 **Ammonia as an alternative Marine fuel-Assessing the impact on lubricants and lubrication reliability** Nicolas Obrecht, TotalEnergies One Tech	**139** **Powering a greener future: the OMT injector enables high-pressure injection of ammonia and methanol** Marco Coppo, OMT SpA	**378** **Improvement technologies for efficiency and development for decarbonized society in Mitsubishi gas engines** KAZUHIRO KAWAI, MITSUBISHI HEAVY INDUSTRIES ENGINE & TURBOCHARGER	**311** **Numerical and Experimental Research on Thermal Insulation Performance of Marine Diesel Engine Piston** zihao shu, Wuhan University of Technology
386 **Development of lubricants for hydrogen-fueled large engine power plants** Dr. Winfried Koch, ESSO Deutschland GmbH	**439** **Steps towards online detection and optimization of e-fuel engine operation** Erwin Swiderski, University Rostock	**560** **Experimental Study on Multi-objective Optimization of a Marine Diesel Engine Cooling System** Bo Zhang, Naval University of Engineering	**414** **Predicting vibrations of the base engine using flexible Multi Body Dynamics simulation** Pranay Sharma, Cummins Inc.
423 **Marine engines lubrication within a broad fuel landscape & impact on exhaust aftertreatment systems** Luc Verbeeke, Chevron	**574** **Development of a retrofit fuel flexible platform for future fuels** Sangram Nanda, Wärtsilä	**616** **CIMAC WG4 - Crankshaft Rules - Multiaxial Fatigue Assessment of Crankshafts** John Dowell, Wabtec Corporation	

15:20 – 16:00 Coffee Break

Thursday - June 15, 2023

15:10 – 15:40

Poster exhibition

25 Poster presentation by the author

097 **Development of the 25AHX diesel engine**
Hiromitsu Fujita, IHI Power Systems

132 **Relationship between the chemical composition of the fuels and cold flow properties**
Sara Rezaee, Viswa Group

200 **Development and validation of a virtual NOx sensor for closed-loop control of marine diesel engines**
Sheng Lin Du, Wuhan University of Technology

224 **Wear mechanism of exhaust valve recession induced by running low sulfur diesel**
Feng Zhu, Shanghai Marine Diesel Engine Research Institute

297 **Pore-Scale Investigation of Solving Active Overpotential in the Catalyst Layer of PEM Fuel Cell**
Li Xing, Tianjin University

357 **The transient performance optimization of an emergency diesel engine**
Li Huang, Shanghai Jiao Tong University, Shanghai Marine Diesel Engine Research Institute

360 **Research on the performance of alcoholic diesel blended fuels on diesel engines with nano-TBCs**
Yuxvan Du, Wuhan University of Technology

399 **Influence of coupling characteristics of control parameters and operating frequency on stability**
Yunpeng Wei, Harbin engineering university

445 **Experimental study on efficiency improvement based on a high performance single cylinder engine**
liang zheng, Shanghai Jiao Tong University/ Shanghai Marine Diesel Engine Research Institute/ National Engineering Laboratory of Ship and marine engineering power system

544 **Ignition and combustion characteristics of fast pyrolysis bio-oil for engine application**
Yu Wang, Eindhoven University of Technology

398 **The Petrobras experience on formulating the “IMO 2020” bunker fuels**
Antonio Prada Jr, Petrobras

117 **Formulation of TPEO Lubricants For Low Sulphur Residual Fuels Post 2020**
Jonathan Hughes, Infineum

453 **Research on Unregulated Emissions of Commercial Pure Methanol Engines**
yajie zhang, Xi\'an Jiaotong Universitiy

433 **Filtration as lube oil maintenance strategy**
Jens Fich, C.C.Jensen A/S

Posters are on display all day, the author’s presentation time is shown in the program.

WEDNESDAY 14 JUNE 2023

GYEONGJU SHILLA DYNASTY (Full Day / Activity Level: Moderate)

Price: $ 130 per person

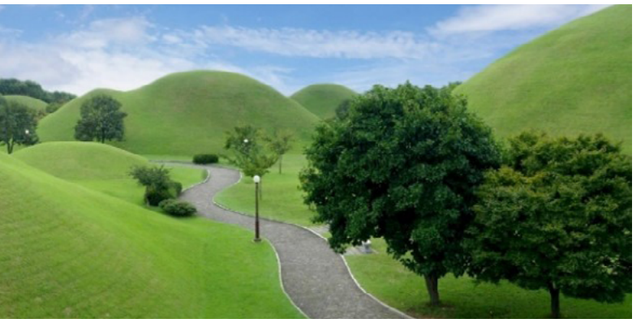
Description
Excursion out of Busan to visit Gyeongju, the ancient capital of Shilla now known as the “open-air museum” for being home of several Unesco Heritage sites of Korea.

The royal tombs at the Tumuli Park date back to the Shilla Dynasty (600-900 AD). Artifacts found in the graves show a remarkable technological and cultural achievements. The Cheomseongdae is the oldest existing astronomical observatory in Asia. The 362 stones used to build the Cheomseongdae represent the 362 days in the lunar calendar. The Anapji Pond is an artificial pond constructed for the royal family for leisure and study.

Inclusive: Private bus / English Guide / Admission fees / Lunch

Program

09:00 Departure BEXCO
10:30 Tumuli Park & Grave of General Kim Yusin
Walk to Cheomseongdae Astronomical Observatory & Anapji Royal Pond
12:00 Gyeongju National Museum
13:00 Lunch & Free time in Hwangnamdong District / Hwangnidan-Gil
Traditional village tour with rooftop cafés, restaurants, and tiny shops
15:00 Woljeong Bridge
17:00 Arrive at BEXCO, end of tour.



Pictures: ©Korea Tourism Organization

OPTIONAL TOURS JUNE 12 - 15, 2023

THURSDAY 15 JUNE 2023

Option 1: BUSAN ANCIENT WALL HIKING TRAIL (Full Day / Activity Level: Active)

Price: $ 80 per person

Description
The century old Geumjeongsan Defense Wall stretches over several mountain ridges along the city of Busan. From the natural spring of Heoshimjeong one can take a cable car to the Defense Wall and make a wonderful hike for several hours along this wall. On the way stops can be made at the South-, East- and North Gate. The city view is spectacular. The hike ends at the Beomeosa Temple.

Preparation: Good physical condition required, good quality hiking shoes (highest point approximately 800 meters), sporty clothing, sun cream, 3-4 bottles of water and energy snacks. Lunch boxes are prepared by the guide. In case of rain or other adverse weather conditions, the tour will be cancelled or postponed.

Inclusive: Private bus / English Guide / Admission fees / Lunch package

Program

09:00 Departure BEXCO
10:00 Cable Car at the Geumjeong Park
10:30 Hiking via East Gate to the North Gate (highest point 800 meter)
Descending to the Beomeosa Temple
14:30 Arrival at the Beomeosa Temple
Free time at Beomeosa Temple
16:00 Arrive at BEXCO, end of tour

Option 2 BUSAN SEASHORE TEMPLE TOUR (Half Day Morning Tour / Activity Level: Easy)

Price: $ 80 per person

Description
The Haedong Yonggungsa Temple dates back to 1376 during the Goryo Dynasty. While most temples are tucked away high in the mountains, this temple was built along the shoreline. An enormous Buddha Statue on top of the temple complex is overlooking the amazing coastline. A special site at the temple are the 108 stairs and stone lanterns lining the rocky landscape. After going down the 108 steps one can enjoy the calming sounds of waves, and view the majestic sunrise.

Inclusive: Private bus / English Guide / Admission fees

Program

09:00 Departure BEXCO
09:30 Dalmaji-gil Road
11:00 Haedong Yonggungsa Temple
14:00 Arrive at BEXCO, end of tour

FRIDAY JUNE 16, 2023

Technical Tour 1: Hyundai Heavy Industries, Ulsan

Price: $ 120 per person

Description
Since its foundation in 1972, Hyundai Heavy Industries turned a small fishing village into the busiest place in Korea. Hyundai Heavy Industries is leading the global shipbuilding industry with a wide range of product lineup that offers any type of ship desired by customers.

Program

07:30 Departure from Busan, start of tour
09:00 Course A - Culture Center: History & Introduction
09:45 Course B - Culture Center 1F: Visit Exhibition Hall
10:20 Course C - Yard Tour (move from Cultural center to Engine factory)
11:20 Course D - Engine Factory Tour + Yard Tour (move from Engine factory to Cultural Center)
11:30 Pickup Lunch & Gift
13:30 Busan arrival and end of tour

FRIDAY JUNE 16, 2023

Technical Tour 2: Korea Maritime and Ocean University

Price: $ 120 per person

Description
Based on the Jinhae Marine Officer School established in 1919, the Korea Maritime and Ocean University (KMOU) was opened in 1945 to pursue the goal of strengthening the country through the ocean. Since then, it has been producing experts in the maritime field, including the shipping industry, based on the noble educational philosophy of truth-finding, cultural creation, and character development, through which it has contributed to the development of the nation and society.

While its past history focused on the development of KMOU as Korea's only specialized maritime university, its future is to lead the worlds oceans with the vision of becoming the world's best global maritime university.

Program

08:30 Departure from Busan „BEXCO" Start of tour
09:20 Course A – Training Ship ("HANBADA" or "HANNARA)
11:00 Course B – Greenship Technology Research & Test Center, Marine Simulation Center
12:30 Pickup Lunch & Gift
13:30 BEXCO arrival End of tour

TECHNICAL TOURS JUNE 16, 2023

FRIDAY JUNE 16, 2023

Technical Tour 3: Korea Marine Equipment Research Institute

Price: $ 120 per person

Description
KOMERI is a specialised production technology research institute established in 2001 by the Industrial Technology Innovation Promotion Act under the Ministry of Trade, Industry and Energy with its aim to contribute to marine and offshore industries through comprehensive support including technical development and test certification of marine equipment.

KOMERI contributes to improving national competitiveness in shipbuilding and marine industry through preemptive technical development and constructing the foundation of test certification as well as international standardisation activities in new leading business such as environmental friendly ship, Maritime Autonomous Surface Ship(MASS), hydrogen fueled ship and new renewable energy. Also, in response to diversification of foreign markets, KOMERI is also making efforts in technical cooperation projects with global regions.

Program

09:00 Departure from Busan „BEXCO" Start of tour
10:00 Course A – Advanced-Green Technology Center
11:00 Course B – Fuel Gas Technology Center
12:00 Pickup Lunch & Gift
13:20 Busan arrival End of tour

None of the tours are adventurous or dangerous, and should be fully covered by your travel insurance. No special preparations needed for Easy and Moderate tours. For Active tours adequate preparation necessary.

Easy: These tours are at a leisurely pace which involves minimal physical activity. Standing and walking for short periods of time, mainly when visiting a Buddhist temple, museum or market.

Moderate: Long touring day with moderate physical activity. Standing and walking for extended periods of time, mainly at Buddhist temple and natural sightseeing spots.

Active: Tour with main active element, such as hiking or biking. Walking over uneven and mountainous terrain, biking with moderate elevations. The participant should be physically fit and comfortable to walk 5-10 km. Adequate preparation according to specified instruction per tour required: suitable shoes, clothing, sunscreen, snacks and drinks.

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Platinum Sponsor

We thank our Platinum Sponsor of the 30th CIMAC World Congress for the extraordinary support!

Accelleron

Turbo Systems Switzerland Ltd
5401 Baden, Switzerland

Accelleron is a global leader in turbocharging technologies and optimization solutions for 0.5 to 80+ MW engines, helping to provide sustainable, efficient and reliable power to the marine, energy, rail, and off-highway sectors. Through its innovative product offerings and research leadership, the company accelerates the decarbonization of the industries it operates in. Accelleron has an installed base of approximately 180,000 turbochargers and a network of more than 100 service stations across 50 countries worldwide.

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WEICHAI

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We thank all the Bronze Sponsors of the 30th CIMAC World Congress for their support!

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Engine & Machinery Division
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Shiga Pref., Japan

Geislinger
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Austria

IHI Power Systems
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Japan

Infineum
OX14 3BD Abingdon,
Great Britain

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8010 Graz, Austria

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Japan

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MAN Energy Solutions SE
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Finland

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8401 Winterthur,
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Germany

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660-8585 Amagasaki,
Japan

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We thank all Media Partners for helping us making CIMAC 2023 once more a successful event.

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MTZ

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EXIBITORS

Exibitors	Booth Number
Accelleron	70
AVAT Automation GmbH	6
AVL List GmbH	58
BOLL & KIRCH Filterbau GmbH	47
C.C.JENSEN A/S	39
Chevron Oronite Company LLC	30
Cummins Engine Components - Valvetrain Technologies	11
Dr. E. Horn GmbH & Co. KG	5
DUAP AG	6
Federal-Mogul Burscheid GmbH	25
FEV Europe GmbH	2
Ganser CRS AG	16
Geislinger GmbH	75
Heinzmann GmbH & Co. KG	17
Hug Engineering AG	55
HYDAC International GmbH	51
IB MATERIALS	63
IMES GmbH	14
Infineum UK Ltd.	12
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KS Large Bore Pistons Germany GmbH	60
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Märkisches Werk GmbH	10
Miba Bearing Group - Miba Gleitlager Austria GmbH	34
Mitsubishi Heavy Industries Marine Machinery & Equipment Co. Ltd.	44
Nova Werke AG	1
OMT Officine Meccaniche Torino Spa	40
PETER FUCHS TECHNOLOGY GROUP AG	35
Purso-Tools Oy	42
Robert Bosch GmbH	56
Sauer Compressors c/o J.P. Sauer & Sohn Maschinenbau GmbH	54
Schaller Automation GmbH & Co. KG	32
Trafag AG	22
TT Gaskets Tampereen Tiivisteteollisuus Oy	50
UT99 AG	74
Viswa Group	4
Woodward L'Orange GmbH	52

Exhibitor Badges
The exhibitor badges are for use of the stand staff only and do not entitle to take part in the conference

HALL LAYOUT

Convention Hall 3F - Grand Ballroom - General Hall Layout

More information on: https://www.bexco.co.kr/eng/Main.do

You can find the latest floor plan at: https:www.hamburg-messe.de/aussteller

CONGRESS VENUE

bexco

Busan the city of international conventions - the perfect place for any event!

Korea is one of the most advanced nations in the world, yet it is also country steeped in historically rich tradition. In Busan, this combination of the old and the new abounds at every turn. Firstclass convention facilities sit minutes from sandy beaches and historic mountain trails. Serene, thousand-year old temple sites are nestled among some of the tallest residential skyscrapers in Asia.

BEXCO - Busan Exhibition Convention Centre
Convention Hall
55 APEC-ro
U-dong
Haeundae-gu
Busan
South Korea

www.bexco.co.kr

Busan

Busan is Korea's representative tourist city with over 3 million foreign visitors a year. From the Haeundae Beach to the beautiful natural environment, visitors can enjoy all four seasons. It provides a variety of marine tour programs, shopping experiences and other cultural activities. These have all combined to make Busan a world class tourist city for lodging and relaxation.

Population: 3.429 million

Languages Spoken: Korean is the national and official language in Busan. The language is drastically different from western languages. In addition to the native language, most people below 40 years of age speak English frequently. One of the most prominent minority languages in South Korea is Chinese, which is spoken by over 1.2 million residents.

Climate: Busan is characterized by the oceanic climate with warm summers and mild winters. In winter temperatures can drop below the freezing point at night. Rainy season is from April until September. Busan has a cooler version of a humid subtropical climate. Extremely high or low temperatures are rare. Busan and the nearby area have the least amount of snow compared to other regions of Korea due to its location.

Time Zone: Busan is in the Korean Standard Time Zone.

Money: The Korean currency is Korean Won (KRW). $ 1 = KRW 1350. Upon your arrival at the airport in Korea you can exchange cash money to Korean won at any bank at Incheon Airport – or debit card out of the ATM. You can use your debit card if it shows the Cirrus- or Maestro-logo. Credit cards (VISA or MasterCard) are widely used.

Electricity: Korea has an electric voltage capacity of 220 volts. Adapters are necessary in case of variation to the European standard 2-pin plugs.

Phone & Internet: Wifi is widely available. If you want to have continuous access without using roaming, you can either rent a phone, sim card of Pocket Wifi. These items are for rental and can be picked up upon arrival at the Incheon Airport & Gimpo Airport.

For more information about Busan please visit:
Busan Tourism

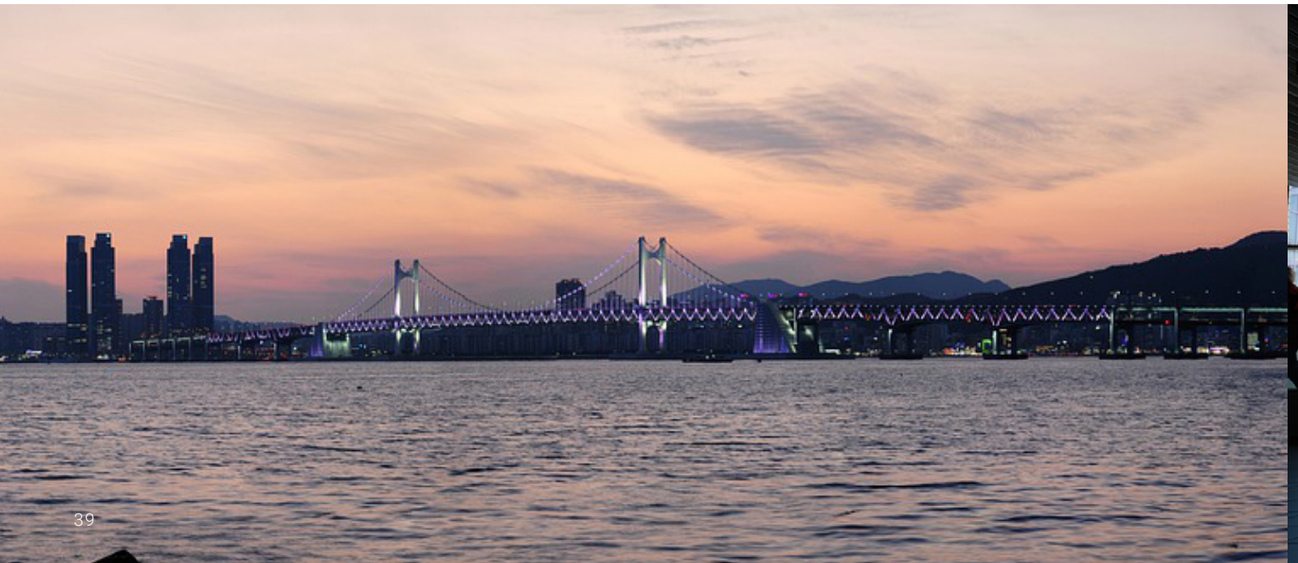
Traveling to Busan

Travel preparation
Please be aware that you have to register online for K-ETA (Korea Travel Authorzation) https://www.k-eta.go.kr/portal/apply/index.do before travelling to Korea! You must complete your K-ETA application at least 24 hours prior to boarding your flight.

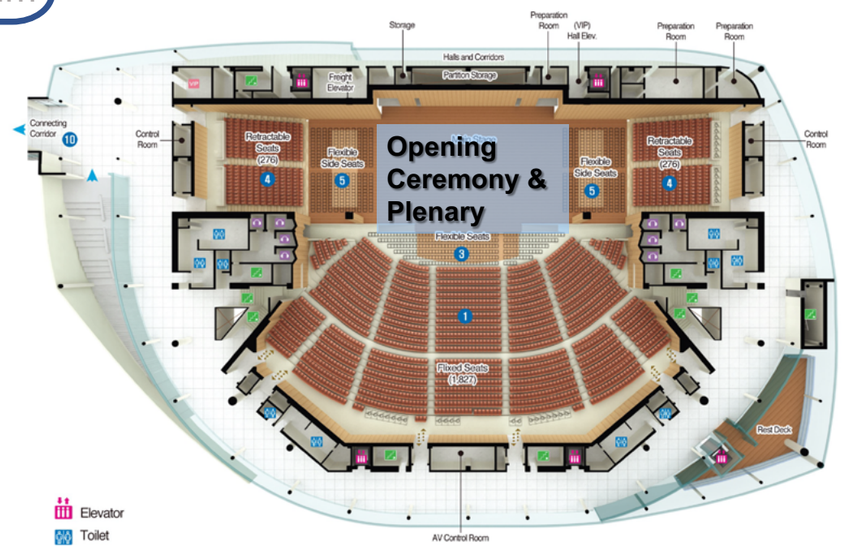
Accessibility
South Korea is extremely well-connected by land, air and sea, with a high density of airports, train/subway stations and bus terminals all over the country. Almost all stations are meticulously clean and safe, the schedules frequent and punctual, and rates reasonable. For subway, bus and taxi, the most convenient is to purchase a T-Money Card at one of the numerous convenient stores.

Domestic transportation

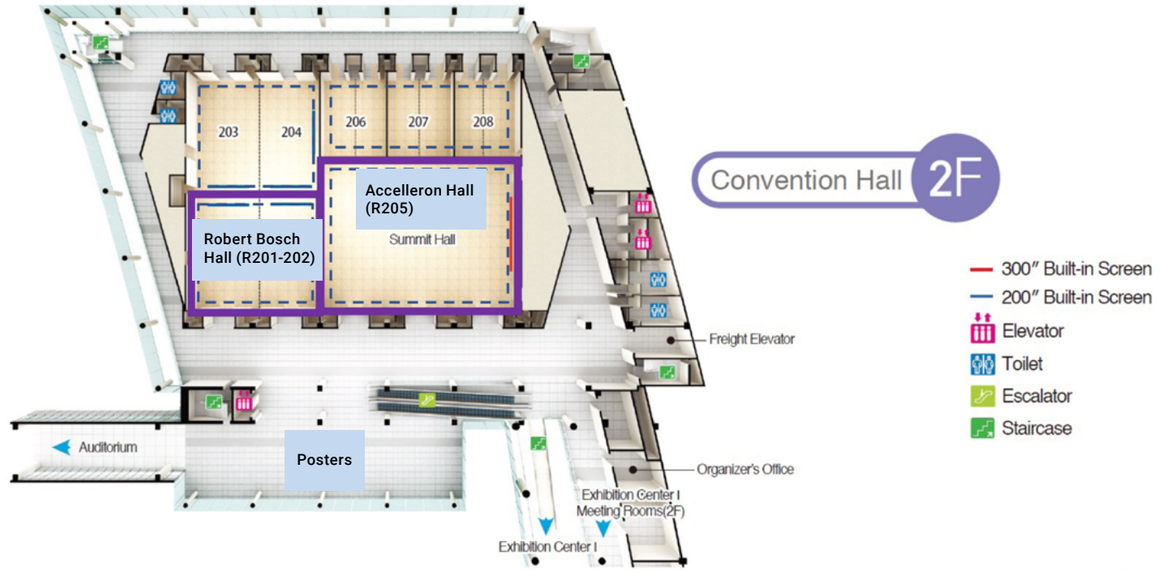
- **Domestic flights:** South-Korea has a convenient network of domestic airport that cover the entire country. The main domestic destinations are Seoul, Busan, Daegu, Gwangju and Jeju Island.
- **Train:** South Korea is conveniently connected by high speed train between all major cities on the mainland: Seoul, Daejeon, Daegu, Gwangju, Yeosu, Busan. Commuter trains ('Mugunghwa) still run and stop at smaller towns and villages. Payment by purchase of separate tickets
- **Subway:** One of the best in the world and by far the most convenient way to transfer within the city. Seoul, Busan, Daegu and Gwangju offers state-of-the-art modern subway, with clear signage in Chinese, English and Japanese. The subway lines cross city borders and connect suburbs and nearby towns. Payment by T-Money card or purchase of separate tickets.
- **Taxi:** Uber is not the common taxi service, instead the Koreans use Kakao Taxi. The app is easy to download and convenient to use. Alternatively, the hotel staff can help you reserve a taxi, or you can stop a taxi on the road. Payment by T-Money card, credit card or cash.
- **Car rental:** Koreans drive on the right side. Driving in the big cities of Seoul and Busan is comparable with driving in Rome or Paris, so caution is advised. Car-rentals can be arranged in South Korea.



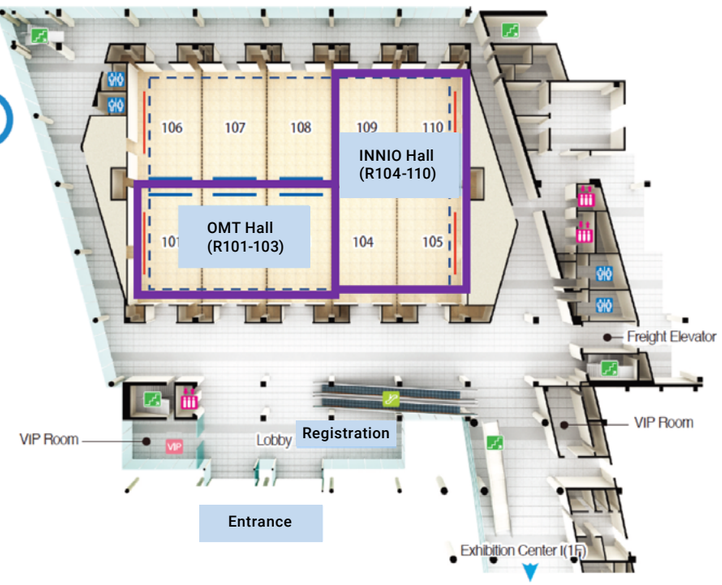
Auditorium



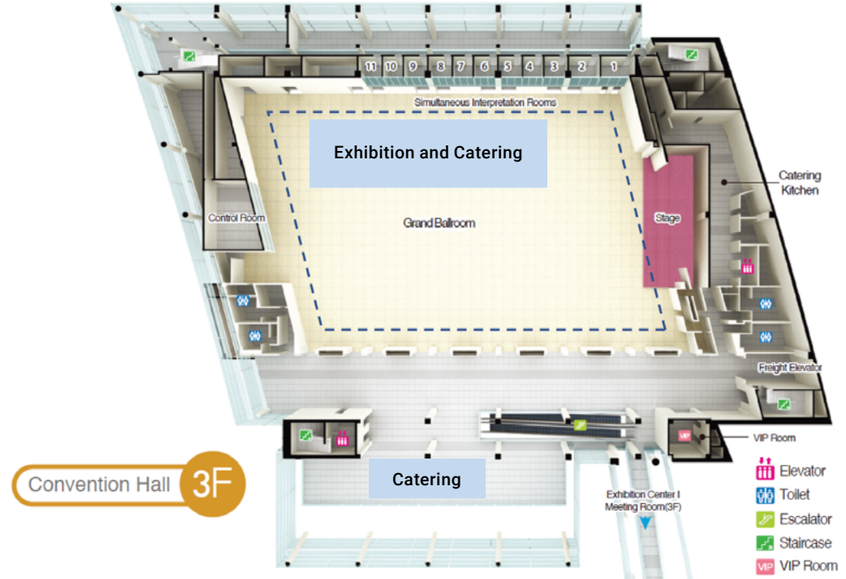
Convention Hall 2F



1F Convention Hall



Convention Hall 3F



ACCOMMODATION

Selected hotels for CIMAC participants

Hotel offers:

- **Special rates** for CIMAC participants on the following website: hotel bookings
- **Close vicinity to BEXCO**, 1 to 10 min away by car.
- **Special Cancellation Policy:** in case the CIMAC Congress is cancelled your room reservation is 100% refundable.
- All rates inclusive of all taxes & breakfast
- Additional week-end charges may apply
- Rates in USD are subject to currency fluctuations and may be adjusted over time.
- Payment via international bank transfer.
- Cancellation policy according to General Terms & Conditions KR H&E for CIMAC Congress 2022.

Contact

KR Hospitality & Events (KR H&E) is the official travel agent for CIMAC Congress 2023 in Busan

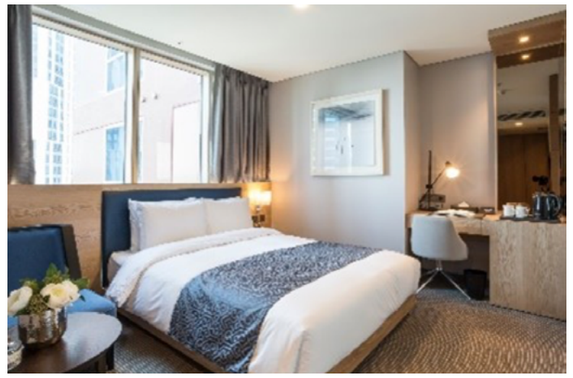
Mr. Don Roelofs

Info & Bookings via don@krhospitality.co

ACCOMMODATION

1

CENTUM PREMIER HOTEL 4 *

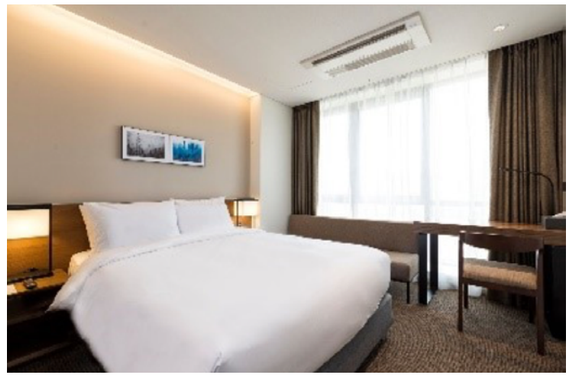


The finest business hotel within walking distance from BEXCO, and only 10 minutes drive to the famous Haeundae Beach. Located in a quiet area in the evening, and with an excellent restaurant inside the hotel. The hotel provides clean and cozy guest rooms and various facilities to ensure the best service and satisfaction for all guests.

This hotel is fully booked

2

RAMADA ENCORE BY WYNDHAM Busan Haeundae 4 *



RAMADA ENCORE BY WYNDHAM Haeundae has been opened in 2017 and is 500 meters away from the famous Haeundae Beach. In the direct vicinity of the hotel, you will find a large variety of restaurants, bars and shops, while still enjoying the tranquility inside the hotel. It only takes 10 minutes by subway to reach BEXCO.

Info & bookings: https://zurl.co/sr6Y

3

THE WESTIN JOSUN Busan 5 *

The Westin Josun Busan offers luxury along the famous Haeundae Beach with true 5-star service. It definitely has one of the best city- and sea views of Busan. It is 15 minutes drive to BEXO Convention Center.

Info & booking: https://zurl.co/9wJJ

4

SHILLA STAY HOTEL Haeundae 4 *

Shilla Stay Hotel Haeundae is a modern and stylish hotel located in the bustling Haeundae district of Busan, South Korea. With its prime location just a few steps away from the Haeundae Beach and other popular attractions, the hotel offers guests comfortable accommodation, excellent dining options, and convenient access to the city's highlights. *The Standard room types are City View only.

Info & booking: https://zurl.co/BLxo

REGISTRATION

Opening Hours Information Desk

Sunday June 11	14:00 – 18:00
Monday June 12	08:00 – 18:00
Tuesday June 13	08:00 – 18:00
Wednesday June 14	08:00 – 18:00
Thursday June 15	08:00 – 18:00

Ticket shop

You can register for the 30th CIMAC World Congress online by using the ticket shop.
Please follow the link: Ticket shop

Registration Fees*

	Euro / €	USD / $	Korean WON / ₩
CIMAC Members	1,950	2,010	2,788,.500
Non-Members	2,300	2,370	3,289,000
Speakers	1,750	1,805	2,502,500
Students	On invitation only		
Accompanying Persons	350	365	500,500
One-Day Ticket	950	980	1,358,500
Exhibition Ticket per Day	50	55	72,000
Gala Dinner only	250	260	357,500

*Not subject to Korean VAT.

The prices in Euro are binding. Dollar and Korean won prices may vary and are for orientation only.

The Congress fee for **CIMAC members, non-members** and **speakers** includes participation in the technical program, admission to the exhibition, the Opening Ceremony, the Welcome Reception, the Accelleron Evening, and the Gala Dinner. Additional Congress components, such as the accompanying program (optional tours, technical tours) must be booked and paid separately. The Congress documents (program, Congress bag, participant badge) as well as catering during breaks are included in the Congress fees.

Invited Students (free of charge) have the above-mentioned services also included - except the participation in the Gala Dinner.

The participation fee for **accompanying persons** includes admission to the exhibition, coffee breaks and lunch, Opening Ceremony, Welcome Reception, the Accelleron Evening and Gala Dinner, but this ticket does NOT include the technical program.

The participant fee for **One Day tickets** includes: participation in the scientific program, admission to the exhibition. The Congress documents (program, Congress bag, participant badge) as well as catering during breaks are included in the Congress fee, this ticket does NOT include any social program.

The participation fee for **exhibitiors** and **exhibition day-tickets only** include only the admission to the exhibition and does NOT include the scientific program and does NOT include any social program.

QUICK FACTS

Accommodation

Informations about selected Hotels in Busan please see page 37.

CIMAC

CIMAC is the non-commercial sponsor of the 30th CIMAC World Congress in Busan. For further informations on CIMAC please visit the website at http://www.cimac.com/

Cancellation of Congress Participation

In case of cancellation, provided that VDMA Services has received written notice about it 40 days before the congress, the participation fee will be refunded less a handling fee of € 180. In case of cancellation after this date, no refund will be made.

CIMAC Membership

If you are uncertain about your membership status or want to apply for a membership, please contact the CIMAC Central Secretariat – info@cimac.com

Congress Catering

Catering stations will be integrated in the exhibition area. During the coffee breaks and lunch break participants will be provided with food and drinks. Enjoy regional and international cuisine!

Congress Documents

Please bring your mobile ticket ready on your mobile phone or tablet with you or print out your e-ticket legibly on a sheet of paper. Your personal badge is your entrance ticket to all sessions, the exhibition and the social events. Please, remember to wear your badge at the congress and the social events at every time. Congress bags will be provided in the registration area in the Convention Centre.

Contact for Questions

For questions regarding the technical Program, please contact CIMAC Central Secretariat. For questions regarding the congress, sponsoring and exhibition, please contact the Main and the Co-Organizer of the congress. Contact details see page 43.

COVID-19

Current COVID-19 regulations will be anounced on our website https://www.cimaccongress.com/ in time before the Congress.

Cloakroom

Participants may leave their belongings in the designated area.

Language

The official language of the Congress is English. No translation will be provided.

Newsletter

For the subscription of the CIMAC Newsletter please fill out the form on CIMAC website: http://www.cimac.com/publication-press/newsletter-subscription/index.html

QUICK FACTS

Mobile App

A mobile app will be available for downloading in Goolge Play and Apple App Store for all congress participants in early spring time. The app contains the actual technical Program, general informations, floor plans and furthermore.

Optional Tours

For participating in the optional tours, please visit our hospitality room at the congress. Please see pages 19.

Social Media

Fans and followers will find the CIMAC Congress on LinkedIn and Twitter.

Speakers' Preparation Room

All presentations can be checked and delivered to the speaker's preparation room 206 at least 2 hours prior to speaker's session. Presentations being held during a morning session should be checked at the end of the day before. Speakers are kindly requested to follow the instructions of the chairperson and strictly keep to the time of their presentation.

Technical Program

Admission to all sessions of the technical Program is only possible with a valid congress ticket. The congress ticket for **CIMAC members, non members, speakers and students** includes: congress badge, congress bag, admission to all sessions and the exhibition, coffee breaks and lunches, Opening Ceremony, Welcome Reception, Accelleron Evening, Gala Dinner (except students).

The registration for **accompanying persons** includes: admission to the exhibition, coffee breaks and lunch, Opening Ceremony, Welcome Reception, Accelleron Evening, Gala Dinner.

Technical Tours

Separate registration is required for participation in the technical tours. Registration is available via the congress website.

Ticketshop

Tickets are only sold online via our Ticketshop and only payable via credit card. Print your ticket or bring it along on your mobile device.

WIFI

Free WIFI is available at Busan Convention Center BEXCO. Login and password will be announced on-site.

CONGRESS ORGANIZER

Main Organizer Congress:

VDMA Services GmbH

a VDMA group company

Lyoner Straße 18
60528 Frankfurt am Main
Germany

Contact: Hatice Altintas
Email: Hatice.Altintas@vdma.org

Phone: +49 69 6603-1143
Fax: +49 69 6603-2843
Email: Hatice.Altintas@vdma.org
Web: www.cimaccongress.com
www.vdmaservices.de

Non-Commercial Sponsor:

CIMAC e.V.

Lyoner Strasse 18
60528 Frankfurt am Main
Germany

Contact: Marc Schinke

Phone: +49 69 6603 1149
Fax: +49 69 6603-2149
Email: info@cimac.com
Web: www.cimac.com

Co-Organizer Congress:

CIMAC National Member Association

Korea Federation of Combustion Engines (KOFCE)
C1-463, Marine Department,
Korea Maritime and Ocean Univ. 727,
Taejong-ro, Yeongdo-gu, Busan, Republic of Korea.

Contact: Ph.D. Ji Hyoub, Cha, Secretary General

Phone: +82-51-917-1767
Fax: +82-51-917-1766
Web: www.kofce.or.kr

Co-Organizer Exhibition:

Hamburg Messe und Congress GmbH

Messeplatz 1
20357 Hamburg
Germany

Contact: Sybille Lang

Phone: +49 40 3569-2293
Fax: +49 40 3569-692293
Email: cimac@hamburg-messe.de
Web: www.hamburg-messe.de/aussteller/auslandsveranstaltungen/auslandstermine-details/veranstaltung/cimac-congress-2022-0013

Originally founded in Paris in 1951, CIMAC has become the **leading global association of the large internal combustion machinery industry**. It is a non-profit association bringing together and representing the large engine industry to regulators and standardizing bodies. In addition to promoting the work of National Member Associations, CIMAC supports information exchange and understanding across the large engine industry including:

- Builders of large diesel, gas and dual-fuel engines
- Users of large engines such as owners and operators of ships, power plants, locomotives etc.
- Systems and component suppliers
- Fuel and lubricant suppliers, including oil companies
- Classification societies and other regulatory bodies
- Academic institutions, consultant engineers, scientists
- System Integrators, shipyards and other service providers

CIMAC's Vision:

To promote large engine technology power solutions that are efficient, reliable, safe and sustainable and of benefit to society, in pursuit of the transition to a low-carbon future.

CIMAC's Mission:

To add value to our members' businesses and to society by:

› Enabling exchange on technological trends and developments among our members, with their users, associated industries along the value chain.

› Developing and promoting globally harmonized standards and regulations that foster a competitive, safe and sustainable industry.

› Striving for zero environmental impact of power solutions utilizing large engine technology.

› Facilitating safe and efficient operation, leveraging digitalization, automation and system integration.

› Promoting open markets to foster the spread and scalability of innovative large engine technology solutions.

CIMAC Membership

CIMAC members currently come from **24 countries** across America, Asia and Europe. Membership can take three forms:

- Membership of the official CIMAC National Member Association (NMA) in your country
- Membership in the respective National Member Associations (NMA)
- Corporate Membership for individual companies (in countries where there is no NMA)

Please see page 43 for CIMAC contact details.

ABOUT CIMAC

CIMAC Strategy Groups & Working Groups: The Consensus Seekers

CIMAC Strategy & Working Groups are the heart of CIMAC. Led by **international specialists** from CIMAC member organisations, they seek solutions to industry-wide technical issues and develop strategies to deal with pressing topics of the industry.

They interface with legislators, standards organisations, and regulators such as the classification societies to develop united CIMAC guidelines, recommendations, or positions, representing the industry on a pre-competitive, pre-legislative basis. They have a distinguished record of issuing guidance and publications on a wide range of crucial subjects relating to the operation of large engines in the maritime industry. Consequently, CIMAC Strategy & Working Group activities encompass the environmental compatibility, efficiency and safety of large engines and their applications.

The two recently established CIMAC Strategy Groups are:

- Greenhouse Gas Strategy Group
- Digitalization Strategy Group

CIMAC Working Groups currently cover these vital areas of engine technology and operation:

- Classification
- Crankshaft Rules
- Exhaust Emissions Control
- Fuels
- Marine Lubricants
- Users
- Electronics & Software Systems
- Gas Engines
- Inland Waterway Vessels
- System Integration
- Propulsion

CIMAC Events

The CIMAC Congress represents the culmination of all CIMAC activities, being held every three years, each time in a different member country. The Congress is **a unique gathering of key industry decision makers**, including manufacturers of engines, components and sub-systems, engine owners and operators, classification societies, researchers and developers, and representatives from regulatory bodies.

The Congress program centres on the **presentation of technical papers** on engine research & development, application engineering on the original equipment side, and engine operation and maintenance on the end-user side. This is complemented by social programs which promotes friendship and networking within the community.

CIMAC Circles are panel discussions involving CIMAC members debating topical issues. They are hosted at key industry events around the world at least once a year. CIMAC CASCADES promote the advancement of young engineers and their careers. The events enable them to meet with leading industry experts to exchange information, network and present their projects.

CIMAC Tech-Talks and Webinars are new online events with technical presentations & live discussion sessions, chaired by distinguished experts from the industry, offering fresh insights into new and important topics pertaining to the industry today.

CONGRESS TECHNICAL PROGRAM COMMITTEE

Person	Company	Place
Aabo, Kjeld	MAN Energy Solutions	Copenhagen, Denmark
Aufischer, Rainer	MIBA Gleitlager GmbH	Laakirchen, Austria
Banck, Andreas	Caterpillar Motoren GmbH & Co. KG	Kiel, Germany
Bergmann, Dirk	Accelleron, Turbo Systems Switzerland Ltd.	Baden, Switzerland
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