Conference Programme

FPC2020

Future Powertrain Conference

DRIVING THE FUTURE

Weds 4th - Thurs 5th March 2020

National Motorcycle Museum, Solihull

AVL

Imperial College London

Contents

2	Contents & WiFi Access
4-5	Welcome
6	Minibus Service/Motorcycle Museum
8	Polite Notice
9	Event Floorplan Overview
10-12	Exhibition Layouts
14-19	Keynote Speakers
20	Evening Event Itinerary
22	Poster Competition
24-25	Seminar Overview (Day 1 & Day 2)
26-29	Day 1
30-32	Day 2
34-53	Exhibitors
54	Closing Comments
56-58	Notes
59	Save the Date 2021
Back Cover	Exhibitors & Supporters

WiFi Access
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AVL EMISSION

The Road to Zero Impact Emission

At AVL we are committed to helping OEMs develop zero impact emission-mobility solutions. With technological know-how developed over seven decades and the experience of our global network of experts, we are creating a cleaner, greener automotive landscape. The work we do with our industry partners today is building a brighter future for everyone.

Discover AVL Emission
www.avl.com/emission

Welcome to FPC2020

Prof Matthias Wellers

MANAGING DIRECTOR - AVL POWERTRAIN UK

"We are facing the biggest change of our generation. This change is important, necessary and highly challenging, but it allows us like never before to directly influence how the change happens, and which technologies can be utilised. We are all taking part in this change, and we have a responsibility to exchange ideas in order to achieve the best outcome. Our Future Powertrain Conference is one meeting where we all can talk freely and explore the way forward.

On the Road to Zero, we will have to take many paths and decide which way is the correct one at the many junctions we come to. We need to avoid obstacles which we may not even know exist at the start of the journey and to choose the optimum direction to take. We have to look at every input, from energy production, material costs, manufacture, technology and customer desires and we have to do this quickly.
We have been predicting dramatic changes in our industry for some time, but the time for action has come, we are all involved, here, today, right now!

So, what does this mean for our industry?

We must reduce carbon emissions to zero for all vehicles, and in order to accelerate the Road to Zero and the dramatic impact on emissions that this will have, the demand for collaboration between industry and academia has never been greater.

As an industry, we must combine the wealth of knowledge we have on traditional propulsion technologies with the research being developed in new technology, such as hydrogen combustion, batteries, fuel cells, and automation.

It is unlikely that one answer will fit all challenges universally. In the cities, there is a need to tackle local emissions, while outside of urban areas there will be a need to offer alternative fuel sources and a range of powertrain applications to suit this environment.

In parallel to tackling these challenges, the industry must always consider sustainability and the impact any technological advancements we have on our planet.

As human beings, and as an industry, we've traditionally been weak at connecting the dots. The forum we have created at FPC enables us to do this and see the bigger picture. The event allows the engineering community as a whole to come together and share innovations and ideas from a diverse range of industries and disciplines, sparking debate and collaboration.
I urge you to share your ideas over the next two days and open your mind to new perspectives that will drive the future of propulsion forward.

Welcome to FPC2020!"

Welcome to the seventh Future Powertrain Conference organised by AVL Powertrain UK, managed by Imperial College London.

Dr Greg Offer

READER IN MECHANICAL ENGINEERING - IMPERIAL COLLEGE

"After 3 years of uncertainty caused by Brexit the automotive industry in the UK is still facing an existential crisis. Which way will we go? Will Government support for batteries and electric vehicles pay off, and will a new industry rise like a phoenix from the ashes of the old. Or will our efforts be in vain, is it too little too late, has the boat already sailed. Thousands of GWh of new battery production capacity is planned for the end of the decade globally, but none of that is currently in the UK. The next few years are going to be critical. On the other side of the coin, what about the combustion engine. A recent IMechE report highlights that there are still going to be millions of combustion engine vehicles on the road well into the 2030s and 40s, and calls for substantial investment in renewable and low-carbon fuel development and associated combustion engine technology. Is there a genuine opportunity to exploit existing knowledge or skills whilst others are writing them off. Or is this a desperate rear-guard action by those on the wrong side of history.

Many of you know me and what I do, so you can probably guess what I believe and also what I hope. However, that doesn't make my opinion right or anyone else's wrong. I'm also prepared to change my mind in the face of new evidence, but I will only be exposed to new evidence if I talk to and listen to those with opposite viewpoints. This is one of the strengths of the Future Powertrain Conference, it is not a battery conference, or fuel cell, or internal combustion engine. We are not an echo chamber where like-minded people pat each other on the back and tell each other how right we are. This is why we have some speakers this year with very contrarian and challenging viewpoints. When Matthias and I founded the conference in 2014, our primary goal was to bring academia and industry together to talk to each other. However, we also wanted to bring together the different technology communities. This second goal is probably even more important now. The UK powertrain and automotive industry has to decide which way to go, and then go hard and fast in order to catch up after 3 years of falling behind. We won't be able to afford to do everything, we just don't have the scale, therefore we are going to have to pick winners, and hope that by picking them we make them winners."

Imperial College London

Minibus Service

We are offering a free minibus service from the National Motorcycle Museum to the following:-

- Birmingham Airport
- Birmingham Railway Station
- Conference Hotels

For more information on how to book please ask at FPC Reception.

National Motorcycle Museum

Whilst you are at the Future Powertrain Conference, why not take time to visit the National Motorcycle Museum? This opportunity is free to all Delegates. Just show your Delegate badge at the entrance.

BIOMETHANE TRACTOR FROM CNH

WE HELP
LOW CARBON
TECHNOLOGIES
BECOME REAL
WORLD PRODUCTS

ADVANCED
PROPULSION
CENTRE UK

Our job is to ensure the UK remains competitive in the research, development and production of low emission technologies.

Through a team of handpicked specialists, we introduce those with good ideas to those who can take them to market, while supporting projects and providing access to funding.

We are delivering a ten-year programme launched in 2013. Born out of the collaboration between UK Government and industry, our organisation aims to save 50 million tonnes of CO_2 by 2023, safeguard or create 30,000 jobs and make £1 billion of match funding available to research and develop low emission propulsion technologies in the UK.

VISIT US ON STAND 19

www.apcuk.co.uk

Polite Notice

The organisers are committed to making this conference productive and enjoyable for everyone, regardless of sex, sexual orientation, disability, age, physical appearance, body size, ethnicity, nationality or religion.

We will not tolerate harassment of participants in any form. As part of the registration process, attendees are required to agree to adhere to this code of conduct.

Code of Conduct:

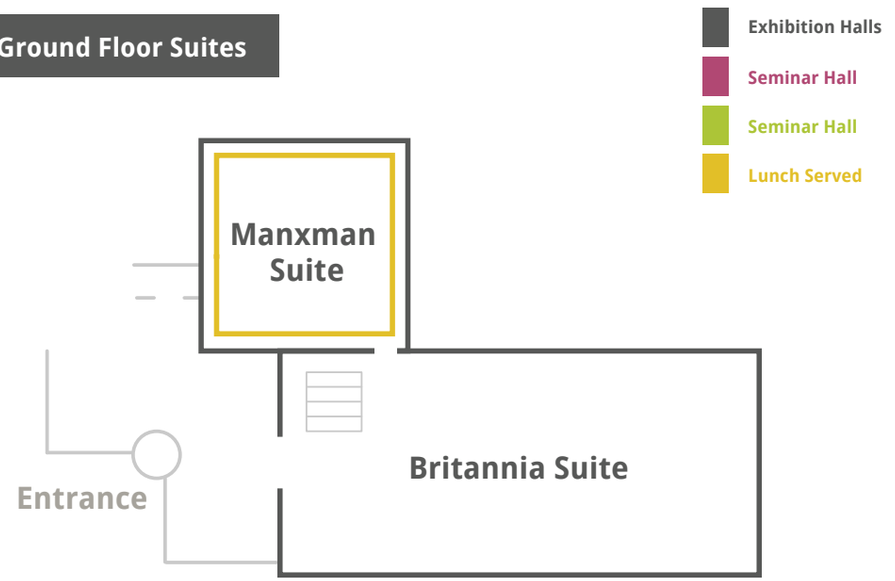
Behave professionally. Harassment and sexist, racist, or exclusionary comments or jokes are not appropriate. Harassment includes sustained disruption of talks or other events, inappropriate physical contact, sexual attention or innuendo, deliberate intimidation, stalking, and photography or recording of an individual without consent. It also includes offensive or belittling comments related to gender, sexual orientation, disability, age, physical appearance, body size, ethnicity or religion. All communication should be appropriate for a professional audience including people of many different backgrounds. Sexual language and imagery is not appropriate. Be kind to others. Do not insult or put down other attendees.

Incident Reporting and Resolution:

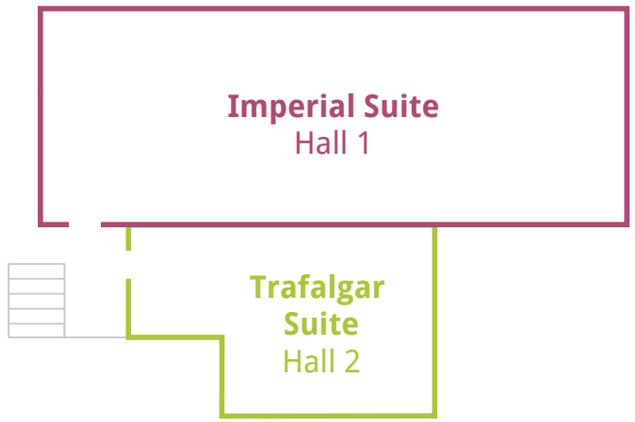
If you observe someone making you or anyone else feel unsafe or unwelcome, please tell them so, and remind them of the Code of Conduct. If you are hesitant about addressing the person yourself, please report it as soon as possible to the Event Co-ordinator, Partner or a member of the Steering Group.

Event Floorplan Overview

Ground Floor Suites

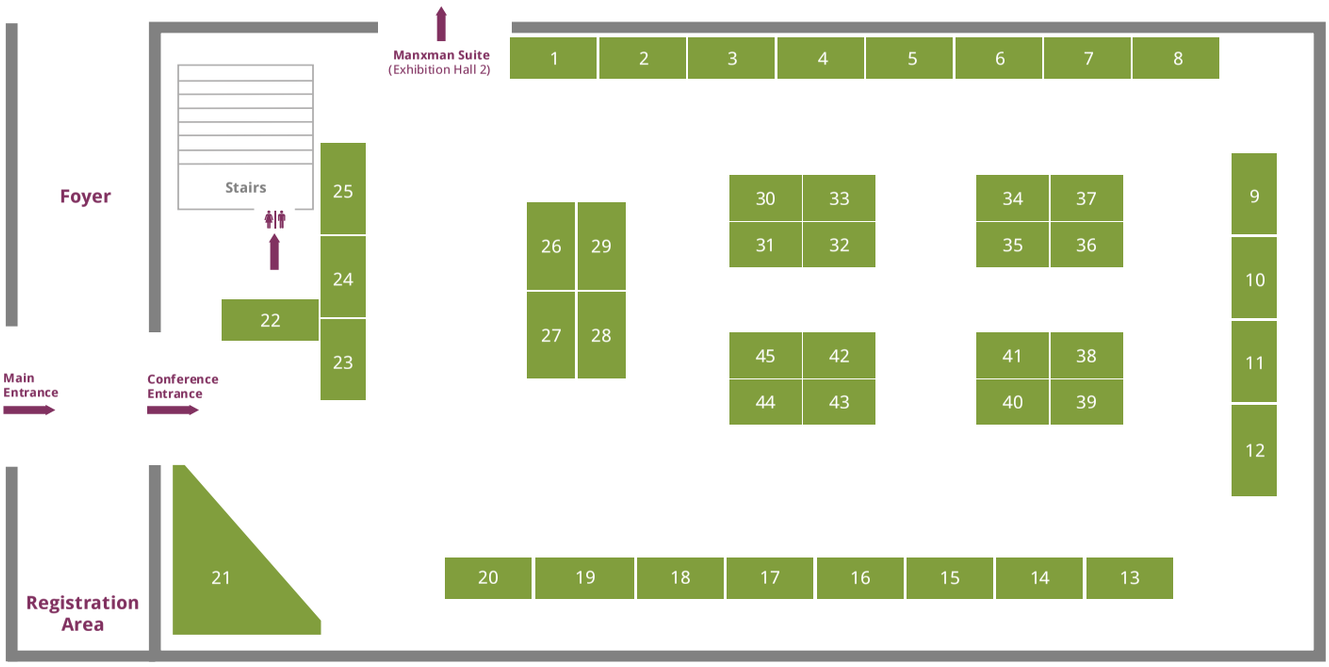


Lower Ground Floor Suites



FPC2020 - Britannia Suite - Exhibition and Conference Layout

NOTE: This plan is not to scale and may change at any time.



1 Millbrook Proving Ground Ltd	2 IAAPS	3 ROLLAX GmbH & Co. KG	4 eDrive Engineering Services	5 Unico (UK) Ltd	6 SPAL Automotive (UK) Ltd	7 Altair	8 ZF Race Engineering
9 ETPS Limited	10 Sunamp Ltd	11 Vector GB Ltd	12 AVL Powertrain UK	13 Advanced Electric Machines Group Ltd	14 ETAS	15 Eatron Technologies	16 Roto Test Europe AB
17 Consilium Group Limited	18 Claytex	19 Advanced Propulsion Centre UK	20 Vocis Ltd	21 MAHLE Powertrain Ltd	22 Continental Engineering Services	23 Sprint Power	24 Saint Gobain Performance Plastics Rencol Ltd
25 Hexagon Manufacturing Intelligence	26 Cambustion	27 Apicom DSG	28 Innovate UK	29 Intertek Transportation Technologies	30 FEV Group	31 Thermal Hazard Technology	32 Venner Shipley
33 Equipmake	34 LAUDA Technology Ltd	35 Austin Consultants	36 IDTechEx	37 Yokogawa UK Ltd	38 Manufacturing Assembly Network	39 Caltest	40 HSSMI
41 Maccor	42 Bitrode	43 MDL Technologies	44 TBAT	45 Nye Lubricants			

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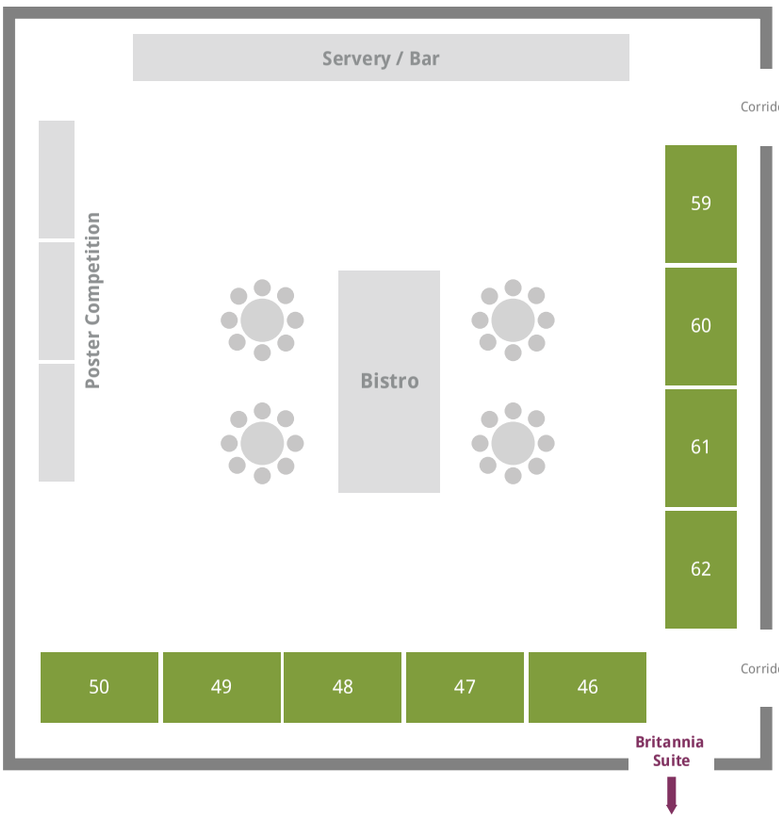
Future Powertrain Conference

FPC2020 - Manxman Suite - Exhibition and Conference Layout

NOTE: This plan is not to scale and may change at any time.



46 OSCO specialist electronic materials — OSCO LTD

47 UNIQUE Specialist Recruitment Ltd — Unique Specialist Recruitment Ltd

48 ACTech a materialise company — ACTech GmbH

49 Polytec — Polytec

50 huber — Huber UK Temperature Control Ltd

59 XTRAC TRANSMISSION TECHNOLOGY — Xtrac Ltd

60 SCHALTBAU Connect Contact Control — Schaltbau Machine Electrics

61 John G Peck Ltd — John G Peck Ltd

62 SIERRA CP ENGINEERING — Sierra CP Engineering Ltd

FPC2020
Future Powertrain Conference

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MAHLE Powertrain

Keynote Speakers - Day 1

WELCOME

09:00 - 09:10 - IMPERIAL SUITE (HALL 1)

Prof Matthias Wellers

MANAGING DIRECTOR - AVL POWERTRAIN UK

Matthias Wellers is the Managing Director of AVL Powertrain UK Ltd, assuming the position in 2006. Before this role Matthias Wellers was leading the IAV branch in UK and was working as a Senior Engineer in the Research & Technology division of Daimler in Stuttgart.

Matthias Wellers is an elected member of the UK Automotive Council Technology Group. Since 2016 he has been a visiting Professor at Loughborough University and an advisory board member of the Digital Engineering and Test Centre in London. Tianjin University China State Key Laboratory of Engines honored Matthias Wellers as a Professor Honoris Causa in 2013.

Matthias Wellers is a chartered engineer and Fellow of the Institute of Mechanical Engineers. In 1998 he received the Ph.D. degree from the Institute of Automatic Control, RWTH Aachen. He studied Mechanical Engineering at the RWTH Aachen as well as at the Dartmouth College in USA and the Ruhr University in Bochum, Germany.

Dr Greg Offer

READER IN MECHANICAL ENGINEERING - IMPERIAL COLLEGE

Dr Gregory Offer is a Reader (Associate Professor) at Imperial College London and leads the Electrochemical Science & Engineering Group in Mechanical Engineering at Imperial College London. The Group includes 3 other academics and over 40 researchers. Greg was one of the founders of the Faraday Institution in the UK and is the PI of the £10M Faraday Institution Multi-Scale Modelling project involving 23 academics across 9 institutions. The group works with multiple industry partners, mostly through Innovate UK projects, and Greg has helped win over £32.5M of funding since starting his group in 2010. Greg also has experience working outside academia as a management consultant and a government advisor. Greg's research is at the interface between the science and engineering of electrochemical devices. Having trained as an electrochemist before moving to engineering, his research portfolio focuses on understanding the limits of operation, degradation mechanisms and failure modes of batteries, supercapacitors and fuel cells in real world applications, and the impacts and consequences on system design, integration and control. Greg has published multiple peer reviewed journal papers, patents, technical reports and books. Greg is also a co-founder of two battery related start-ups, Cognition Energy Ltd and Breathe Battery Technologies Ltd.

Keynote Speakers - Day 1

09:10 - 09:30 - IMPERIAL SUITE (HALL 1)

Mark Pecqueur

THOMAS MORE UNIVERSITY OF APPLIED SCIENCES, BELGIUM

Mark Pecqueur is prof. & research developer automotive for Thomas More university of applied sciences. With 25 years of research experience and 2 start-ups, Mark Pecqueur is an experience expert in both research into renewable fuels & drive systems and bringing the results to the market.

In addition to his academic career, Mark Pecqueur is active as an expert & keynote speaker (www.markpecqueur.com) with the aim of supporting companies in their steps in the mobility of tomorrow.

09:30 - 10:00 - IMPERIAL SUITE (HALL 1)

Prof Dr-Ing Marko Dekena

EXECUTIVE VICE PRESIDENT GLOBAL BUSINESS DEVELOPMENT SALES AND INTERNATIONAL OPERATIONS, POWERTRAIN SYSTEMS - AVL LIST GMBH, GRAZ/AUSTRIA

Education:
Study of Mechanical Engineering at the
Technical University in Munich / Germany
Diploma in 1993

Professional Career:
08/1993 – 03/1994 Kubota, Osaka / Japan
Trainee Program of VDMA
12/1994 – 09/2000 Volkswagen Group / Germany
Conferral of Doctorate at Volkswagen AG
Product Manager V6 and V8 Gasoline Engines at AUDI AG
10/2000 – 01/2005 MAN B&W Diesel AG / Germany
Assistant to the Executive Board
02/2005 – 06/2010 MAN Nutzfahrzeuge AG / Germany
Head of Engines and Components Sales
07/2010 – today AVL LIST GmbH, Graz/Austria
Executive Vice President Global Business Development
Sales and International Operations, Powertrain Systems

Keynote Speakers - Day 1

13:00 - 13:30 - IMPERIAL SUITE (HALL 1)

Graeme C Cooper

PROJECT DIRECTOR, ELECTRIC VEHICLES - NATIONAL GRID RENEWABLE

Graeme leads National Grid Corporate work on electric vehicles/decarbonisation of transport by leading and coordinating all the work relating to the UK regulated business of National Grid.

National Grid separated the Electricity and Gas Transmission Ownership (TO) from the Electricity System Operation (ESO) in April 2019, so Graeme represents the Asset business of National Grid.

His work helps the Government, the energy and transport industry's transition towards zero emission. With over a decade in communications infrastructure and over a decade in low/zero carbon electricity generation, Graeme is a well-known and highly respected energy industry expert.

Graeme is a graduate of Oxford Brookes University (BSc 1997) and Bi Norwegian Business School (MBA Energy 2016).

Graeme takes his decarbonisation work home with him as he drives a PHEV and BEV and heats his home using ground source heat pumps.

18:30 - 22:00 - IMPERIAL SUITE (HALL 1)

Alan Tolley

GROUP DIRECTOR, POWERTRAIN - JCB

Training & Studies:
University of Oxford 1975 – 1978 (Physics – MA)
Fellow: Institution of Mechanical Engineers

Career:
1979 – 1985 Perkins Engine Co Ltd (+Atlantis Diesel Engines, Cape Town)
1986 – 1998 Ford Motor Company, Ford New Holland, European Engine Alliance
1998 – present J.C Bamford Excavators Ltd

Current Responsibilities:
Group Director, Powertrain
Responsible for Engine Product Development, Planning and Strategy for J.C Bamford Excavators Ltd.

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Keynote Speakers - Day 2

WELCOME & CONFERENCE CLOSE

09:00 - 09:10 & 13:45 - 14:00 - IMPERIAL SUITE (HALL 1)

Prof Matthias Wellers

MANAGING DIRECTOR - AVL POWERTRAIN UK

Dr Greg Offer

READER IN MECHANICAL ENGINEERING - IMPERIAL COLLEGE

09:10 - 09:30 - IMPERIAL SUITE (HALL 1)

Prof Nigel Brandon

DEAN OF THE FACULTY OF ENGINEERING - IMPERIAL COLLEGE LONDON

Nigel Brandon OBE FREng is Dean of the Faculty of Engineering at Imperial College London. His research is focused on electrochemical devices for energy applications, with a particular focus on fuel cells, electrolysers, and batteries. He is Director of the UKRI funded Hydrogen and Fuel Cells SUPERGEN Hub (www.h2fcsupergen.com), a founder of Ceres Power (www.cerespower.com), a UK fuel cell company spun out from Imperial College in 2000, chair of the Sustainable Gas Institute at Imperial College (www.sustainablegasinstitute.org), and a founder of RFC Power, a flow battery company spun out from Imperial College in 2018. He was awarded the Royal Academy of Engineering Silver Medal in 2007, the Inst Civil Engineers Baker Medal in 2011, and the ASME Francis Bacon Medal in 2014, for his contribution to fuel cell science and engineering.

Keynote Speakers - Day 2

13:15 - 13:45 - IMPERIAL SUITE (HALL 1)

Dr Andreas Docter

DIRECTOR ELECTRIC POWERTRAIN - JAGUAR LAND ROVER

Dr. Andreas Docter is the Director of Electric Powertrain at Jaguar Land Rover (JLR). He leads a team of specialist engineers, senior managers and Chief Engineers in the field of Batteries, Power Electronics, Mechatronics and Fuel Cell development – responsible for the Research, Design and Development of next generation of Hybrid and Electric Vehicle Powertrain systems and components for JLR.

Before joining JLR he worked for Daimler AG in various leadership positions in the field of Electrical Engineering and Powertrain for more than 20 years. Over the years, he has played an instrumental part in Daimler's current generation electrified vehicles, ranging from different types of Hybrid Vehicles, full Battery Electric Vehicles and Fuel Cell Vehicles. His involvement includes everything from the system design, as well as hardware and software design and delivery for all the components of the Powertrain, including Batteries, Fuel Cells, Power Electronics, Electric machines and Transmissions.

He studied Mechanical Engineering at Northwestern University in Chicago and at Bochum University in Germany, where he completed his PhD in Thermodynamics.

Evening Event

17:00	**Infineon Drinks Reception** Presentation of **Prizes for Poster Competition**
18:20	**Evening Network Event** - Delegates move to the **Imperial Suite**
18:45	Welcome by **Dr Greg Offer & Prof Matthias Wellers**
19:00	Drinks & Buffet
20:00	Introduction to Keynote Speaker by Dr Greg Offer Alan Tolley - *JCB* - **"The World's Fastest Tractor!"**
20:30	Drinks & Networking - Introducing Jester Styles, Magician
21:00	Mini Bus Service commences returning to hotels *
22:00	Event Closes

* **Can you please ensure that all Delegates who wish to use the Mini Bus Services have booked their time slot with reception – we have limited availability and will cease this service at 22:30 hrs.**

Jester Styles, Magician

Powering tomorrow's electromobility today

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Increasingly strict carbon regulations are driving the adoption of electric and hybrid vehicles (EVs and HEVs). This, in turn, calls for cutting-edge semiconductor solutions to enable fast charging and longer-lasting batteries that contribute to carbon mitigation.

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Poster Competition

Each year, *Imperial College London* promote the Poster Competition which gives everyone the opportunity to present their work to the Key Decision makers and developers in the automotive industry.

Imperial College London

This year, we have **10 Entrants**, their work will be on display in the **Manxman Suite:**

Ahmed Mohammed	Zhihuo Wang	Nassir Ibrahim
Kieran	Mei-Chin Pang	Simon E. J. O'Kane
Scott Marquis	Ben Gunn	
Daizy	Nick Weston	

Please take the opportunity to view these Posters whilst at the Conference.

IAAPS

UNIVERSITY OF BATH

A **£70 million** investment in your automotive powertrain R&D

The Institute for Advanced Automotive Propulsion Systems is a new, **£70 million centre** that will accelerate powertrain R&D across all current and future propulsion technologies. Opening in 2021, IAAPS provides a purpose-built centre for collaborative research and post-graduate education, focussed on the expertise of The University of Bath and its 40-year reputation for supporting industry with outstanding powertrain innovation.

Join us on LinkedIn to follow the development of this important new UK facility – expected to become one of the top three independent centres of its type worldwide – and find out how we are addressing not just the technology requirement, but also the need for new skills and new innovation and validation tools.

www.bath.ac.uk/iaaps

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Seminar Overview - Day 1

Wednesday 4th March 2020

08:00 - 09:00	**Registration Opens**
09:00 - 09:10	Welcome - Prof Matthias Wellers - *AVL Powertrain UK* & Dr Greg Offer, *Imperial College London*
09:10 - 09:30	Keynote Speaker - Mark Pecqueur - *Thomas More University Of Applied Sciences, Belgium*
09:30 - 10:00	Keynote Speaker - Prof Dr-Ing Marko Dekena - *AVL LIST GmbH*
10:00 - 10:30	**Refreshments & Networking** (Britannia & Manxman Suites)
10:30 - 12:00	**IMPERIAL - Session 1 - Advanced & Hybridised Engines** Chair - Dr Aaron Costall - *Imperial College London* **TRAFALGAR - Session 2 - Batteries** Chair - Isobel Sheldon - *UKBIC*
12:00 - 13:00	**Lunch & Networking** (Britannia & Manxman Suites)
13:00 - 13:30	Keynote Speaker - Graeme C Cooper - *National Grid Renewable*
13:45 - 15:15	**IMPERIAL - Session 3 - Markets/Regulation** Chair - Dr Greg Offer - *Imperial College London* **TRAFALGAR - Session 4 - Power Electronics** Chair - Dr Alastair McGibbon - *CSA Catapult*
15:15 - 15:45	**Refreshments & Networking** (Britannia & Manxman Suites)
15:45 - 17:15	**IMPERIAL - Session 5 - Heavy Duty** Chair - Ryan Ballard - *JCB* **TRAFALGAR - Session 6 - Electrical Machines** Chair - Dr Will Drury - *Innovate UK*
17:15 - 18:30	Drinks Reception / Poster Competition Winners - Sponsored by *Infineon Technologies*
18:30 - 22:00	Evening Networking Event - Keynote - Alan Tolley - *JCB*

Seminar Overview - Day 2

Thursday 5th March 2020

08:00 - 09:00	**Registration Opens**
09:00 - 09:10	Welcome - Prof Matthias Wellers - *AVL Powertrain UK* & Dr Greg Offer, *Imperial College London*
09:10 - 09:30	Keynote Speaker - Prof Nigel Brandon - *Imperial College London*
09:45 - 11:15	**IMPERIAL - Session 7 - Emissions** Chair - Thomas Stone - *AVL* **TRAFALGAR - Session 8 - Hydrogen & Fuel Cells** Chair - Dennis Hayter - *Intelligent Energy*
11:15 - 11:45	**Refreshments & Networking** (Britannia & Manxman Suites)
11:45 - 13:15	**IMPERIAL - Session 9 - Alternative Fuels** Chair - Prof Jamie Turner - *University of Bath* **TRAFALGAR - Session 10 - Electrification Systems** Chair - James Gaade - *9MAG Propulsion Ltd*
13:15 - 13:45	Keynote Speaker - Dr Andreas Docter - *Jaguar Land Rover*
13:45 - 14:00	Prof Matthias Wellers & Dr Greg Offer
14:00 - 15:00	**Lunch & Networking** (Britannia & Manxman Suites)
15:00	**Conference Closes**

Wednesday 4th March 2020

08:00 - 09:00 **Registration Opens**

09:00 - 09:10 Welcome Prof Matthias Wellers - *Managing Director, AVL Powertrain UK* & Dr Greg Offer - *Reader in Mechanical Engineering, Imperial College London*

09:10 - 09:30 Keynote Speaker - Mark Pecqueur - *Thomas More University Of Applied Sciences, Belgium*
"There is No Energy Problem"

09:30 - 10:00 Keynote Speaker - Prof Dr-Ing Marko Dekena - *AVL LIST GmbH*
"Alternative Fuels in Geofenced Off-Road Operations"

10:00 - 10:30 **Refreshments & Networking** (Britannia & Manxman Suites)

10:30 - 12:00

IMPERIAL - *Session 1* - Advanced & Hybridised Engines

Chair: Dr Aaron Costall, *Imperial College London*

Dr Richard Osborne - *Ricardo*
"The Gasoline Engine and the Fourth Industrial Revolution – Challenges and Opportunities"

Dr Mike Bassett - *MAHLE Powertrain*
"A New Modular Hybrid Powertrain Concept"

Dan Aris - *Libralato*
"R6 Eco-Engine: a Rotary 6 Phase Thermodynamic Cycle for the 21st Century"

Prof Bengt Johnansson - *KAUST: King Abdullah University of Science & Technology*
"The Internal Combustion Engine is Not Dead Yet"

Discussion

10:30 - 12:00

TRAFALGAR - *Session 2* - Batteries

Chair: Isobel Sheldon, *UKBIC*

Dr Tazdin Amietszajew - *University of Coventry*
"Thermo-Electrochemical In-Situ Instrumentation for Smart Energy Storage"

Timothy Engstrom - *Williams Advanced Engineering*
"Practical Benefits of Advanced Battery State Estimation"

Stephanie Morton - *Warwick Manufacturing Group/Milbrook*
"The Safety of Lithium-ion Cells at Low States of Charge"

Can Kurtulus - *Eatron Technologies*
"A1 Powered Battery Management Systems Development"

Discussion

12:00 - 13:00 **Lunch & Networking** (Britannia & Manxman Suites)

Day 1

Day 1

13:00 - 13:30 Keynote Speaker - Graeme C Cooper - *National Grid Renewable*
"Connecting the Future"

13:45 - 15:15
IMPERIAL - *Session 3* - Markets/Regulation
Chair: Dr Greg Offer, *Imperial College London*

Marc Elliott - *Investec*
"A Capital Markets View of Disruption in the Context of the Changing Powertrain"

Gilbert Ragowsky - *AVL List GmbH (Austria)*
"Electrifying the UK Automotive Propulsion Supply Chain"

Pete Sadler - *Reddie & Grose LLP*
"Innovation by Numbers"

Dr Andy Walker - *Johnson Matthey*
"Mobility in a Net Zero World"

Discussion

13:45 - 15:15
TRAFALGAR - *Session 4* - Power Electronics
Chair: Dr Alastair McGibbon, *CSA Catapult*

Dr Stephen Lambert - *McLaren Applied*
"A Free Inverter When Using Silicon Carbide?"

Tjark Eissfeldt - *Infineon Technologies AG*
"Relevance of Functional Safety for Electric Motor Control"

Jonathan Stevens - *Equipmake*
"Enhancing the Power Density of an Electric Motor using Additive Manufacturing"

Sam Cockerill - *Libertine*
"Free Piston Engine Power Electronics for Hybrid Electric Vehicle Power Generation"

Discussion

15:15 - 15:45 **Refreshments & Networking** (Britannia & Manxman Suites)

Day 1

15:45 - 17:15
IMPERIAL - *Session 5* - Heavy Duty
Chair: Ryan Ballard, *JCB*

Matthew Dear - *London Fire Brigade* | Phil Stones - *Millbrook*
"The Zero Emissions Challenge for the London Fire Brigade"

Adam Chase - *e4tech*
"Hydrogen Heavy Duty Vehicles – A Big Opportunity for UK"

John Hutcheson - *Artemis*
"Demonstration of High Round-Trip Efficiency for Energy Recovery Systems Using Digital Displacement Hydraulics"

Amanda Lyne - *ULEMCO*
"Practical Examples of Using Hydrogen HGV's"

Discussion

15:45 - 17:15
TRAFALGAR - *Session 6* - Electrical Machines
Chair: Dr Will Drury, *Innovate UK*

Volker Bier - *Schunk Kohlenstofftechnik GmbH*
"Carbon Fiber Reinforced Sleeves (CFRP) – Advantages and Possibilities for Electric Traction Motors"

Cleef C Thackwell - *Jaguar Land Rover*
"Permanent Magnet Motor Multiphysics Optimisation Opportunities for Weight Reduction"

Prof James Widmer - *Advanced Electric Machines Ltd*
"The Weakest Link In The Chain"

Venn Chesterton - *Innovate UK*
"Driving the Electric Revolution"

Discussion

17:15 - 18:30 Evening Drinks Reception / Poster Competition Winners - Sponsored by *Infineon Technologies*

18:30 - 22:00 **Evening Network Evening** - Keynote - Alan Tolley - *JCB*
"The World's Fastest Tractor!"

Thursday 5th March 2020

08:00 - 09:00 **Registration Opens**

09:00 - 09:10 Welcome Prof Matthias Wellers & Dr Greg Offer

09:10 - 09:30 Keynote Speaker - Prof Nigel Brandon - *Imperial College London*
"Fuel Cells - Fact or Fiction?"

09:45 - 11:15
IMPERIAL - *Session 7* - Emissions
Chair: Bernadette Longridge, *AVL*

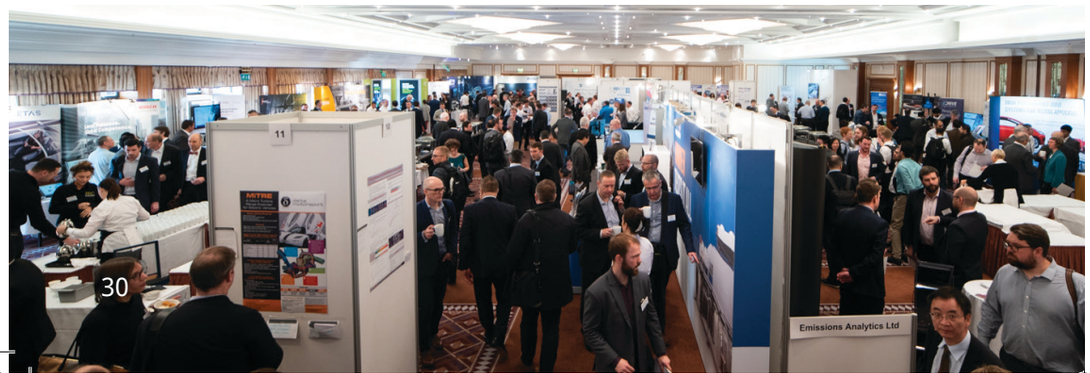
Dr Alex Mason - *HORIBA Mira*
"A Road to Rig Development Methodology for Complete RDE Compliance: Road to Chassis Perspective"

Daniyal Khan - *University of Southern Denmark*
"Review on Modelling and Simulation of Urea Water Solution Spray in Selective Catalytic Reduction Systems of Automotive Vehicles"

Dr Thomas Kruse - *ETAS Ltd*
"Optimizing Particle Emissions of a GDI Engine by Coupling a Dynamic Data Based Engine Model with ECU Injection Structures"

Eloise Cotton - *e4tech*
"Lifecycle Analysis for Automotive Powertrain Selection"

Discussion



Day 2

09:45 - 11:15
TRAFALGAR - *Session 8* - Hydrogen & Fuel Cells
Chair: Dennis Hayter, *Intelligent Energy*

Dr Richard Kemp-Harper - *Arcola Energy*
"Fuel Cell Electric Powertrains for Heavy-Duty Vehicles"

Antonio Balboa - *Robert Bosch Limited*
"The Fuel Cell as Part of the Mobility Solutions"

Tommi Jokela - *AVL Powertrain UK*
"Off-Road Fuel Cell Vehicle Analysis and Development with Model-Based Design"

Mark Selby - *Ceres Power*
"The Revolution is Coming…"

Discussion

11:15 - 11:45 **Refreshments & Networking** (Britannia & Manxman Suites)

11:45 - 13:15
IMPERIAL - *Session 9* - Alternative Fuels
Chair: Prof Jamie Turner, *University of Bath*

Jörn Behrenroth - *FEV Group*
"De-Carbonising Road Transport"

Prof Robert Morgan - *University of Brighton*
"Sustainable, Affordable Energy for Freight Transport"

Prof Roger Cracknell - *Shell Global Solutions (UK)*
"Designing Fuels and Engines for Optimum Efficiency"

Prof Sam Akehurst - *IAAPS - University of Bath*
"Water Injection Technology for Low Emissions and Higher Efficiency Combustion, a Synergistic Solution for Future Fuel Technologies"

Discussion

Day 2

11:45 - 13:15

TRAFALGAR - *Session 10* - Electrification Systems

Chair: James Gaade, *9MAG Propulsion Ltd*

Kyle Grubb - *GRM Consulting*
"Achieving True System Optimisation of EDUs through Co-simulation"

Dr Gareth Brown - *Lubrizol*
"Developing Lubricant Solutions for a Diverse Electrified Future"

Dr Michael Bryant - *Drive System Design*
"Quietly Efficient – Reducing EV Powertrain Noise without Compromising Efficiency"

Alberto Minguela - *HSSMI*
"A Circular Supply Chain for EV Powertrains in the UK"

Discussion

13:15 - 13:45 Keynote Speaker - Dr Andreas Docter - *Jaguar Land Rover*
"Status and Outlook on Jaguar Land Rover Electrified Powertrains"

13:45 - 14:00 Closing Remarks - Prof Matthias Wellers & Dr Greg Offer

14:00 - 15:00 **Lunch & Networking** (Britannia & Manxman Suites)

15:00 **Conference Closes**

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SAINT-GOBAIN

FPC2020 Exhibitors - Gold

AVL is the world's largest independent company for the development, simulation and testing of powertrain systems (hybrid, combustion engine, transmission, electric drive, batteries, fuel cell and control technology) for passenger cars, commercial vehicles, construction, large engines and their integration into the vehicle.

https://www.avl.com/

The **Advanced Propulsion Centre** was born out of the collaboration between UK Government and the automotive industry to support the R&D of low carbon propulsion technologies in the UK through a matched investment of £1 billion – aiming to save 50 million tonnes of CO_2 and safeguard or create 30,000 UK-jobs.

https://www.apcuk.co.uk/

IAAPS is a £70m R&I institute opening at the Bristol and Bath Science Park in 2021. The new facility builds on over 40 years of automotive propulsion expertise at the University of Bath, working in alignment with industry in the pursuit of cleaner, smarter engines, powertrains and driver technologies.

https://www.bath.ac.uk/research-institutes/iaaps/

Infineon is a leading semiconductor manufacturer for automotive applications that covers a wide range applications within vehicles. Infineon offers a broad product portfolio of discrete and integrated power semiconductors, powertrain solutions, microcontrollers, chassis and comfort electronics, intelligent sensors, as well as transmit and receive ICs for radio-frequency & radar applications to meet the latest driver safety applications. Infineon`s comprehensive range of products coupled with a high-level of quality has made us a preferred partner for our customers for over 40 years.

https://www.infineon.com/

MAHLE Powertrain is an Engineering Services provider specialising in the design and integration of advanced internal combustion engines and electrified powertrain systems. As recognised experts in these fields, we are fully engaged in the detailed development of traditional and advanced drivelines into cost-effective, production feasible solutions for enhanced efficiency, improved fuel economy and lower emissions.

https://www.mahle.com/

Millbrook is a leading provider of vehicle test and validation services and systems to customers in the automotive, transport, tyre, petrochemical and defence industries. It is independent and impartial in everything it does. It has a range of test facilities in the UK, the USA and Northern Finland.

http://www.millbrook.co.uk/

Saint-Gobin provides engineered solutions to international manufacturers in the global automotive market with 15 sites worldwide, dedicated to delivering solutions in NORGLIDE® Bearings and RENCOL® Tolerance Rings. Backed by innovation and market leadership, Saint-Gobain is committed to working closely with customers using its development and testing expertise to create smooth, quiet and consistent movement in the most demanding situations.

https://www.saint-gobain.com/en

Sprint Power are vehicle electrification and integration experts. From initial modelling and simulation, through specific component design, to full vehicle integration we offer a complete turnkey solution. Our experience extends to applications across a variety of vehicle types including electric, hybrid, autonomous and hydrogen fuel cell vehicles.

https://www.sprint-power.com/

Vocis, a subsidiary of Dana Incorporated, is a British high-technology company that provides competitive advantage globally for OEM's and their suppliers. Vocis specialise in the development of transmission control systems for series production and low volume design, assembly and testing of novel powertrain concepts, particularly for hybrid and electric vehicles.

http://www.vocis.co.uk/

FPC2020 Exhibitors - Silver

Altair is a global technology company that provides software and cloud solutions in the areas of product development, high performance computing (HPC) and data analytics. Altair enables organizations across broad industry segments to compete more effectively in a connected world while creating a more sustainable future. To learn more, please visit www.altair.com.

https://www.altair.com/

Apicom DSG are rotating test machine specialists, who focus on servicing the customer through the life cycle of the test machine. From concept design through to calibration, spares and future upgrades.

https://www.dsgroup.uk.com/partners/apicom

Cambustion's fast-response gas and particulate analysers enable engineers worldwide to understand engine operation and meet emissions targets, including real world driving. Rapid mapping and transient mapping capabilities offer cost effective routes to emissions compliance.

Cambustion's Particulate Filter Testing System has been embraced by GPF/DPF and vehicle manufacturers for filter testing and development including ashing studies.

https://www.cambustion.com/

Claytex is an engineering consultancy specialised in systems engineering; modelling, simulation and analysis of complex multi-domain systems. We provide a comprehensive suite of solutions for Automotive and Motorsport customers enabling all aspects of a vehicle to be modelled, integrated, simulated and tested on desktop and driver-in-the-loop virtual environments. Our integrated tools thus also fully support ADAS and Autonomous vehicle development and testing.

https://www.claytex.com/

With a service portfolio that includes development, product supply, integration and consulting, as well as core competencies and specialist engineering in 'Chassis & Safety Controls', 'Interior Electronic Functions', 'Driveline & Electrification' and 'Product Manufacturing', CES is the ideal engineering and production partner for solving technical challenges within the automotive and industrial sectors.

https://www.conti-engineering.com/

eDrive Engineering Services is an innovative engineering consultancy specialising in the rapid development of integrated electric drive systems. Our expert services help customers set their products apart:

- Turn-key electrical machine and power electronics development/prototyping
- Electric/hybrid powertrain simulation and HIL testing
- Specialist electromagnetic, thermal, electronic and mechanical analysis

https://www.edrive-engineering.com/

ETPS specialise in programmable power supplies and test systems. Our wide selection of products caters for almost any power, voltage or current requirement. Specific ranges include programmable AC & DC sources, battery/capacitor emulators, bidirectional PSUs, electronic loads, battery/capacitor cyclers and drive cycle test equipment. We also provide rental power systems.

https://www.etps.co.uk/

Hexagon is a global leader in sensor, software and autonomous solutions. We are putting data to work to boost efficiency, productivity, and quality across industrial, manufacturing, infrastructure, safety, and mobility applications.

Our technologies are shaping urban and production ecosystems to become increasingly connected and autonomous – ensuring a scalable, sustainable future.

Hexagon's Manufacturing Intelligence division provides solutions that utilise data from design and engineering, production and metrology to make manufacturing smarter.

https://www.hexagonmi.com/en-GB

Innovate UK is part of UK Research and Innovation, a non-departmental public body funded by a grant-in-aid from the UK government.

We drive productivity and economic growth by supporting businesses to develop and realise the potential of new ideas, including those from the UK's world-class research base.
We deliver a range of programmes to help accelerate innovation in electrification and future mobility.

https://www.gov.uk/government/organisations/innovate-uk

Intertek Transportation Technologies in Milton Keynes, UK, has over 30 years' experience in the automotive industry and is the largest independent automotive EV powertrain testing facility in the UK.

Our engine test cells offer the most technologically advanced driveline test facilities in Europe. As well as offering engine durability testing, we specialize in engine performance, emissions development, combustion mapping, fuel and lubricant testing, exhaust system manufacture and catalyst aging.

https://www.intertek.com/

Since more than 40 years, **Rollax** is conceptualizing, designing and producing innovative mechanical solutions. Even though "New Mobility" is mainly connected with digitalization, it is our credo that high-quality mechanical components will play a key role in the individual mobility.

No movement, no mobility – neither now nor in future.

https://www.rollax.com/en/

Rethinking Powertrain Testing.

Rototest has established a new benchmark for Powertrain Dynamometers. Time optimizing and cost reducing solutions that will advance your R&D into the next decade, providing an unprecedented versatility to meet the demands of tomorrow.

https://rototest.com/

SPAL Automotive is a global designer & manufacturer of brushless driven cooling fans and heater blowers. Software controlled for maximum efficiency, the fully sealed drive units are specified to IP6K9K, spark-free, waterproof and safe; meeting the exacting demands of hybrid engine & battery cooling, delivering high performance, 30,000+ hours operation and contributing to reduced emissions.

https://www.spalautomotive.co.uk/

Sunamp designs, develops and manufactures non-toxic, compact, highly efficient advanced thermal storage technology called 'Heat Batteries' that can be used to store heat and cold for a number of applications. These Thermal Batteries help address vehicle thermal management challenges such as engine warm up, cabin warm up, catalytic converter temperature fluctuation and electric vehicle battery thermal conditioning and HVAC systems.

https://www.sunamp.com/

Unico is one of the World's leading suppliers of high-performance test stand drive systems. Working with R&D teams across the automotive and motorsport sectors, Unico has remained at the forefront of innovation for over 20 years. Whether it's engine simulation, powertrain, battery or eAxle testing Unico have a solution.

http://www.unico.co.uk/

Vector has been your competent partner for the development of automotive electronics for over 30 years. Technical solutions from Vector through software, hardware and services help to develop the mobility of tomorrow in: electromobility; safety and security; ADAS and autonomous driving; and AUTOSAR Adaptive.

https://www.vector.com/int/en/company/contacts/vector-greatbritain/

WMG is actively researching projects to improve how we travel, how we interact and even the quality of the air we breathe. A multidisciplinary department of the University of Warwick. Our mission is to improve the competitiveness of UK industry through innovation in new technologies and business models and skills development.

https://warwick.ac.uk/fac/sci/wmg/

FPC2020 Exhibitors - Bronze

ACTech a materialise company

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Welcome to the front-runner. Since 1995, we have been continually setting new standards for rapid prototype production in terms of both quality and speed. The results are high-precision, finished ready-to-install casting prototypes, produced in record time.

Since October 2017 **ACTech** is a member of the materialise group. Besides casting prototypes it is now possible to offer parts produced by Metal 3D Printing as well.

https://www.actech.de/en/soziales-engagement/

Advanced Electric Machines Ltd

Advanced Electric Machines Ltd. is a manufacturer of magnet free motors for passenger car, commercial vehicle and aerospace applications based in the North East.

With first commercial orders in place, AEM is now working with leading OEMs to deliver next generation powertrain solutions into the market.

https://advancedelectricmachines.com/

AUSTIN CONSULTANTS

Austin Consultants are experts in automated data acquisition and control. Our extensible, platform-oriented architecture provides maximum flexibility for testing Electric Vehicle powertrains and new battery technologies. Easily integrate with existing instrumentation and test cell equipment; rapidly deploy models from almost any environment to run deterministically in-the-loop, at high-speed; and automate testing through the innovative Python scripting engine.

https://austinconsultants.com/

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Bitrode Corporation, a member of Sovema Group, is a leading manufacturer of battery charging and testing equipment with over 60 years of industry experience. We offer an extensive product line of laboratory test equipment, user-friendly software and manufacturing automation tools appropriate to all battery applications and chemistries.

https://www.bitrode.com/

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Caltest Instruments offer high level technical/applications support, an extensive range of sale, demo and rental equipment and a comprehensive service/UKAS calibration department.

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https://www.caltest.co.uk/

consilium RECRUIT

Formed in 2001, **Consilium Recruit** is a recognised authority in the recruitment of qualified engineering, management level, and industry executives to the UK's EV and Battery Technology Sector. Consilium provides a dedicated recruitment service for innovative, R&D and advanced technology companies, ranging from hi-tech start-ups through to established international groups

consiliumrecruit.com

Eatron Technologies is an AI / Machine Learning powered intelligent products & solutions company specializing in Electric and Autonomous mobility. Eatron uses its unique IP of “Automotive Safe AI” in developing cutting edge Battery Management System (BMS) and L2+ assisted automated driving (ADAS) solutions and systems for OEMs.

https://eatron.com/

ETAS provides innovative solutions for the development and testing of automotive embedded systems, ranging from high-level functional modelling and analysis of complex control algorithms, to software engineering using Adaptive AUTOSAR, and the measurement and calibration of ECU performance. A full range of security solutions is available via our subsidiary ESCRYPT.

https://www.etas.com/en/

Equipmake develops State of the Art Electric Drivetrain Solutions for niche and specialist markets. Established in 1997, the Company’s core expertise is in the development of power electronic control systems, inverters and high performance motors. We have in house design, manufacturing and test facilities from prototype through to series production.

https://equipmake.co.uk/

The **FEV Group** is an internationally renowned service provider in the area of vehicle and powertrain development. The skill spectrum of FEV includes engine and transmission development, vehicle integration, and the calibration and homologation of modern vehicle powertrains, the development of hybrid and electric drive systems as well as alternative fuels is constantly increasing in importance.

https://www.fev.com/united-kingdom.html

HSSMI is a sustainable manufacturing innovation consultancy, offering solutions for manufacturers looking to create impact. We are focussed on ‘Scale Up’, organisations who are making new products or increasing the volumes of current products, ‘Productivity’, using an array of tools, including digital, to increase efficiency and flexibility for manufacturing and ‘Circular Economy’, helping organisations to implement circular business models to reduce waste.

https://hssmi.org/

Huber are the technology leader for high precision thermoregulation in research and industry. Our products ensure precise temperature control within a variety of applications, for instance fluid conditioning, environmental simulation, stress and battery testing. The product range offers solutions for all thermoregulation tasks from -125 to +425°C.

https://www.huber-online.com/en/

IDTechEx offers independent market research, business intelligence and events on emerging technologies. Experienced business and technology experts provide international perspective in 3D Printing, Advanced Materials, Electric Vehicles, Photonics, Energy Storage, Internet of Things, 5G, Life Sciences, Off Grid, Printed Electronics, RFID, Robotics, Sensors and Wearable Technology.

https://www.idtechex.com/

JGPL is a specialist distributor of Power Semiconductors and associated products from leading manufacturers MITSUBISHI ELECTRIC, MERSEN and POWEREX. JGPL's experienced team offer technical support, backed by stock for fast delivery. Product scope is broadened further by PETERCEM sensors plus Exxelia and ICEL capacitors.

JGPL have solutions for Inverters, Cooling, Busbars and DC protection covering Automotive Inverters, Battery and also Industrial applications.

https://www.jgpl.com/

LAUDA is the global leader in the manufacture of Constant temperature equipment and provides solutions into the automotive sector for R&D and product development. LAUDA has seen a rapid growth in sales accompanying the expansion in new technologies, especially testing and temperature simulation in battery cells, dyno-rigs, climate chambers, fuels and also motors. LAUDA offers a wide temperature range from -90 degC to +320 degC.

https://www.lauda.de/en/index.html

Maccor Inc. designs and manufactures cell and battery test equipment used for material and cell research & development, battery application testing, quality assurance and other applications requiring precise control and measurement of current and voltage. Different systems can operate from 100 nanoAmps to 2000 Amps and from 5V to 1200V.

http://www.maccor.com/

The **Manufacturing Assembly Network** is a collaboration of non-competing, sub-contract manufacturers.

The member companies are actively focused on developing innovative solutions, combining disciplines and refining existing processes to offer those involved in powertrain development the best in manufacturing solutions.

https://www.man-group.co.uk/

MDL Technologies provides specialist electronic test equipment, test facilities and consultancy to the UK and Ireland, working in partnership with market leading global manufactures.

The rapidly expanding EV industry drives the demand for high power and electronic related key component, battery cell and module test equipment. For the FPC 2019 Conference we will be exhibiting / demonstrating the latest Power Electronic / Battery Test Equipment from Chroma ATE Inc.; Hioki & Hardware in the Loop Simulators from Typhoon HIL.

https://www.mdltechnologies.co.uk/

Helping automotive powertrain component manufacturers improve performance and reliability using speciality synthetic lubricants. High temperature capable grease to help deliver more engine efficiency, a quieter drive and extending functional life. Application examples? Gears, throttle body bearings, EGR valves, air intake control valves, actuator bearings, electrical connectors/connections.

https://www.nyelubricants.com/

OSCO designs and supplies Litz Wire, Custom Cable and Thermal Management Materials to OEMS and Suppliers of Electric Vehicle Systems and Motor / Powertrain Technologies. OSCO's team of technical engineers push the boundaries in copper compaction resulting in winding efficiencies to optimise powertrain performance in all market sectors.

http://www.osco.uk.com/

Polytec has been manufacturing a wide range of laser vibrometer, velocimetry and surface topography instruments for non-contact measurement for more than 50 years. Research, development, production or even for long-term monitoring, our equipment range allows for analysis of different size, shape and material from large objects to micron-sized MEMS.

https://www.polytec.com/uk/

Schaltbau manufacture DC Power Contactors, Connectors and Switches. Our DC Contactors are used in E-Mobility Charging, Storage, Energy Distribution and Control. Voltages up to 3000V and Currents up to 2000A with new products always in development. Schaltbau Machine Electrics are based in Cwmbran, South Wales.

https://schaltbaugroup.com/companies-brands/schaltbau/

Sierra CP works in partnership with our Global Clients to deliver custom products as well as turnkey facility solutions.

Our strategy is to meet customer needs today, whilst providing solutions that can adapt to ever changing future requirements.

Sierra CP's advanced hardware and software products enable a wide range of test applications.

https://www.sierrainstruments.com/autotest/

TBAT Innovation offer a range of funding services that are crucial to helping companies succeed with their R&D projects. They have expert knowledge of accessing UK and EU grant funding and R&D tax credit submissions.

https://www.tbat.co.uk/

THT is a leading supplier of lithium battery safety testing equipment.

ARC provides an adiabatic testing environment typically leading to full thermal runaway.

IBC isothermal calorimeters offer high precision heat measurement and Cp determination.

ICP maintains isothermal conditions of an entire battery with minimal internal thermal gradients during cell cycling.

https://www.thermalhazardtechnology.com/

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All divisions are based out of our office in Chelmsford Essex, but our supply capabilities enable us to recruit Internationally.

http://www.unique-specialist.co.uk/

Venner Shipley is a leading firm of European Intellectual Property Attorneys, representing a broad range of clients including major domestic and international corporations, SMEs, universities and individual inventors.

https://www.vennershipley.co.uk/

Xtrac is a world-leader in the design and manufacture of high performance transmissions and driveline components for top-level professional motorsport and high performance automotive applications, including hybrids and electric vehicles. Xtrac is a major ambassador for the UK's world-renowned motorsport industry; employing 375 people and exporting more than 80% of sales.

https://www.xtrac.com/

Find the exact performance of your Powertrain with the World's Most Accurate Power Analyser.

Backed Up by the World's Most Capable Power Calibration Laboratory.

Look out for the **Yokogawa** WT5000 on show at Stand 37!

https://tmi.yokogawa.com/uk/solutions/products/power-analyzers/wt5000/

https://www.yokogawa.com/uk/

Part of the ZF Group, Conekt is the Solihull-based Engineering Services division of **ZF Race Engineering**, delivering environmental, EMC and materials testing to automotive, aerospace and emerging technology companies. We focus on robustness and reliability of electronic and mechatronic assemblies through conventional and bespoke test programmes to deliver a clean launch for today's electric vehicles.

www.zf.com/conekt

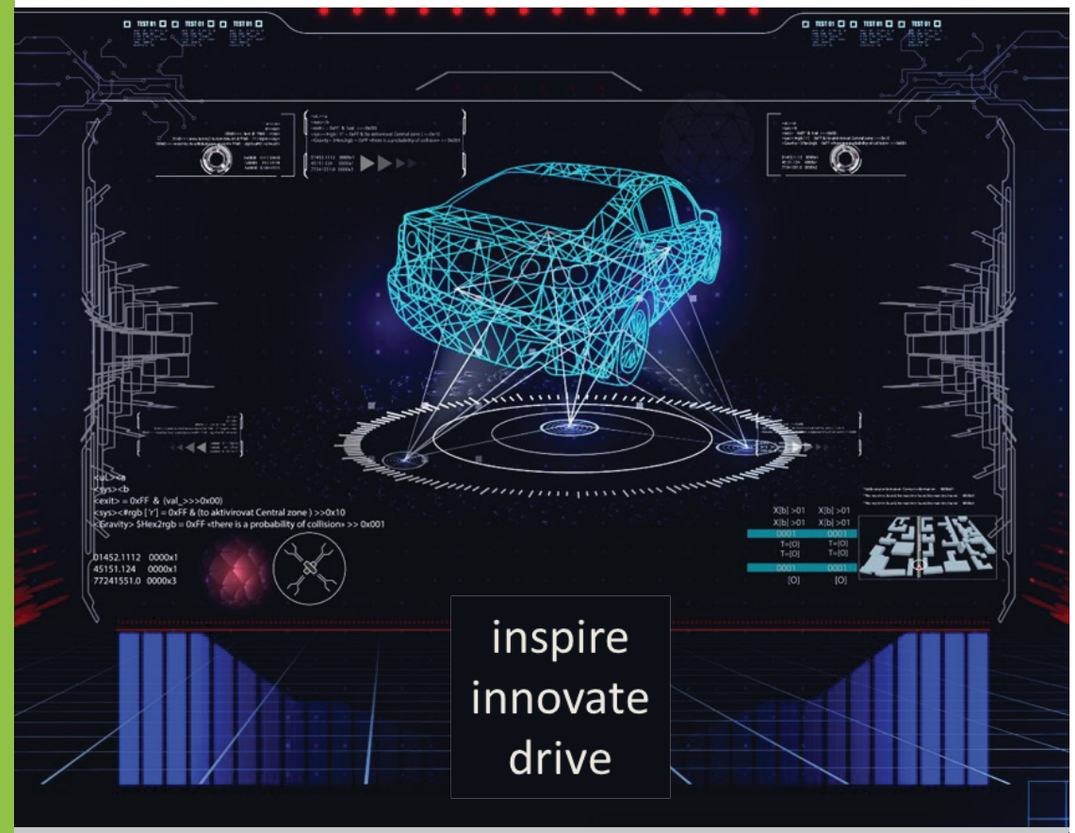
THANK YOU

We would like to take this opportunity to thank all our Keynotes, Presenters, Chairs, Exhibitors and Steering Group for their valued contribution in supporting this Conference, and especially to our Delegates for attending.

Your feedback is valuable to us and would welcome your comments on how we can improve for 2021. Feedback forms will be distributed at the conference, please take a moment to complete and hand to staff as you depart.

- PRESENTATIONS -

Whilst we seek permission from presenters for copies of their presentations, some companies are reluctant to agree to this. For those where permission is granted these will be uploaded within four weeks of the conference.



Vocis is a high-technology company providing innovative solutions built on our foundation of software and control of driveline systems

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For more information:
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Notes

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Cenex Events 2020

Cenex–LCV & Cenex–CAM

9th - 10th September 2020

Millbrook, Bedfordshire

For further information, **visit our website** or **email**:

lcvsales@cenex.co.uk | **camsales@cenex.co.uk**

www.cenex–lcv.co.uk | **www.cenex–cam.co.uk**

@lcv_event +44(0)1509 642 500

Notes

SAVE THE DATE

We will be returning on

Wednesday 24th - Thursday 25th February 2021

CONTACT

info@futurepowertrains.co.uk

For support on the day, please call:
07948375746

https://futurepowertrains.co.uk

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