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The new MINI Aceman final testing

In just a few months, the MINI Aceman will be presented to the public for the first time. Offered exclusively with an all-electric drivetrain, the model expands the MINI range. With agile driving dynamics and brand-typical proportions, the crossover model combines the features of the two most successful MINI models, the MINI Cooper and the MINI Countryman, to create a new vehicle concept. On its way to series production, the new model has undergone testing in extremely high temperatures on sandy desert roads.

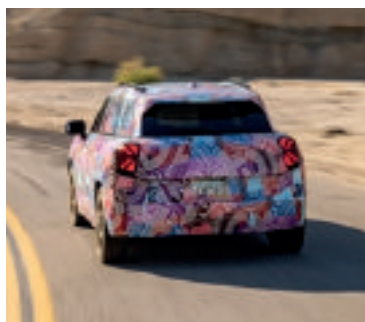
With a length of 4,075 mm, a width of 1,754 mm and a height of 1,495 mm, the MINI Aceman occupies the position between the MINI Cooper and the MINI Countryman. The third standalone model in the new all-electric MINI family is equipped with four doors and a large tailgate. Its interior can accommodate five passengers.

“The all-electric MINI Aceman opens new opportunities for customers who want a smaller crossover than our successful MINI Countryman. The consistent

electrification of our product portfolio makes a clear statement about the future of the MINI brand,” said Stefanie Wurst, head of MINI.

Tested under extreme conditions

After the MINI Aceman successfully completed tests at the Arctic Circle, the crossover model is completing final testing in the desert in strong sunlight and heat. In addition to classic features such as driving dynamics and driving comfort, the test team is focusing on the demanding aspects of an electric vehicle. For this purpose, the air conditioning, charging and cooling of the battery, drive and control devices are intensively tested at temperatures of up to 50° Celsius in dusty desert sand.



Fully electric and efficient

The new MINI Aceman will be offered solely with an all-electric powertrain, and a battery size of 54.2 kWh.

Thanks to the purely electric drive concept, the agile MINI crossover takes up little space on the road and offers a high level of comfort and versatility. The design of the newly developed model is in line with the brand's basic principle: plenty of interior space with the smallest possible external dimensions, agile driving characteristics and efficiency. Behind this is the functional two-box design with short overhangs. This creates maximum space for five passengers and luggage on a minimal floor space.

www.bmwgroup.com

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Published in association with **ENERGY ENGINEERING** magazine by Media Culture, Pure Offices, Plato Close, Leamington Spa, Warwickshire CV34 6WE, UK

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www.futurevehicle.co.uk



Cover image courtesy of www.bmwgroup.com

www.futurevehicle.co.uk

£38m funding to upgrade the UK Battery Industrialisation Centre

Battery technology

The UK Battery Industrialisation Centre (UKBIC) has secured a further £38m in funding to upgrade the facility's scale-up capabilities to support innovation projects for high-tech developers and users of battery technologies.

The new funding, announced as part of the Autumn statement, is principally for UKBIC's innovative flexible scale-up line, and builds upon the £36m already committed by Faraday Battery Challenge in May. Preparatory work on construction of the facility is already underway.

The new flexible scale-up line will bridge the gap between UKBIC's existing volume industrialisation line and kilogramme scale demonstrator lines available elsewhere. The new capability, which is expected to be operational during 2025, will provide battery developers with an increasingly cost-effective route to market, enabling companies to move from R&D through to large-scale production, without having to use overseas facilities.

The funding is being provided by UK Research and Innovation, as part of the UK Government's £610m Faraday Battery Challenge, a national investment programme which is delivered by Innovate UK. The Challenge supports world-class scientific technology development and manufacturing scale-up capability for batteries in the UK

www.ukbic.co.uk



Verge launches Starmatter software and intelligence platform

Innovation

The Starmatter software and intelligence platform announced by electric superbike manufacturer Verge Motorcycles is shaking up the entire vehicle industry. Starmatter offers automatic over-the-air updates (OTA), allowing Verge customers to access new functions and improvements for their motorcycle. In addition, the platform includes capabilities to utilise artificial intelligence and machine learning in the processing of data collected by advanced sensor technology, which enables the motorcycle's characteristics to be personalised for each user. At the heart of the Starmatter platform is Verge's redesigned Human-Machine-Interface (HMI), for which the motorcycle manufacturer has begun working with Epic Games, developer of the Unreal Engine game engine.

With the Starmatter platform, all new Verge motorcycles come with a sensor package that comprises, for example, GPS positioning, an accelerometer, and Bluetooth, 4G and WiFi connections. In addition, the new platform enables automatic downloading of enhancements and new functions specified by the manufacturer with OTA updates when the device is connected to a network. OTA updates can optimise, for example, the performance of the bike, its charging characteristics, or the operation of the rim

motor inside the rear wheel. Verge also aims in the future to proactively identify possible maintenance requirements.

Although advanced artificial intelligence functions have been used in cars for years, sensors and AI have been hardly utilised at all in motorcycles. With Starmatter, Verge introduces various sensors and machine learning models to series-produced motorcycles, making the company a pioneer in its field.

www.vergemotorcycles.com



LOCTITE looks forward to another successful Formula E season

Adhesives

The new season of the ABB FIA Formula E World Championship began in January 2024, and next time you watch the cars from the TAG Heuer Porsche Formula E Team, you might not realise they feature a secret ingredient: LOCTITE.

Henkel Adhesive Technologies, through its LOCTITE brand, has formed a close partnership with the TAG Heuer Porsche Formula E Team. The collaboration began in 2021, when Henkel Application Engineer Martin Christall met the team to identify possible points of use where Loctite could further improve the performance and reliability of the team's electric race car.

The biggest challenge was that, in Formula E, the chassis, battery, aerodynamics, and front suspension are provided centrally and are the same for all teams. This means there is only a certain amount of leeway when it comes



to incorporating a team's technologies and components, for example in the engine, transmission, rear suspension, and control systems.

Today, the teams work closely together to get even more out of the cars of the future – and TAG Heuer Porsche Formula E Team is improving season on season, with its best-ever placing of 4th in the 2023 season.

Their shared goal is to develop even

better ways of using LOCTITE products, while also testing new products that enhance the car's performance and speed – and, of course, its sustainability.

Already, different Loctite solutions are used to ensure mechanical reliability for a host of key applications, which extend from suspension bearings, gearbox housing parts, and powertrain bolts to steering wheel components.

www.henkel.com

Novuna Vehicle Solutions funding award

Funding

Novuna Vehicle Solutions, one of the UK's largest fleet leasing providers and a leading advocate for zero-emission vehicles, has announced it has been awarded funding of over £2.1 million as part of the Tees Valley Hydrogen Vehicle Ecosystem (HYVE) Consortium, which will showcase the first large-scale deployment of fuel cell electric HGVs in the UK.

The £7 million project, part of the Tees Valley Hydrogen Transport Hub, is being

funded by the Department for Transport and delivered in partnership by Innovate UK. The programme will unlock at least £15 million of private investment.

Led by project coordinator ERM, the consortium will support the rollout and maintenance of fleets of fuel cell HGVs in the Tees Valley commencing later this year, supported by the construction of a strategically located hydrogen refuelling station by Exolum at their Riverside Terminal.

The publicly accessible refuelling

station, near to Middlesbrough town centre and at the intersection of the A19 and A66, will be capable of dispensing up to 1.5 tonnes of hydrogen per day.

As the selected HGV leasing partner within the consortium, Novuna Vehicle Solutions will work alongside German manufacturer Quantron AG, to build, fund and manage the in-life maintenance of more than 20 fuel cell electric HGVs ranging from 4.2 to 27 tonnes deployed in the project.

These vehicles, which will be used by some of the region's largest vehicle operators within the logistics, infrastructure, utilities and home delivery sectors, will replace diesel vehicles, reducing local air pollution and carbon emissions.

Data monitoring and performance evaluation will be provided by the School of Computer Engineering and Digital Technologies at Teesside University, who have extensive experience in the fuel cell field.

www.novunavehiclesolutions.co.uk



New hydrogen cleantech reduces worst carbon emissions by 91%

Transport

An independent 18-month trial of Advanced Hydrogen Technologies (AHT) Group's carbon capture device has reported significantly lower emissions from a fleet of Abels Moving Services' diesel lorry exhausts.

During the in-depth study involving Abels' HGVs, control vehicles averaged a particulate number count of 116,300 cm³ while identical trucks fitted with AHT's carbon capture device peaked at just 10,030 cm³ - a game changing reduction of 91.4 % and more than 10 times less!

Even an identical comparison of truck 1 test (Q: 15200 cm³) versus truck 2 test (L: 125000 cm³), both for nine months, but the former fitted with the carbon capture device, resulted in a highly impressive 87.8% reduction in harmful emissions.

AHT's unique, eco-friendly testing process uses hydrogen to remove carbon build up, which is worst in diesel and high mileage engines. The UK Government and similar organisations focus on gases as part of the Euro Emissions Standard initiative, but AHT's system further reduces harmful fine particulates, less than 2.5 micron in diameter, which are strongly associated with detrimental health effects. Particulate Matter (PM) 2.5 can remain airborne for long periods and be drawn deeper into the lungs and bloodstream than Carbon Dioxide, Carbon Monoxide or NOX, for example.

ahtgroup.co.uk



Next generation

Charging solutions

Lotus has launched its own electric vehicle (EV) charging solutions including an ultra-fast 450 kW DC charger, power cabinet and a modular unit for charging up to four vehicles at once.

Charging anxiety remains one of the main barriers to electric vehicle adoption, with nearly 80% of the public citing the lack of charging infrastructure as a primary reason for not buying an EV in a survey conducted by the Energy Policy Institute. With Lotus' charging capabilities, the company is providing consumers with reliability and confidence wherever they are driving.

Lotus is using liquid-cooled technologies throughout its suite of commercial charging solutions to make it easier and quicker for EV drivers to charge their vehicles.

Lotus' fast-charging solutions have already been deployed in China and are

expected to roll out across the majority of European countries and Middle East in Q2 2024. Further market availability will be announced in due course.

As charging infrastructure improves over time, Lotus is ensuring its customers are equipped by providing a 450 kW solution. Lotus has futureproofed its charging

offering, which is expected to be the next step forward in fast charging when the infrastructure becomes readily available. Lotus customers will be able to easily upgrade to this power output without additional hardware costs once in-market service providers rollout grid upgrades.


www.lotuscars.com




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Coolant hose for Shell E-Thermal Fluid E5 M is now available

EV applications

OEMs working with EV battery applications which use Shell E-Thermal Fluid E5 M can now obtain an approved dielectric coolant hose from Technical Services (UK) Ltd.

As a key supplier for the much sought-after Shell E-Thermal Fluid E5 M, Technical Services has extended its product range to include specialist components for its application. The new dielectric coolant hose is now available and has undergone extensive testing to ensure fluid compatibility.

The coolant hose has a temperature rating of -40°C to +120°C. It features a smooth inner and a reinforcement rubber outer, ensuring fluid compatibility internally and the durability required for an automotive environment.

Andrew McMahon, Sales and Engineering Director, Technical Services,



says: "Technical Services launched the dielectric coolant hose as part of its EV range due to market demand for reliability. As a key supplier for new cutting-edge thermal management fluids, it is important we have all the correct components available to support OEMs."

The new dielectric coolant hose provides OEMs with an approved solution

for systems that use Shell E-Thermal Fluid E5 M, including the KREISEL electric high-voltage battery system.

The dielectric coolant hose can be purchased from Technical Services as a separate component, as part of a comprehensive install kit or customised cooling system.

www.technical-services.co.uk

StoreDot unveils fast charging concept

Innovation

StoreDot has unveiled a breakthrough concept for taking extreme fast charging (XFC) capability from the cell to the vehicle level with its new I-BEAM XFCTM concept, an innovative cell-to-pack (CTP) design that will accelerate the integration of XFC into EVs.

At the core of I-BEAM XFCTM sits

StoreDot's proprietary 100in5 cell technology, which enables charging 100 miles, or 160km of range in just 5 minutes. StoreDot's 100in5 electrodes are assembled into its new I-BEAM XFCTM cells, which are designed to be incorporated directly into the battery pack.

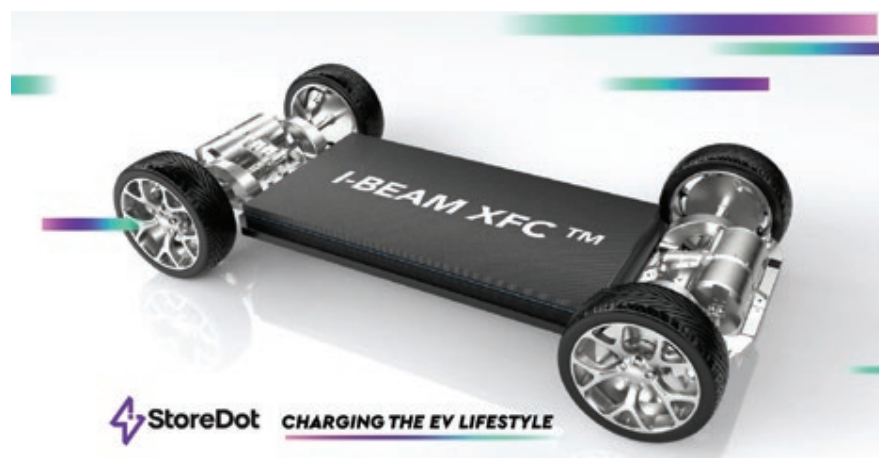
While standard cell-to-pack architectures aim to improve range

and energy density, StoreDot is also focusing on extreme fast charging with its I-BEAM XFCTM concept. It leapfrogs the complexity and cost challenges of embedding XFC capability at the vehicle level, allowing EVs to be charged even more rapidly.

Unlike traditional cooling systems, the I-BEAM XFCTM patented Structural Cooling concept is embedded into the structure of each cell, providing enhanced thermal management. This prevents localized hot spots and maintains uniform temperatures across the battery pack, enabling it to accept the ultra-high currents required for fast charging, with minimal system overhead.

While still a concept, StoreDot has already secured several patents around I-BEAM XFC's™ unique architecture. The company views this groundbreaking design as the key to unlocking the full potential of XFC technology on a mass scale.

www.store-dot.com



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The exhibition is **free** to attend, **free** to park and easy to get to. Doors open at 9.30am on Tuesday 6th February.

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Utility, capability, and sustainability

Ross Anderson on how electrification delivers the ideal balance for **Munro's** all-new Series-M off-road vehicle

It's not so long ago that diesel engines were the powertrain of choice in Europe and the UK, across almost all vehicle segments, and were seen as the most effective solution to reducing CO₂ emissions. At the same time, electric vehicles (EVs) were considered

viable only for early adopters and as limited-range city cars.

Today, all that's changed. Improvements to battery technology and motors have made zero-emissions powertrains much more capable and dependable, evidenced

by the launch of long-haul trucks able to travel more than 300 miles on a single charge. Even in the US, where big V8s are the default choice for pickup trucks, such as Ford's perennial best-seller, the F-150, electric power is catching on.



Driving a diesel off-roader on a trip through the Scottish Highlands with co-founder, Russ Peterson, we realised vehicles like these would also benefit from a redesign as an EV: not just for the environmental benefit, but from a capability standpoint too – the one we were in struggled with the steep inclines, even in low-range.

When we saw an empty row of 50kW rapid chargers outside a café – with several adventure 4x4s parked next to them – it got us thinking: why not develop an EV which could do the job better? One which could be adapted to suit a range of sectors, including construction, agriculture, mining, emergency rescue, power infrastructure, and defence – the ones the original Land Rover Defender was so successful in, until production finally ceased in 2016.

Looking at the gap in the market, we were convinced of the business case for an affordable, all-electric, four-wheel-drive, utilitarian workhorse – one with ultimate, go-anywhere, off-road capability. We also wanted improved refinement, and the inherently smooth, quiet torque delivery of an electric motor reduces driver fatigue – especially when you're behind the wheel for hours on end.

Our answer is the Munro Series-M. It's a clean sheet design, built around a ladder-frame chassis made from 5mm-section galvanised steel for maximum strength and stiffness. We wanted to combine a powerful, efficient, electric propulsion system with the simplicity, ruggedness, and durability of a purely mechanical driveline, so we selected a permanent magnet axial flux motor rated to 170kW or 280kW, an 85kWh Lithium-Iron Phosphate battery pack, two-speed transmission with locking centre differential, and coil-sprung live axles front and rear, each with an optional locking differential.

Having a single motor, mounted relatively high up, ensures that it's better protected from impacts, and from mud, water, and dust ingress. In-hub motors bring more problems than they solve, in our context – not least thermal management and brake performance – while e-axles mean having to use two electric motors, each with its own inverter and controller, which drives up cost and complexity, and both are in the firing line and vulnerable to damage.

Axial flux motors are generally more expensive than the ubiquitous radial flux machines but deliver

significant advantages. Chief among these is mass: at 40kg, our 280kW/700Nm motor is half the weight for the same output. It's also much shorter: only about as long as an A4 sheet of paper is wide, enabling us to package it next to the front bulkhead. This contributes to near-50/50 weight distribution, enhancing off-road capability. We're also using a composite rotor to ensure low 'cogging' and ripple torque, further enhancing refinement.

Axial flux motors develop strong regenerative braking when the driver lifts off the accelerator. This returns energy to the battery, makes it easier to control vehicle speed going downhill, and enables a 'single-pedal' driving style. You don't need to use the friction brakes as much – which also extends disc and pad life.

Most radial flux motors reach speeds of 15,000rpm or more, and therefore require a reduction drive: our motors operate at up to 8000RPM with 700Nm at the shaft. Instead, we send drive directly from the motor to the transmission. This means less weight, less friction, and better packaging.

The transmission has two-speeds because it enabled the optimum





The Munro Series-M comes in both pick up (truck) and Utility (hard top) configurations

rating of the motors for the use cases we wanted to cover, without having to oversize them to deliver the launch torque needed for extreme off-roading and towing. We can deliver greater efficiency at low vehicle speeds, minimising heat generation.

We worked hard on the calibration to deliver the driveability and refinement we wanted: as electric motors develop maximum torque from 0rpm, it can be challenging to ensure that launch performance and tip-in are always intuitive and progressive – we're not looking to maximise acceleration. Also, coupling a highly responsive motor to a heavy-duty mechanical driveline can result in pronounced backlash, so we developed software that ensures smooth, but positive gear engagement.

Energy is stored in three separate battery packs, each with liquid heating and cooling. They're located beneath the passenger compartment floor, one either side of the longitudinal frame rails, and one in-between; total gross capacity is 88.3kWh, with 85kWh useable. This allows us to optimise driveline packaging, while also making it easier to repair, replace or upgrade the battery in future. We use prismatic cells with Lithium-Iron Phosphate chemistry to give the best balance

of energy density, energy efficiency, thermal management, deep cycling, and long service life. This is why the Series M offers a range of up to 200 miles – or, in more practical terms, up to 16 hours of operation off-road – with the reassurance of an 8-year / 100,000-mile warranty, during which time it will retain at least 80% of its original capacity.

We engineered several charging options into the Series-M for maximum flexibility. It can rapid charge at up to 130kW DC – enough to go from 15 to 80 per cent in only 30 minutes. A 7kW AC wallbox is ideal for overnight charging, while those with 22kW three-phase supplies can achieve 0 to 100 per cent in around four hours. If you need to, plugging-in to a 3-pin socket will trickle-charge the battery.

To ensure customers can fully exploit the vehicle's capability, we engineered radius arm suspension systems that would deliver the maximum possible axle articulation and wheel travel. We also ensured that the powertrain and passenger compartment are fully waterproof. As a result, the Series-M has a ground clearance 480mm, approach, departure and breakover angles of 84-, 51- and 148-degrees respectively, plus an 800mm wading depth. For

comparison, the numbers for the main benchmark – the Land Rover Defender 130 – are 314mm, 49-, 35-, and 53-degrees, and 500mm respectively. While both can tow up to 3,500kg, our vehicle can also take a 1,000kg load on a Euro pallet in the back. The immediate, electric torque makes all of this feel effortless, and whereas our 280kW motor generates its 700Nm from 0-2,000rpm, the Defender's 90kW diesel develops 360Nm at 2,000rpm.

As a new company that hasn't engineered a vehicle before, the Series-M was a massive challenge for us. At the same time, it meant we were free of the constraints that many established manufacturers must contend with. We could also implement changes quickly because we can be very agile. We listened to our early customers and evolved the design. Our all-electric powertrain coupled to a purely mechanical driveline is the enabler for the Series-M's unrivalled off-road capability and durability, and we're extremely proud to pioneer the decarbonisation of this key vehicle sector.

Ross Anderson is Munro co-founder and head of drivetrain

www.munro-ev.com

Manufacturing and automotive technology on show

UK's premier annual manufacturing show returns in February

The future is looking bright for the engineering and manufacturing sectors in the UK and Ireland, despite rapid transformation driven by technological advances and global challenges. People who take the trouble to visit the Farnborough-based Southern Manufacturing & Electronics Exhibition in early February next year will be in pole position to profit from the optimism and stay ahead of the curve. The show offers a unique opportunity to interact with experts and suppliers, stay up to date with the latest innovations and make informed decisions to remain competitive.

The organisers say they are receiving the highest-ever number of inquiries and stand bookings from overseas companies, making the 2024 show a truly international event. It is on schedule to be a sell-out, as in previous years, and the high level of demand has prompted the creation of extra space for stands to accommodate the multitude of exhibitors eager to showcase their innovations and solutions. Visitor attendance last time was in excess of 9,000, mostly engineers eager to see what 600 different supplier companies on 460 exhibitor stands had to offer.

Southern Manufacturing & Electronics is the UK's most comprehensive annual industrial exhibition, covering a wide spectrum of technology divided approximately equally between mechanical engineering and the electrical / electronic manufacturing sectors. The



event spotlights production, test and assembly, machine tools, tooling and workholding, 3D printing, PCB design, contract electronics manufacturing, wiring, batteries, electro-mechanical systems, a vast range of components and consumables, design and business software, consultancy and subcontract services. The venue is therefore the ideal place to source everything a business needs to operate efficiently and profitably.

Although it is a multidisciplinary event, it is by no means fragmented. There are no barriers between the various areas, so people can walk easily between stands showing many diverse engineering specialities. Visitors often say this is one of the show's main attractions, as it frequently results in the discovery of companies and technologies that might otherwise be missed. Firms with expertise in similar areas are grouped together, allowing Technology Trails to guide visitors

logically around the exhibits.

The event has evolved significantly since its inception in 1997. From modest beginnings as a regional event, it has become a truly national and international exhibition, attracting visitors and exhibitors from around the world. Its history is intrinsically linked with the Farnborough International Exhibition Centre, where it moved in 2008. Ten years later it was the first event hosted in a new, 20,000 square metre facility built on-site at a cost of £35 million.

Southern Manufacturing & Electronics is unique in its diversity. Exhibitor companies of all sizes, from multinationals to SMEs, create a vibrant atmosphere and foster a strong sense of community. Testament to this is the high rate of repeat bookings and indeed many participants have been with the show since the start.

Automation will feature prominently in 2024, driven by the skills shortage in the UK and Europe. The manufacturing



industry is facing challenges due to Brexit, supply chain disruptions, rising energy costs and higher taxation. As a result, there is a growing focus on automation, Industry 4.0, handling technology such as cobots (collaborative robotics), reshoring of production, and new technologies like green energy and power-saving machinery. Additive manufacturing is gaining ground as a mainstream production technique; and there has been steady growth over the years in the number of specialist plastics and composites companies participating.

In the electronics sector, the exhibition provides a comprehensive look at everything from passive components to specialised sensors, OEM parts, production equipment and an extensive array of service provision. Whether one's interest is in PCB design and inspection, box build or wiring loom and cable harness manufacture and assembly, it can be found here. Likewise, the show plays host to the very latest in the manufacture of mechanical components and assemblies, whether it is equipment for in-house production or identification of subcontractors to which work can be outsourced.

Other no less essential products and services on offer will encompass oil and coolant supply, workshop equipment, dust and fume extraction, humidity control, workplace storage systems, bespoke case and foam manufacture, plastic packaging, injection moulding, hand tools, adhesives, industrial flooring, waste

removal and recycling, training, freight services and financial consultancy.

Specific exhibitor highlights next year will include Colchester Machine Tool Solutions, which is showcasing its new Storm vertical machining centre range and Tornado CNC turning centres. Present also will be another machine tool company, Haas Automation, with over 100 models in its range of vertical machining centres, 5-axis universal machines, horizontal mills and turning centres.

Deval is a UK-based specialist manufacturer of bespoke cable assemblies, harnesses and looms, offering a personalised service focused on customer satisfaction. Kiwa Instruments offers high-voltage test and measurement solutions including partial discharge measurements, VLF-AC testing and cable fault location. Jauch Quartz designs battery solutions for diverse applications. Its primary lithium batteries include the energy-dense lithium thionyl chloride range. Frequency control



products are also provided, as are electrolytic, polymer and film capacitors, inductors, transformers and wireless charging solutions.

In the electronics arena, Relec will feature the latest developments in power supplies and display technology, Esprit will be there to offer guidance for OEMs looking to select the right contract electronics manufacturer, Incap will promote its turnkey supply programme including PCBAs and electro-mechanical assembly, and Accelonix will stress its expertise in microelectronics and PCB manufacturing, from wire bonding to testing.

Beyond the exhibition stands, Southern Manufacturing & Electronics offers educational opportunities via free-to-attend presentations to raise operational excellence in today's competitive business landscape. The seminar programme includes advice for small manufacturers looking to improve their relationship with customers, opportunities for those seeking financial support, how to enhance a sales team's performance, CE and UKCA marking compliance, sustainable practices in manufacturing, the importance of brand awareness and creative campaigns, management skills coaching including how to address the challenges of hybrid working, and digital process management.

Southern Manufacturing & Electronics 2024 opens from 6th to 8th February and will co-locate with AutoAero, a specialist theme within the exhibition devoted to automotive and aerospace engineering. There is ample free car parking space and the site is well served by road and public transport links. A regular, complimentary bus service runs between Farnborough's railway stations and the showground. Admission and parking are also free of charge. Tickets, more information and the current exhibitor list is also on the website.

www.industrysouth.co.uk

Mind over matter

Secondmind has expanded their strategic partnership with **Mazda** to accelerate vehicle design and development through advanced AI – **Steve Welch** interviewed their CEO **Gary Brotman**

Gary Brotman



Gary Brotman, CEO, Secondmind has had the privilege of shaping and scaling product lines and services for leading Fortune 500 companies and startups with machine learning, mobility, and media at their core for over 20 years. His responsibilities have encompassed a broad spectrum, from shaping the AI hardware and software roadmap to fortifying ecosystem partnerships that are essential for collaborative advancements in automotive tech. Prior to Secondmind, as Head of AI Strategy and Product Planning at Qualcomm, Gary had the opportunity to spearhead the strategic direction and product oversight for the company's AI technologies, including those embedded in Snapdragon Mobile Platforms, which are crucial in automotive applications for their processing capabilities and efficiency. Working at the intersection between AI and mobility innovation has proved invaluable experience for his current role leading Secondmind and ensuring that their machine learning solutions resonate with the nuanced

needs of engineers tackling highly complex engineering challenges.

Steve Welch: Could you provide a brief summary of your organisation and offering to the market?

Gary Brotman: The goal for engineers is to streamline the whole vehicle development process - dramatically cutting down those lengthy design, simulation and calibration cycles. That's where Secondmind comes in. Since 2016, our diverse and talented team of automotive engineering experts, machine learning specialists and software engineers have been developing cloud-native optimisation tools that are helping car makers design components, systems and sub-systems in highly complex modern vehicles and then calibrate those systems for optimum performance. Unlike many of the traditional AI tools out there, we're able to achieve this using up to 80% less data, slashing development time by half and significantly reducing costs. The time is ripe for our innovation as the industry seeks to find faster, more sustainable means of delivering the next generation of software-defined vehicles.

SW: Who in the main are the companies you engage with and in what way?

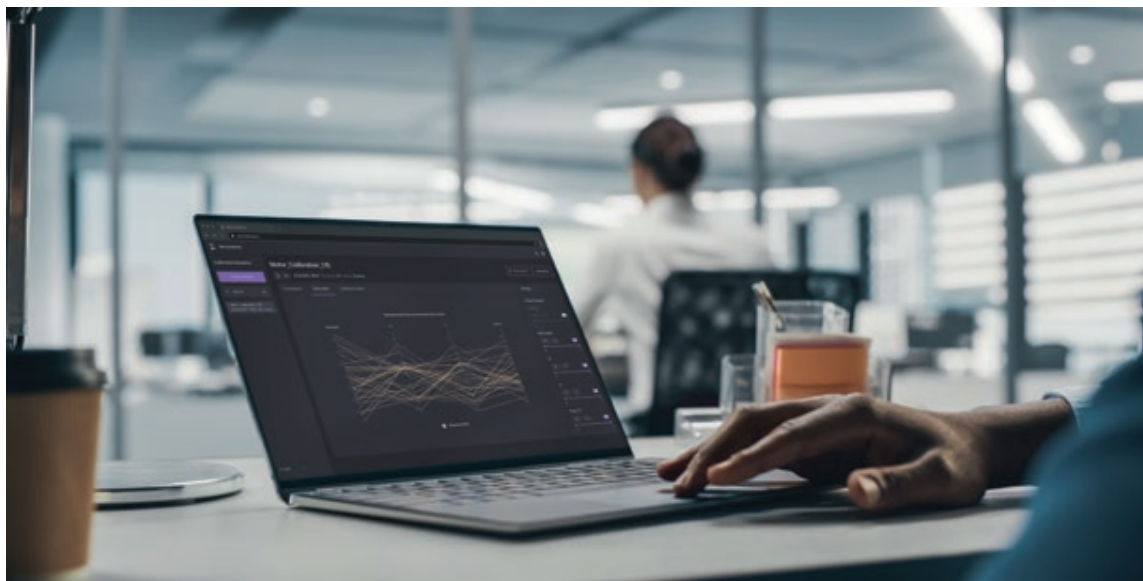
GB: We work with leading automotive OEMs and Tier 1 and 2 suppliers. Today's engineers face a herculean task in efficiently and effectively modelling and simulating the systems that comprise modern cars. The industry is in the midst

of major transformation and faces regulatory pressures to decarbonise, and increasing demands for high-performing, connected, autonomous software-defined vehicles. As a result, product design parameter volume is increasingly leading to an unmanageable amount of data that adds cost and time to the development process at a time when significant reductions in these areas are needed.

SW: What does your tech do?

GB: Secondmind specialises in cloud-native optimisation solutions that focus on designing, calibrating and enhancing complex vehicle systems, such as advanced electric vehicle (EV) powertrains, electric motors (e-motors) and their associated inverters, to name a few. Using our Optimization Engine, engineers can enjoy faster, more intuitive design processes and highly-precise development workflows resulting in a more refined driving experience.

A good example of EV powertrain optimisation is how we help fine-tune the e-motor and its inverter pair - one of the most important components in EVs. Calibration involves a meticulous and time-consuming process of adjusting myriad variables and constraints, all aiming to harness energy from the battery most effectively and rapidly attain peak performance. Engineers are particularly interested in monitoring the rotor temperature, since rising heat can diminish the motor's magnetic field, necessitating a wide range of temperature readings. However, as



testing progresses, increased rotor temperatures can delay the process substantially, as engineers must wait for the system to cool to a stable baseline before proceeding with further measurements, leading to significant downtime.

Secondmind enriches its machine learning algorithms with the engineer's domain knowledge, allowing a more nuanced and precise understanding of the e-motor's thermal dynamics. Our intelligent models are designed to quickly capture and adapt to the distinct characteristics of the e-motor, significantly reducing the volume of data required for precise calibration. This streamlines the calibration workflow, reducing the time it takes to create accurate calibration maps that direct the e-motor and inverter on optimal operations across various scenarios.

SW: What has already been done with Mazda – how long has that relationship been in place?

GB: Mazda initially approached Secondmind based on our reputation for developing effective AI for high-dimensional optimisation, with the first program designed to help calibration engineers manage the high volume of sensors and actuators involved in the calibration of its innovative SKYACTIV system.

Secondmind automated the most time-consuming part of this process and we have since extended capabilities to other calibration processes in EV development.

Mazda and Secondmind have been engaged in an engineering collaboration for more than three years, united by a common goal of enabling the optimisation of vehicle design, development process and performance with advanced AI. This has resulted in bi-directional knowledge transfer, with Mazda helping us identify and understand the most complex problems in vehicle design and development, and we in turn have helped Mazda use and operationalise AI and machine learning software in their business. Through this work, we have developed cloud-native optimisation solutions that will benefit the entire industry, chief among them being our production-grade Secondmind for Calibration solution.

SW: Why have Mazda invested in the company and also a UK company now?

GB: This investment by Mazda will drive AI-fueled innovations that will help Mazda manage increasing engineering complexity in automotive design and development and deliver on the promise of the software-defined vehicle.

SW: What will the funding investment allow Secondmind to do?

GB: We will leverage the investment to accelerate the development and commercial deployment of more high-value system design optimisation and calibration applications.

SW: How will AI impact car design – what are the creative challenges/limitations?

GB: AI's impact on car design will be transformative, offering new methodologies in engineering processes where rapid prototyping, simulation, and testing become increasingly efficient. AI will empower engineers to explore vastly more design permutations than previously possible, using optimisation tools like ours to address high-dimensional engineering challenges in aerodynamics, thermal management, safety, and weight distribution, to name a few.

Understanding AI decisions has, to date, been a limitation due to increasing system complexity and, more so, the black box nature of algorithms in the deep learning class. Secondmind differentiates itself through transparent and explainable AI. This transparency is crucial, as it ensures designers and engineers understand the 'why' behind recommendations and decisions,

reinforcing trust and enabling informed iterations on design choices. This approach aligns with regulatory expectations and satisfies the engineers' need for concrete rationale during all stages of vehicle design and development, ensuring that AI thrives as a tool for enhancing engineering expertise, rather than a black box that obscures it.

SW: Where is AI best used – prototyping, simulation & testing, powertrain design, styling, software in car?

GB: At Secondmind, we see the transformative power of AI as an essential element in advancing all aspects of vehicle development, from the drawing board to the driveway, continually pushing the boundaries of what's possible through continuous vehicle optimisation. But it is important to remember that AI is a toolbox, and there's no such thing as a 'one size fits all' approach. To deploy AI successfully, engineers need to identify the right tool for the problem at hand.

At Secondmind, our tools specialise in tackling multi-dimensional challenges that benefit from rapid, iterative learning and optimisation. Our Active Learning technology has been built to address problems where too much data slows down development to a crawl.

We empower engineers to accelerate early stage design, sharply reducing the need for physical prototypes by leveraging predictive models to fine-tune systems. As the development progresses, our algorithms adeptly manage the myriad factors of vehicle system design, to help the engineer make informed and precise design decisions.

On the road, the same technology can be applied to enhance user experience and enable predictive maintenance, ensuring performance improvements and optimisations that evolve with the vehicle's usage and feedback, end-to-end, across the vehicle's entire lifecycle. The

road ahead is ripe for innovation that will redefine the way we design and experience cars.

SW: What do you see as the key trends in the sector?

GB: The automotive sector's trajectory is being defined by the rise in connected, autonomous and electrified vehicles, and the need to meet increasingly stringent regulatory requirements and mounting consumer demands. Most importantly, the future will be defined through the lens of software. What has traditionally been a hardware-centric industry bogged down by waterfall development processes must evolve to be more agile in thinking and development behaviour. To compete, car makers must compress the time for design and development of new vehicles to under two years, or faster, much like the mobile phone market.

In this dynamic landscape, consumer expectations are also shaping a future where cars require new experiences and continuous performance optimisation is essential to sustainability and brand affinity.

SW: What are your objectives looking ahead to 2024 and beyond?

GB: Our vision is of a world where every engineer has a second mind. The 2024 priorities that will help us achieve this vision are to realise the full potential of our partnership with Mazda while helping engineers at other car makers, Tier 1 and Tier 2 suppliers, and automotive engineering services companies reap the time and cost benefits of the system design and calibration solutions powered by our unique breed of AI. With increasing pressure to demonstrate viability and strong financial health across the technology domain broadly, and in the automotive more specifically, our aim is to grow, but to do so in a sustainable manner. This means leveraging tools like generative AI to drive efficiencies across our business, something we piloted in 2023 in

marketing, engineering and research and will leverage more in the coming months and years to come.

SW: What are the main challenges facing the sector more generally and for you specifically?

GB: The complexity of modern vehicle development creates a big data problem that traditional AI techniques have so far failed to address, as the unmanageable amount of data adds cost and time to the development process. Software complexity is outpacing development productivity by four times (PWC). To put this scale of complexity into context, there is projected to be 1 billion lines of code running in an autonomous vehicle, generating as much as 40TB of data an hour - that's equivalent to an iPhone's use over 300 years and we're now seeing R&D spend eclipsing sales growth (PWC). The industry is facing monumental challenges and those that can leverage AI-powered optimisation solutions capable of crushing mounting software complexity and accelerating development productivity will win. We are excited about the potential for our cloud-native optimisation solutions to overcome these challenges and pave the way for continuous vehicle performance optimisation on the journey to a more sustainable future in the automotive industry.

SW: How would you sum up your message to the market?

GB: As the automotive industry races to reimagine every aspect of vehicle design, development and the experience of driving, Secondmind offers optimisation tools that can crush mounting software complexity and accelerate development productivity. In helping our customers unlock continuous optimisation of vehicle design and performance, we will enable the automotive industry to deliver on the promise of the next-generation of software-defined vehicles.

www.secondmind.ai



HYDROGEN UK

2024 CONFERENCE AND AWARDS



11th - 12th March 2024
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Join us for the UK's
largest hydrogen event!

Early Bird ends 30th November



Helping shape the future

Ceetak and WMG, University of Warwick partner on pioneering smart battery cell manufacturing research

Established in 1980, WMG, University of Warwick is a leading research, education and business department of the University of Warwick and houses the Energy Innovation Centre (EIC), a national facility for battery research.

WMG is an international role model for successful collaboration between academia and the public and private sectors, driving innovation in science, technology, and engineering.

Collaboration with leading UK based manufacturer

Ceetak Heat Sealing Solutions was delighted to be approached by WMG to assist in the design and manufacture of a bespoke battery sealing unit as part of their on-going

research to support electrification in many industries, especially the automotive and aerospace sectors. The research supports innovation and growth in technologies for energy storage and energy machines, drives and systems.

The Ceetak sealing unit will be used by the Cell Instrumentation Team as part of WMG's wider research on batteries across the whole R&D process, including materials and electrochemistry, through to application integration and recycling / re-purposing. The heat-sealing machine produced by Ceetak is to be used for trials in a laboratory environment in relation to constructing smart pouch battery cell instrumentation leading to the

development of affordable, higher energy density and safer batteries.

Past success stories born out of WMG include understanding battery ageing and performance over time, battery safety through regulations and standards, and battery tech for hybrid buses. The findings of these projects are used by businesses to help drive the industry forward.

The engineering brief

The brief was a unit to be a self-contained, adaptable, free-standing and a manually operated battery sealing machine. The pouch material to be sealed is a foil laminate: CPP/Al Foil material which has an approximate thickness of 120- μm , with a total thickness as two ply of 240- μm . This is in combination with being able to form a seal around embedded instrumentation, such as fibreoptics and flexible PCB sensor components.

Additionally, as safety is paramount to both the customer and Ceetak, the requirement was for the heating bars to be enclosed within an interlocking cabinet and all electrical controls to be contained within an integral enclosure.

The technology

The Ceetak team identified that an ImPulse Heat Sealing (IPH) system would be suitable for this project because it offers a compliant weld face compared to the solid metal sealing tools often traditionally used.

IPH also promotes hermetic leak-proof seals both around, and over



Credit: WMG, University of Warwick.

variations in material thickness. The Cell Instrumentation Team embed various types of sensors in their smart cells (temperature, pressure, current etc.), requiring electrical connections to pass through the pouch seal. These variants within the material (such as electrical tabs and sensor wires) need to be carefully heat-sealed over, without damage to these components. IPH technology achieves this critical requirement due to the rubber sealing bar, which compresses and undulates with the material being sealed.

With its precise temperature control and accurate heat-seal force adjustment (with a digital gauge showing pressure display), IPH is suitable for many materials including polyethylene, and biodegradable and compostable films. Additionally, the user can control if heat is to be applied from one or both sides of the material, allowing for even more versatility of this technology.

The result is a user-friendly and adaptable sealing unit with a vital role to ensure the battery pouch has perfect seal integrity.

Full design, manufacture, and testing process

Ceetak Heat Sealing Solutions’ experienced in-house team offer a full bespoke consultancy service incorporating design, materials, technology, and equipment build.

Before projects are signed off, the customer is invited to take part in an ‘FAT’ – Factory Acceptance Trial. Dr Timothy Vincent, Assistant Professor in the Cell Instrumentation Team, WMG, attended the FAT on this project. He was shown the seal capabilities using a dye test which demonstrated no fluid leakage through the seals produced by the IPH technology.

After FAT approval, the machine was transported to the EIC and Dr Vincent commented, “We have been delighted to work with Ceetak on this project as we continue to innovate our cell manufacturing



and instrumentation techniques. The new sealing process developed with Ceetak allows the reliable and repeatable placement of miniature sensors within our pouch cell manufacturing line. We had been conducting many trials to adapt our processes to overcome the variation in material thickness in the seal area when embedding our sensors, however the results were inconsistent. Initial trials in Ceetak’s test lab showed instant improvements in seal quality and consistency”.

Ceetak Heat Sealing Solutions supplies heat-sealing technologies for the sealing and cutting of all thermoplastic materials, foil laminates and other biomaterials including plastics, card, and paper. The company produces both modular heat-sealing components to be retrofitted onto existing customer machinery or alternatively, a complete design and build service of bespoke machinery.

<https://heatsealing.ceetak.com/>



Bespoke self-contained, free-standing unit built for WMG by Ceetak

Accelerating innovation

The Future Propulsion Conference (FPC2024) is a two-day UK event created to bring together industry and academic experts within the propulsion development field. It will open up presentations and discussions on the solutions to the challenges faced by the engineering industry in the UK and internationally over the next ten years.

With multiple pressures pushing the industry to meet ever tighter emission regulations, the need to develop and implement new technology is increasing all the time and the inherent risks can only be mitigated by a better understanding of the technology.

To help strengthen the UK engineering community and to meet



this challenge FPC2024 helps to bring together and bridge the gap between scientists and engineers from the UK's leading academic institutions and the best of the UK's industry.

The companies featured in the

Preview are an example of some of the technology and expertise that can be seen at the event. For more information and to register as a delegate go to:-

www.fpc-event.co.uk

Investing in net-zero emission vehicle manufacturing

Formed in 2013, the Advanced Propulsion Centre UK (APC) supports the transition to a zero-emission automotive supply chain, in the UK.

Funded by the Department for Business and Trade (DBT), the APC collaborates with government, industry, and academia to accelerate the industrialisation of technologies, supporting the transition to deliver zero-emission vehicles.

Its mission is to use knowledge and insight to sustain and grow long-term automotive capability and investment in the UK; building a strong economy through the delivery

of safer, smarter, more sustainable, and affordable mobility.

Since its foundation in 2013, APC has funded 261 low-carbon projects involving 480 partners, working with companies of all sizes, and will have helped to create or safeguard over 58,000 jobs in the UK. The technologies developed in these projects are projected to save over 400 million tonnes of CO₂, the equivalent of removing the lifetime emissions from 16.1 million cars.

Ten years on, in a context of global protectionism and climate



emergency, APC continues to build on and prepare decisive action unleashing future investment in net-zero emission vehicle manufacturing.

With its deep sector expertise, and cutting-edge knowledge of new propulsion technologies, APC helps projects start more quickly and deliver increased value. In the longer term, its work to drive innovation and encourage collaboration is building the foundations for a successful and sustainable UK automotive industry.

For more information go to apcuk.co.uk or follow us @theapcuk on X and Advanced Propulsion Centre UK on LinkedIn.



Access a share of up to £25 million

Does your late-stage R&D project need a boost?

Bring your new advanced propulsion technology to market. Help us advance the UK's journey to a zero-emission automotive industry.

Visit us on Stand 20

Our experts are available to chat about your technology.

Get in touch for more information

Email the team at info@apcuk.co.uk

Visit our website at

apcuk.co.uk/collaborative-rd-competitions



We offer you:

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Receive a share of up to £25 million in match-funding

Collaboration

We can connect you with specialist partners

Expertise

Facilitating your journey through the funding ecosystem

CR&D

Collaborative
Research & Development



Reimagining Motion for a Greener, Safer, Better World of Mobility

AVL with its headquarters in Graz, is one of the world's leading mobility technology companies for development, simulation and testing in the automotive industry, and in other sectors. Drawing on its pioneering spirit, the company provides concepts, solutions, and methodologies for a greener, safer, and better world of mobility.

AVL constantly expands its portfolio of high-end methodologies and technologies in the areas of vehicle development and testing. With a holistic approach - from ideation phase to serial production - the company covers vehicle architectures and platform solutions including the impact of new propulsion systems and energy carriers.

To achieve the vision of climate-neutral mobility, AVL drives innovative and affordable solutions for all



applications - from traditional to hybrid to battery and fuel cell electric technologies.

As a global technology provider, AVL's offerings range from simulation, virtualisation and test automation for product development to ADAS/AD and vehicle software. The company combines state-of-the-art and highly scalable IT, software, and technology solutions with its application know-how, thereby offering customers extensive tools in areas such as Big Data, Artificial Intelligence, Cybersecurity or Embedded Systems.

Furthermore, AVL is striving towards

a safe and comfortable driving experience for everyone and brings a comprehensive understanding of assisted and automated driving functions in different vehicles and environments into play.

AVL's passion is innovation. Together with 11,200 employees at more than 90 locations and with 45 Tech and Engineering Centres worldwide, AVL is supporting customers in their mobility ambitions. In 2022, the company generated a turnover of 1.86 billion Euros, of which 11% are invested in R&D activities to ensure continuous innovation.

Visit the AVL stand '45' and speak with our experts about the future of the automotive industry; they will be on hand to discuss your mobility needs. We look forward to seeing you at FPC2024!

www.avl.com

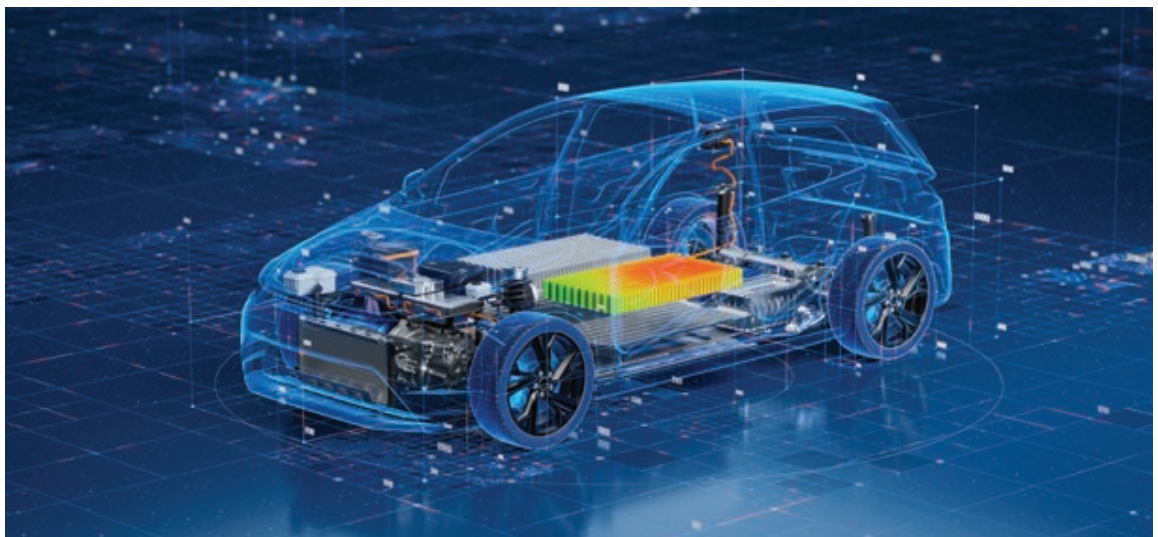
Simulation technology and consulting services

Altair provides leading edge simulation technology and consulting services to the world's top electric vehicle OEMs and suppliers. With the industry's most comprehensive suite of physics

solvers and integrated multiphysics workflows, pervasive optimisation, and data intelligence solutions, Altair is a powerful innovation partner for your next e-mobility programme. Speak to us and see

how Altair's simulation solutions can help you develop highly efficient electric motors, optimised battery packs, and lightweight vehicle structures.

www.altair.com





Reimagining Motion

**For a greener, safer,
better world of mobility.**

We are driven by a passion to examine the science, mechanics and philosophy of movement. By using all our imagination, creativity and pioneering spirit, we create a world that is climate neutral and one that makes safe, comfortable, green mobility a reality for everyone.

Some will call it a distant dream.
We call it **Reimagining Motion**.



Electrification research at the AMRC

The University of Sheffield Advanced Manufacturing Research Centre (AMRC) offers open-access research facilities for the development and testing of electrical machines and components, including design, build and test capabilities at component and assembly level, for use in both - low and high - MRL development work.

Our range of capabilities are tailored towards research in the manufacture of electrical machines and components, including robotic and conventional coil winding and shaping, laser processing of electrical

steels and lightweighting of non-active components in metallic and composite materials, for example, casings, shafts and rotors.

Electrification research at the AMRC is also supported by our wider digital manufacturing capabilities, including automation, composite manufacturing, design and prototyping, data science and artificial intelligence, advanced visualisation, and process monitoring and control.

With two decades of experience at the interface of academia and industry, we work with our own robust

industrial and academic network to accelerate the implementation of novel technology into operational environments. We offer world-class infrastructure, capital equipment and expertise for developing and testing novel solutions to manufacturing challenges.

Every day we work with companies of all sizes — including SMEs, start-ups and large-scale manufacturers — to help them improve their productivity and save time, money and energy.

Whatever your challenge, we can help. So get in touch.

amrc.co.uk



University of
Sheffield

AMRC
Advanced Manufacturing
Research Centre

Addressing the sustainability of EV motors

Advanced Electric Machines (AEM) is a UK-based leader in sustainable motor manufacturing, using British innovation and engineering know-how to deliver rare-earth free electric powertrain solutions for a broad range of transport applications.

Initially providing electric motors for commercial and off-highway vehicles through its HDSRM range of magnet-free machines, AEM is continuing to scale its next-generation SSRD motor for use in passenger cars. Both products deliver 'plug and play' compatibility, industry leading performance and sustainability throughout the entire lifetime of the motor.

By using a patented, novel approach to motor design, AEM's advanced technologies remove the need to use polluting rare earth metals in its machines. In eliminating the need for permanent

magnets, manufacturing costs and the reliance on geographically concentrated supply chains are reduced. The relative abundance of the metals used in AEM's motors significantly improves both the recyclability and environmental footprint over a traditional traction motor.

Since its formation in 2017, AEM has received significant interest in its technology from major vehicle manufacturers and powertrain engineering providers. Historically, engineers have struggled to match the performance of rare earth permanent magnet motors when attempting to develop alternatives. AEM's solution overcomes these challenges and serves as an enabler to reduce the environmental impact

of electrification and electric vehicle production.

Last November, AEM announced that it had secured £23 million of funding to scale up its production capacity, establish a global sales footprint and deliver on its ambitious growth plans. AEM also plans to accelerate its ongoing research and development projects, including the launch of a copper-free motor that will further increase recyclability.

The investment has expanded AEM's recruitment efforts, with positions open for a range of engineering specialities. If you would like to learn more about these vacancies please visit our website.

www.advancedelectricmachines.com

AEM | Advanced
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Test facilities and test benches

Apicom Group is a company of Group ICM and is dedicated in providing testing solutions for the transportation industry. Apicom provides test facilities and test benches for motorcycle, car, truck, engine, transmission, gear box manufacturers and offers a complete range of products and services including eddy current dynamometers, AC dynamometers, chassis dynamometers and test bed

automation for all testing applications. Including End of Line, Research & Development or Remanufacture.

Our systems can test all types of fuel combustion engines, hybrid, or full electric powertrain systems as well as all types of vehicles. Whether passenger car, truck, bus or military to name a few. Our capabilities include design, construction, supply, integration,

installation, commissioning and maintenance of single bench, complete test cell or a turn-key test department.

With manufacturing sites across the globe including UK, Germany, Italy, China, India and Turkey, we provide global solutions locally with a focus on service and support throughout the life of the machine.

www.api-com.uk



Academia and Industry - accelerating the journey to net zero emissions

Coventry University and its global engineering partner FEV, stand at the forefront of the UK's journey to reach net zero emissions targets by 2050.

Leading academic experts and industry players are working together on the science and engineering behind the next generation of electrified propulsion systems for the automotive, aerospace, marine and rail industries.

At the heart of the collaboration is the Centre for Advanced Low-Carbon Propulsion Systems (C-ALPS), a £50 million research facility based in Coventry, where FEV and university teams look for solutions to revolutionise propulsion systems and support businesses in the transport sector.

There are many benefits of working

with C-ALPS experts and they include:

- Access to state-of-the-art propulsion test facilities including:
- Battery cell prototyping
- Battery cell and module testing
- Electrolyser and fuel-cell and stack testing
- Hydrogen fuel-cell, e-machine and ICE powertrain system testing
- An electronics lab and power-semiconductor characterisation facility including EMC chamber
- Vehicle workshops
- Expertise and advice on commercialising research and development activity.

Coventry University's net zero portfolio also includes the Electric Revolution Skills (ERS) Hub, which

looks to enable the success of UK electrification with career and skills development by connecting Power Electronics, Machines and Drives (PEMD) stakeholders. The ERS Hub aims to support and empower the sectors and supply chains of UK PEMD by helping energise and grow the community so that it can meet the challenges of the future.

Contact Coventry University and FEV, and work with us to gain access to the latest novel technologies in future transport. For more information, please visit:

www.coventry.ac.uk/c-alps

www.fev.com/en

www.ershut.co.uk



Electric
Revolution
Skills Hub

Cutting edge of vehicle simulation

Claytex, a TECHNIA Company, delivers exceptional tools at the cutting edge of vehicle simulation. With over 20 years of system simulation experience using Dymola and Modelica in the Motorsport and Automotive sectors, we know that no single challenge is the same. So, we apply an adaptable, flexible and solution-oriented approach, empowering our customers to achieve their technical and business objectives.

AVSandbox, the autonomous vehicle simulation solution developed by Claytex, is built around rFpro and provides physics-based sensor models enabling automotive manufacturers to test, develop and deploy AV solutions into the real world without compromising on safety.

New project brief, including Fuel cell bus

Exploration of new technologies is a key aspect of maintaining Claytex's



position at the forefront of vehicle simulation. Realising Dymola's multidomain support and applying our multiphysics expertise, we conducted a technical exercise in modelling a hypothetical Hydrogen Fuel Cell bus.

Utilising Modelica based Fuel Cell models from our partner Dassault Systèmes, a high level of detail was achieved. Physical air and hydrogen fuel supply systems were integrated with an electro-chemical fuel cell model, with a separate cooling and electrical system completing the ancillary arrangement. To complete

the picture, a physics-based HVAC and cabin thermal model were included to better represent the actual use case such a bus would undergo. Putting the model through its paces in a drive cycle experiment revealed the ancillary system management (fuel/reactant supply, cooling requirements, exhaust flow management) required to support proper system management.

On the autonomous vehicle side, Claytex have won two Innovate UK Government funded projects. They lead the Sim4CAMSens project with the aim to enable accurate representation of ADS sensors in simulation; and partner in the DeepSafe – a dRISK led consortium, developing the simulation-based training needed to train AVs to handle 'edge cases', the rare, unexpected driving scenario they must be prepared to encounter on the road.

www.claytex.com

Fast response emissions and Air Quality measurement

Cambustion's analysers measure particulates and HC, NO & NO₂, CO & CO₂ emissions with millisecond time responses. They can be used to optimise the combustion processes, engine control and aftertreatment to yield efficient powertrain systems with minimal environmental and air quality impact. The fast response time allows engineers to identify engine operating conditions that lead to

transient emissions. High frequency analysers offer critical insights during events such as cold crank and run up, tip-in, deceleration fuel shut offs, and even emissions from individual firing cycles. Emissions analysers with two channels allow simultaneous pre and post aftertreatment measurement to assess EGR rates, catalyst efficiency (including the influence of lambda control) and SCR urea injection

strategies. In-cylinder sampling is also possible for fuel vaporisation studies or measurement of residual gas fraction.

In addition to the products offered by Cambustion, Cambustion's Engineering Services group offers a range of powertrain development facilities from its Cambridge, UK base, catering for conventional ICE, hybrid, and full electric powertrains. The test facilities include 9 transient dynamometers, a robot driver-equipped chassis dynamometer and dedicated particle filter test rigs. New testing capabilities include a 4WD hub dyno and a 4WD chassis rolls, each with battery emulation capability for electrified powertrain development, and hydrogen infrastructure for fuel cell testing.

CamMotive is Cambustion's Electric Powertrain group, working on all areas of Electric Powertrain testing, including Hydrogen Fuel Cells.

www.cambustion.com



Delivering high-value automotive programmes

Dana Lindley Technology Centre (DLTC) is at the forefront of delivering challenging and high-value automotive programmes as part of Dana Incorporated. We are committed to powertrain and transmission development, providing support for customers in passenger car, commercial vehicle and off-highway as they shift to electrification.

The DLTC facility is located on the grounds of the MIRA Technology Park – the UK's most comprehensive automotive proving ground with more than 60 miles of specialist test track and 40 major testing laboratories supporting the development of leading-edge automotive products.

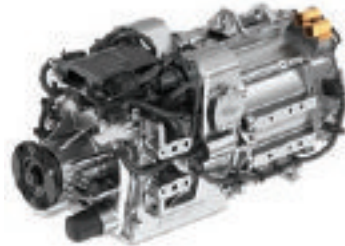
In the commercial vehicle space Dana recently launched a new Zero-Emission Technology for extended coverage of a wide range of duty cycles and applications for commercial vehicles.

The Spicer Electrified Zero-6 e-Transmissions optimise operating

range and vehicle performance for applications ideally suited to a central drive e-Propulsion system with a conventional axle and driveshaft layout.

Leveraging Dana's in-house capability for motors, inverters, gearing, clutches, thermal management, and software solutions, the Dana engineering team brings the market a true integrated system. The new e-Transmissions have been engineered to provide the highest level of efficiency and performance with maximum startability, gradeability, and road speed.

This engineering development



and much more are achieved with close cooperation among our global technology centre network – strategically located across nine countries to ensure proximity to customers – and employs the methods of agile start-ups and drives innovative, high-value solutions and new product optimisation.

This agile mindset is powered by our engineers' belief that there must be better solutions for the electrified future our industry is turning towards. And one of the standout features of the Dana Lindley Technology Centre is that it is a software and electronics development centre as well as having substantial mechanical design capabilities.

To learn more about how Dana powers ideas to move the world in your automotive sector – please visit us on stand 18.

www.dana.com

Growing UK Manufacturing in Power Electronics, Machines and Drives

Backed by UK Government funding, Driving the Electric Revolution Industrialisation Centres (DER-IC) reduce the cost and risk of manufacturing Power Electronics, Machines and Drives (PEMD) in the UK by providing open access to expertise and state-of-the-art manufacturing, test and validation equipment.

DER-IC supports the PEMD supply chain with open-access capital equipment, specialist capability, prototyping, testing, design for manufacture, manufacturing process development and scale-up, access to supply chain partners and training.

The DER-IC network engages in collaborative research and development projects (CR&D) funded through UKRI, Innovate UK, regional initiatives and other funding schemes. DER-IC can deliver projects and access to equipment and capability through commercial

contracts and provide SME advice and regional support programmes. DER-IC hosts an online portal enabling partners to highlight PEMD capability, and link with the national DER-IC network and industry to promote business to business collaboration.

DER-IC can facilitate targeted introductions to expedite access to the most relevant researchers, engineers and capability across the partner network. Company IP can be protected through all engagement routes.

By using DER-IC equipment and capability, supply chain partners

can develop and verify product and manufacturing process performance ahead of committing to capital investment, reduce cost and risk of new product introduction (NPI) and achieve a faster time to market.

DER-IC offers the following capabilities:

- Product and Manufacturing Process Equipment Design
- Manufacturing Process Development and Optimisation
- Prototype Manufacture and Scale-up Support
- In-Process and End-of-Line Test and Validation
- Material and Component Characterisation
- Electrification Skills Learning and Development

Visit our booth at FPC to find out more.

www.der-ic.org.uk



Innovating tomorrow's world today

DGI is powering the transition to electrification with disruptive, environmentally friendly technologies for electric propulsion and energy storage. DGI's segmented motor architecture breaks conventions to deliver the superior power density and efficiency critical for the electric transition.

Applicable for light and heavy commercial vehicles, marine and defence applications, DGI's patented Pareta® drive system has a unique architecture that divides motor and inverter functionality into multiple segments, each of which can be powered and controlled individually. The control system optimises torque output across wide speed ranges while achieving exceptional reliability, thanks to built-in redundancy that maintains

functionality should any individual component fail.

As global leaders in sustainable technologies, DGI has only just begun to tap the potential of its innovations. The company can customise Pareta® electric drive configurations to meet specific efficiency, size, cost, and safety demands. And it's responsive support facilitates seamless integration of its revolutionary technologies into existing and conceptual designs.

While propulsion is the main focus of FPC 2024, attendees will also be able to discuss DGI's patented hard carbon anode material, sustainably made from bio-waste. This provides a recyclable, non-toxic alternative to conventional lithium-ion battery technology, offering enhanced performance with competitive costs for sustainable energy storage

in stationary and transportation applications.

"The Future Propulsion Conference is an important event where industry leaders come together to discuss electrification and decarbonisation," said Martin Boughtwood, CTO of DGI. "We are excited to be showcasing how our unique technology will help power the zero-emission future."

www.dgiplc.com



Simulation and validation of your Innovations

dSPACE is a leading provider of simulation and validation solutions worldwide for developing networked, autonomous, and electrically powered vehicles. The company's range of end-to-end solutions are used particularly by automotive manufacturers and their suppliers to test the software and hardware components in their new vehicles

long before a new model is allowed on the road. Not only is dSPACE a sought-after partner in vehicle development, engineers also rely on our know-how at dSPACE when it comes to aerospace and industrial automation. Our portfolio ranges from end-to-end solutions for simulation and validation to engineering and consulting services

as well as training and support. With more than 2,500 employees worldwide, dSPACE is headquartered in Paderborn, Germany; has three project centers in Germany; and serves customers through its regional companies in the USA, the UK, France, Japan, China, Croatia, Korea, India and Sweden.

www.dspace.com



Developing and integrating innovative electric powertrains

Equipmake has more than 20 years' experience developing and integrating industry-leading innovative electric powertrains. Not only is the company a leader in high performance electric motors, but also complete EV drivetrains with power dense inverters and associated software.

Equipmake's team can take a project from initial specifications through modelling, simulation, design, prototyping, testing and then production in tight timescales.

Equipmake has become a global leader in vehicle repowering, and continues to supply leading technology to electric sports car and hyper car projects. Inverters have been developed to **ISO:26262 ASIL-D**, integration as a complete powertrain is possible with the inclusion of Equipmake designed motors or e-Axle.

At the 2024 Future Powertrain Conference, Equipmake is exhibiting the following high-performance products:

HTM-3500 is a robust, compact, high-torque motor generating 3,500Nm and maximum power of 400kW. Ideal for buses, HGVs and mining trucks, its direct-drive design negates the need for a separate transmission, enhancing packaging within the powertrain. Our next generation includes an upgrade which significantly increase continuous performance (S1) along with a new cast design giving more product flexibility

HPI-800 is a state-of-the-art silicon carbide inverter featuring modules from Wolfspeed/Cree. Rated at a continuous maximum power output of up to 400kW, and switching at frequencies from 20-40kHz, it's light weight modular design is easily scalable for a given application. Taking advantage of Equipmake's propriety HW and SW the HPI-800 can meet stringent ASIL-D functional safety requirements.

HPI-450 is an Insulated Gate Bipolar Transistor inverter, ideal for low-volume, high performance electric vehicles,

from sports cars through to hyper cars. Light and highly efficient, HPI-450 offers switching frequencies from 1-20kHz and delivers exceptional power and control. It is also for ASIL-D capable.

Ampere-220 e-Axle

The e-Axle features the Ampere electric motor which, with a spoke rotor design is extremely lightweight yet efficient. Ampere has a maximum motor speed of 30,000rpm and weighing just under 20kg, it offers power density of 11kW per kg. In twin-motor specification, Ampere-220 e-Axle offers 440kW peak power per axle with a total unit weight of just 85kg including all necessary power electronics, Equipmake's SiC inverter and a reduction transmission, ready to be integrated into a high-performance electric vehicle.



www.equipmake.co.uk

Programmable Power Systems

ETPS specialise in programmable power supplies and electronic test systems. The company's problem solving skills provide the catalyst to drive propulsion research forward for many of the world's leading brands.

The company will be showcasing their G5-RSS bidirectional DC power systems at the conference. Modules are available from SELV models starting at 60V/338A, ranging up to 3000V/5MW at tens of thousands of amps.

With two current ranges for high accuracy, the G5-RSS is ideal for cycling energy storage devices. The module's ultra-fast dynamics with switchable capacitance also allows accurate simulation of batteries and capacitors. A current step between 90% sourcing to 90% sinking can be as quick as 50us, enabling high speed drives to be supplied. An embedded function generator enables V/I and V/W relationships to be programmed against time, to accurately simulate a

discharging fuel cell.

Each power dense module has an extensive feature set which includes programmable PI parameters, programmable ripple, and an inbuilt 8 channel recording scope. Adjustable power and resistance limits are provided. A high speed 1kHz CAN interface is available.

Modules can be arranged in series, parallel or matrix configurations. Unusually, units can also be connected in master/slave with different nominal values. For example, a 36kW/500V module will connect in parallel with a 54kW/500V unit to provide 90kW/500V. Multi-module systems based around a centre tapped earth are possible, creating a +/- voltage output. Ideal for testing power systems used in ships and aircrafts.

Besides bidirectional systems the ETPS product range includes new and rental DC & AC sources, electronic loads, four quadrant grid simulators and battery chargers/dischargers. Application specific equipment is also available for battery emulation, fuel cell simulation, battery cycling, V2G/V2H testing, electric drive testing, fuel cell loading, plus many more. Power systems ruggedised against shock, vibration and humidity are also available.

www.etps.co.uk



Battery, EV and Gigafactory recruitment

EVERA Recruitment is the world's only dedicated Battery, EV and Gigafactory recruitment consultancy. The EVERA team have been involved in the Battery, EV and Gigafactory market for more than 10 years. Our team is made up of professionals that understand the complex technology that our clients use and thus the skillsets required to make their businesses a success. We understand the complexities and skills required for the industry; from powder and electrochemistry through to cell manufacture, integration and ultimately recycling of battery systems. As these new industries evolve, we monitor the market and provide insight into parallel sectors that require similar expertise from their employees.

The EVERA team partner with our customers to provide a dedicated service and give our partners an unfair advantage – our consultants don't do any sales calls to allow us to focus

all of our time on supporting your recruitment needs. We take the time to we get to know our customers and work closely with them to find the right person for the job, and every candidate is taken through a 30 point screening process to establish their personal and professional circumstances, as well as their interest level in the roles we discuss. We can also partner with any other agencies you work with to help create a streamlined process with a single point of contact.

On top of our work to support the EV revolution, EVERA is committed to reducing our impact on the environment and has just released a 5 part Environmental Pledge including initiatives to plant a tree for every candidate placed, creating Bee Motorways, and committing to community wildflower propagation. We have also been certified as a Carbon Negative Company with well over 1000 tonnes negative for a 160 tonne footprint.

www.everarecruitment.com



Developing innovative simulation solutions for 25+ years

Global talent, personalized service

Gamma Technologies, LLC. develops and licenses GT-SUITE, a leading multi-physics CAE system simulation software. GT-SUITE includes a complete library of physics based modeling templates covering fluid flow, thermal, mechanical, electrical, magnetic, chemistry, and controls. In addition, higher level modeling templates are available that are specifically designed for specific applications.

GT-SUITE applications include: powertrain, engine, a variety of vehicles, driveline, transmission, hybrids, exhaust aftertreatment chemistry, acoustics, cooling & thermal management, HVAC, hydraulics, fuel systems, lubrication, chain, gear & belt drives, and others.

We at GT are dedicated to building the most advanced system

simulation tools complemented with carefully designed software solutions that provide major productivity improvements for our customers.

1D & 3D MULTIDISCIPLINARY APPLICATIONS

Gamma technologies offers a comprehensive application simulation suite

From automotive cabin comfort, engines, batteries to pump and compressors, Gamma Technologies offers state-of-the-art simulation software for engineering today...and tomorrow.

SIMULATIONS FOR MOBILITY ENGINEERING AND BEYOND

Multi-physics, integrated systems for product engineering

Since the late 90's Gamma Technologies has offered robust

engineering simulation capabilities. Using GT-SUITE, vehicle engineers are designing tomorrow's vehicles today using our robust, integrated solutions.

ENGINEERING THE FUTURE

Working differently with gamma technologies

By partnering with Gamma Technologies and committing to work smarter will allow your organisation's product innovations to be the best-in-class while reducing prototypes, development time, and hardware cost.

www.gtisoft.com



Innovating the next generation of eDrive systems

GKN Automotive is a world-leading global automotive technology company that pioneered electric drive systems and is now driving the future of transportation. Its origins date back to 1759, and for the last 70 years it has been at the forefront of the automotive industry, putting key technologies into series production. It is the trusted partner for most of the world's automotive companies, specialising in developing, building, and supplying market-leading driveline systems and advanced ePowertrain technologies. The first eDrive system was fitted to a production car over 20 years ago and GKN Automotive is now powering over two million electrified vehicles worldwide. GKN Automotive's Innovation Centre in Abingdon, Oxfordshire, is one of the leading global hubs for developing the eDrive systems for future electrified vehicles. This is

where its engineers work on solutions for future systems and channel that knowledge into GKN Automotive's product development pipeline. As part of the Advanced Research Centre project, GKN Automotive's engineers at Abingdon, UK, work in close collaboration with the University of Nottingham and Newcastle University to push the boundaries of future electrified products through collaborative research and testing.

Amongst GKN Automotive's portfolio of innovative drive systems is a range of 3-in-1 and 2-in-1 eDrive systems. These systems demonstrate the business' integration expertise and will be on display for attendees to view at the conference. This includes a 3-in-1 eDrive system with integrated active motor components, which has an integrated park lock system, a disconnect system and active sids shaft components built



into one compact unit. GKN Automotive will also display its Offset 2-in-1 eDrive System, which includes an internal permanent magnet synchronous machine and park lock system.

GKN Automotive's 800V inverter technology will also be available for conference attendees to see at its exhibition space. This features a range of improvements to deliver market leading performance and enhanced sustainability. The integration of 800V technology in the automotive industry is a key development as it allows for faster charging times, higher efficiency, and improved performance for future electric vehicles.

GKN Automotive's technology will be on display at booth 46 in the Britannia Suite, alongside its experts from the GKN Automotive Innovation Centre.

www.gknautomotive.com

Busbar & Core Pack experts to showcase components

H V Wooding, a pioneering force in high-performance components for the hybrid and electric vehicle market, returns to FPC2024. Renowned for its expertise in crafting bespoke busbars for battery and drivetrain applications, alongside precision-engineered motor laminations and core packs, H V Wooding stands out for its seamless collaboration with clients from prototype inception to full-scale series production.

Boasting a diverse array of in-house capabilities, including wire erosion, laser cutting, presswork, electroplating, and powder coating services, H V Wooding ensures the adoption of the most efficient manufacturing methods. This commitment guarantees the delivery of products characterised by unparalleled quality and reliability.

Actively participating in a



spectrum of low-carbon vehicle projects, spanning electric buses, commercial vehicles, off-road machines, construction vehicles, rail, and aerospace applications, H V Wooding's esteemed clientele includes industry giants such as Mercedes, McLaren, Williams Advanced Engineering, Ford, and Rolls Royce.

Setting new benchmarks in the

fabrication of pre and post-bonded core pack assemblies, H V Wooding excels from initial prototyping to mid-volume production. Their advanced capabilities empower them to achieve the most stringent tolerances, working with a diverse range of Silicon Steels and Cobalt materials.

With over 50 years of busbar manufacturing prowess, H V Wooding has further elevated its capabilities pioneering a groundbreaking powder coating process, enhancing the quality and performance of electric vehicle busbars to meet the demands of this rapidly expanding market.

Embark on a journey through innovation and excellence – discover H V Wooding's cutting-edge components and engage with their expert team on their stand in the Manxman Suite during FPC2024!

www.hvwooding.co.uk

Advanced Powertrain Research & Innovation

IAAPS is a world-leading centre of excellence supporting the transport industry in the transition to net zero. Established to foster engineering innovation through the collaboration of industry, enterprise and academia, IAAPS is a wholly owned commercial subsidiary of the University of Bath.

Combining cross-sector academic rigour with commercial focus, the centre supports industry in the development and adoption of clean, efficient and affordable zero carbon propulsion technologies for integration into commercial applications. IAAPS' expertise is based on more than 40 years of propulsion systems research at the University and enables a broader experimental approach than conventional test facilities.

Working with key players from the automotive, aviation, marine, off-highway and heavy-duty segments, as well as being a front-running in

hydrogen propulsion research and development, IAAPS plays a pivotal role in the delivery of rapidly evolving hydrogen technologies.

IAAPS has world-class, fully integrated research facilities with the flexibility to cater for most propulsion types from advanced engines supplied by a range of fuels through to hybrid and electric powertrain systems. The £70 million, 11,300 sqm Research & Innovation centre, based on the Bristol & Bath Science Park, can accommodate complete



vehicles, individual systems or single components through bespoke cell configuration, utilising the latest measurement equipment designed to offer partners timely, consistent, accurate and repeatable data, analysis and results.

Unique technical facilities include 2x4WD 5e Hybrid Powertrain / Transmission cells, 1x4WD chassis dyno, 1x2WD 3e Hybrid Powertrain / Transmission cells, 7x Propulsion cells for electric machines, battery, inverter or engine systems, 1x Turbocharger / Hot Gas Stand with 3x flexible lab spaces, Digital Engineering and simulation including HP Hardware in the loop integration in all facilities, up to 750kW battery emulation available in all cells, green hydrogen production, storage and distribution together with closed loop cryogenic helium cooling systems.

www.iaaps.co.uk

Supporting business-led innovation

Innovate UK is the UK's national innovation agency. We support business-led innovation in all sectors, technologies and UK regions. We help businesses grow through the development and commercialisation of new products, processes, and services, supported by an outstanding innovation ecosystem that is agile, inclusive, and easy to navigate.

We help companies, through three strands of activity:

- **inspire:** to make the opportunity visible and compelling
- **involve:** to bring relevant organisations and people together
- **invest:** to convene the resources needed, including our own.

We do this in our five strategic theme areas and through the six strong foundations that underpin all our activities.

We help companies access the expertise and equipment they need, build the partnerships that will help

them go faster, and fund the innovation work through grants or loans.

We support the best ideas from business, as determined through free and fair competition.

Within Innovate UK, the Land and Maritime Transport team work closely with a number of different government departments and other stakeholders to deliver funding which accelerates high growth potential areas of the transport industry. These include Zero Emission Vehicles, Connected & Autonomous Vehicles, Rail, Connected Transport, Vehicle Charging and Clean Maritime.

We are currently looking to expand our pool of technical experts in the above transport areas, who review and score applications submitted as part of our funding competitions. Our assessors are experts from both business and academia and are allocated to applications based on their skills and expertise in relevant technical areas. If you are interested in becoming one of our paid assessors please contact support@iuk.ukri.org for a discussion, making reference to the Land and Maritime Transport team.

www.ukri.org/councils/innovate-uk/



Moving the world towards zero emissions

Our state-of-the-art £70m research & innovation centre at the Bristol & Bath Science Park delivers a wide range of expertise to facilitate multi-disciplinary collaboration across all propulsion types and transport sectors, accelerating the pace of innovation in future mobility.

The addition of our new green H2 production and test facility, the first of its kind in the South West of England, will support vital research and development into sustainable propulsion technologies and the use of hydrogen as an alternative green source of fuel to achieve net zero targets, in particular in the hard to electrify sectors such as aviation, marine, off-highway and heavy-duty transport.



We are excited about talking to potential partners to understand their challenges and how we can work together to solve them.

Email iaaps@iaaps.co.uk for more information.

www.iaaps.co.uk

Fast charging battery pack development for first responder electric motorbike

The global drive for decarbonisation of the transport sector has led to the creation of ambitious targets for the reduction or elimination of in-use emissions. While these targets may be primarily focused on reducing emissions from passenger vehicles and commercial transport, they extend as far as the emergency services and first responder vehicles.

These applications have unique requirements that are often not well catered for by mass-produced solutions, and this is particularly evident in the field of urban first-responder motorcycles. Existing fully-electric offerings are both expensive to purchase and slow to recharge, particularly when judged against the state-of-the-art in the passenger car market.

MAHLE Powertrain and White Motorcycle Concepts are working in

partnership to develop a new and innovative fully-electric three-wheeled motorcycle with fast charging capability and high availability. This will enable emergency services to operate a zero-emissions fleet without sacrificing service levels or needing to purchase additional vehicles to compensate for the downtime created by incumbent slow charging technology.



This solution is centred around a fast-charging battery pack, designed by MAHLE Powertrain, that is packaged around a unique aerodynamic architecture that makes use of White Motorcycle Concept's patented V-Duct technology, a venturi duct that passes through the centre of the motorcycle that significantly reduces drag, improving performance and efficiency. Optimised for packaging, weight and mass centralisation, this battery pack delivers exceptionally fast charging levels with high thermal stability and a long lifetime.

At this year's Future Propulsion Conference, MAHLE Powertrain will present the results of the design and analysis work undertaken to optimise the thermal and structural characteristics of the battery pack.

www.mahle-powertrain.com
www.whitemotorcycleconcepts.com

Skills development

The MTI is a result of a unique collaboration led by North Warwickshire and South Leicestershire College and its partners HORIBA MIRA, Coventry University, the University of Leicester, and Loughborough University. It is helping to create specialist skills in electrification, autonomous and connected vehicles, cybersecurity, and safety.

As investment in hydrogen continues to grow bringing broader access to refuelling and transportation infrastructure, commercial fleets will

increasingly benefit from the potential of hydrogen fuel cell vehicles (FCEVs). Hydrogen is an excellent fuel source for LGVs and HGVs because vehicles can be refuelled very quickly with no downtime for lengthy charging periods. The range of these vehicles is inevitably longer as they have larger batteries than cars.

The MTI is at the forefront of developing capacity in this area of skills development, helping businesses to understand and realise the potential of hydrogen as an alternative clean

source of energy that can keep their vehicles on the road with the minimum of downtime while reducing their environmental impact. One-day and three-day training courses for businesses and individuals in the automotive and logistics sector are available from the MTI to help them gear up for the switch to cleaner, greener energy.

Since it first opened its doors, the MTI has welcomed over 48,200 students and delegates. This includes over 3,600 studying for accredited qualifications from a Level 1 Institute of the Motor Industry (IMI) certificate up to Masters' degrees, and over 880 apprenticeships at all levels. More than 18,200 automotive professionals have taken part in professional development activities.

To find out more about how to access flexible training options email enquiries@mti.ac.uk

www.mti.ac.uk



Specialists in high voltage automotive power cables

OSCO supports Customers with High Voltage Automotive Power Cables, Modular High Voltage Distribution Units (mHVDU), Cable Harness Assemblies, Litz Wire and Thermal Management Materials to OEMs and Suppliers of Electric Vehicle Systems and Motor Powertrain Technologies.

Partnered with Huber+Suhner, OSCO's HV cable range is tested and approved to Automotive Standards and designed to operate successfully within the harsh environmental conditions of the transportation and automotive markets. With stock readily available in screened, unscreened, single core and multi-core constructions, OSCO provide a quick turnaround for prototype developments and production.

The mHVDU is an off-the-shelf solution designed with a range of standardised components, which can be configured to achieve the individual requirements of all types of electric vehicles (land, water, or air) where



high voltages need to be distributed. Managing up to 800 Volts DC it meets EV standards whilst providing automotive manufacturers with various added benefits of weight, space, and cost savings in a simplified housing design.

It is essential that all HV cables and vehicle components are protected throughout tough driving environments. Huber+Suhner's mHVDU and large portfolio of HV cables work in harmony to deliver optimum performance when

distributing power in an electric vehicle deliverable from OSCO in a complete cable ready-to-use system.

OSCO's engineering team also design Litz Wire solutions for increased winding efficiencies and Thermal Materials providing superior thermal transfer. All Thermal Materials can be cut to drawings, and Litz Wire designs processed into windings manufactured in-house with short lead times.

With over twenty-five years' experience, OSCO consistently fulfils Customers expectations delivering quality products and a high level of Customer Service with Technical Engineering and Assembly capabilities in-house.

Visit OSCO at Stand 40 in the Britannia Suite.

www.osco.uk.com



Testing equipment and facilities

Sierra CP Engineering design and build world leading testing equipment and facilities, enabling our customers' design, development and production of future propulsion systems.

Over thirty years of successfully meeting tough customer challenges has taught us that the concept of "one solution fits all" just doesn't work in the auto test industry. As a result, we have positioned our company to embrace the critical role that flexibility plays at every stage of design and development. And it all starts with creating an open atmosphere for client interaction that breeds innovation.

Whether upgrading existing test cell equipment or facilities or planning new installations, Sierra CP works in partnership with our

global clients to deliver custom products and testing solutions for both present and future needs.

To help meet the challenges of a rapidly changing industry, Sierra CP has developed advanced hardware and software solutions covering the complete scope of test applications.

At the heart of many Sierra CP solutions is our powerful CADET automation technology. Its innovative, open design and easy to use interface allows us to integrate seamlessly with existing instrumentation and other manufacturers' equipment, or build powerful turnkey systems designed to our customers' specific requirements.

2024 will see the Sierra CP headquarters move to a new facility in the UK with over twice

the current floor area. This will enable our continued expansion in production capacity, engineering capabilities and service resources.

Along with our UK facilities where Sierra CP designs and manufactures all our own solutions, we support them globally with technical locations in the USA, China, India, Australia and Malaysia.

www.sierra-cp.com



SPAL introduces new super-efficient cooling fans

Designer and manufacturer of high-performance axial fans SPAL Automotive has responded to the growing demand for ever greater efficiency in electric vehicles with the introduction of a range of High Voltage cooling fans.

Both 850W and 2kW HV fans will be the main attraction for visitors to the SPAL stand at FPC 2024.



Developed to fulfil EV makers' requirements, the fans can be powered directly from the vehicle's battery, therefore eliminating the need for a DC/DC converter in the system. Such a solution will not only improve the energy efficiency, but it will also contribute to bring the overall build costs down.

Suitable for all types of vehicles and machines where a high voltage battery is used, SPAL's latest product addition will appeal to manufacturers of short-haul truck and delivery vans. These vehicles, equipped with 400V and 800V batteries, are typically used for food deliveries in urban areas with pollution and noise restrictions, this means vehicle designers need to use low noise components compatible to the battery voltage, which makes SPAL's HV fan with a minimum/maximum operating voltage of 450V to 850V the ideal cooling partner.

As with other fans in the SPAL brushless family, the fully sealed



brushless drive units meet IP6K9K specifications and are resistant to corrosion and water ingress. Smart controlled with CAN, PWM and LIN versions available as well as HVIL optional, the built in diagnostic and safety features enable the fans to maintain performance in challenging environmental conditions while delivering 40,000 hours of operation.

The new HV fans join a suite of new products from SPAL aimed at maximising energy and thermal management efficiency in EVs which includes the extended range of brushless drive coolant pumps.

Find out more about the new SPAL fans at FPC 2024, Stand No. 8

www.spalautomotive.co.uk

Supporting innovation

TBAT Innovation is a leading consultancy firm founded in 2002, dedicated to supporting and driving innovation within the SME sector. With a strong focus on new product and process innovation, TBAT has evolved into a dynamic and forward-thinking enterprise. Their team of experts are passionate about embracing a hands-on approach to problem-solving and drawing from their extensive knowledge and experience, they provide comprehensive support to companies throughout the entire lifecycle of innovation, from the initial concept to successful implementation.

TBAT understand the challenges faced by businesses in today's rapidly changing landscape, offering

tailored solutions that address the unique needs of each client. TBAT can help you access Grant Funding, R&D Tax Credits, Video Games Tax Relief, SEIS/ EIS, Capital Allowances, and Patent Box. They also offer Grant Claim Management and HMRC Enquiry Support.

With a track record of success, TBAT has helped a large volume of companies achieve their innovation goals. Their deep understanding of various industries, coupled with their commitment to staying at the forefront of emerging technologies and market trends, enables them to deliver results-driven solutions that propel businesses forward. Whether you are a startup seeking funding opportunities or an established company looking to enhance your

R&D capabilities, TBAT is your trusted partner in innovation.

www.tbat.co.uk



Innovation

Specialised sensor technology and measurement solutions

Transense Technologies plc is a leader in the development and supply of specialised sensor technology and measurement solutions for use in demanding markets like aerospace, robotics, electric motors and drives, industrial machinery, and motorsports.

Transense's Surface Acoustic Wave or SAW sensor solution is proven to deliver accurate, real-time measurements of torque, temperature, force, and pressure to

improve performance, efficiency, and safety. This patent-protected technology offers significant advantages over conventional sensors including improved

accuracy, higher sensitivity, more compact packaging, and the ability to maintain the mechanical integrity of the system being measured.

www.transense.com



High-performance test stand drive systems

Unico is recognised as one of the World's leading manufacturers of high-performance test stand drive systems. Unico have worked together with R&D teams across the automotive, motorsport and aviation sectors to develop high speed dynamometers, battery simulators, battery cyclers and

other test systems for today's fast evolving EV market. This year Unico have added new product lines to their portfolio specifically for the battery industry. This includes high channel count battery cell testers, module testers and a new battery test and data acquisition system.

www.unico.co.uk



Putting Engineers in the Fast Lane

For more than 35 years, Vector has been your capable partner in the development of automotive electronics. Driven by our passion for technology, Vector develops tools, software, hardware and solutions for automotive and related industries around the world. Solutions from Vector help simplify the development of embedded systems in areas such as e-mobility, safety and security, ADAS and autonomous driving.

Shaping E-Mobility Smart Solutions for the Electrified World

Electric mobility is the future of transportation and innovative solutions are becoming available to allow electric mobility to enter the mass-market. Vector supports developers of on-board charging ECUs in the vehicle, charging

stations and induction charging systems with extensive test systems and libraries of test cases. Helping our customers to develop their software quickly and cost effectively.

The development of electric vehicles poses new challenges for measurement technology. Vector and our partner company CSM developed powerful and flexible e-mobility measurement solution providing fast multi-channel

measurements in high-voltage cables and components.

Vector also offers a comprehensive tool chain for the new SAE standard ZEVonUDS. This supports all development phases from the specification of the relevant OBD content to the implementation in ECU software and its validation to the application in the OBD diagnostic tester ("scan tool").

www.vector.com



Silicon Carbide semiconductors

For more than 35 years Wolfspeed has built a legacy of designing and supplying high-quality, high-performance Silicon Carbide materials and devices. As a pioneer in Silicon Carbide semiconductors, Wolfspeed offers a high-performance portfolio of next-generation Silicon Carbide MOSFETs, Schottky diodes and power modules. Our product lineup delivers low losses, high current density and reduced system sizes for a diverse array of applications such as automotive EVs, fast EV chargers, industrial E-Mobility, renewables and motor drives.

Unlocking a new era of energy efficiency

Wolfspeed is harnessing the power of Silicon Carbide to change the world for the better with our growing portfolio of power devices that enable customers to deliver solutions that significantly reduce greenhouse gas

emissions in transportation, energy generation and energy storage. Our solutions are fundamental to the electrification of the drivetrain that powers the shift to electric vehicles, to simplifying renewables designs that can drive broader adoption of alternative energy, and are enabling motor designers to meet increasingly stringent efficiency standards.

Increasing capacity to address steepening demand

Wolfspeed was the first vertically integrated supplier of Silicon Carbide devices and for the past 35 years has supplied more than 90% of the world's Silicon Carbide. Today, Wolfspeed is meeting the

rapidly growing global demand for Silicon Carbide devices with Mohawk Valley Fab, the world's first 200 mm Silicon Carbide fab in Marcy, NY, and a planned second 200 mm fab in Saarland, Germany. These industry-leading fabs will be supplied with Silicon Carbide from the John Palmour Manufacturing Center for Silicon Carbide, a state-of-the-art materials manufacturing facility in Siler City, NC that will expand Wolfspeed's existing materials capacity by 10x.

At Wolfspeed we unleash the power of possibilities through hard work, collaboration and a passion for innovation.

www.wolfspeed.com



Guiding innovation forward

Arrow Electronics guides innovation forward for over 210,000 leading technology manufacturers and service providers. With 2022 sales of \$37 billion, Arrow develops technology solutions that help improve business and daily life.

Our strategic direction of guiding innovation forward is expressed as Five Years Out, a way of thinking about the tangible future to bridge

the gap between what's possible and the practical technologies to make it happen.

Our broad portfolio spans the entire technology landscape, helping customers create, make and manage forward-thinking products that make the benefits of technology accessible to as many people as possible.

Offering customers components to build their designs, in addition

to engineering support, customized systems and technology platform solutions. We partner with customers to provide solutions that bring ideas to life and get end products to market faster.

www.fiveyearsout.com



Hydrogen fuel cell solutions

Hydrogen Fuel Cell systems are a critical solution to both the energy security needs of the UK as well as the climate goals set out by COP28 and our own government's Net Zero aims. The current challenge to this alternative energy is not just the infrastructure, but the efficiency of the system itself. The largest parasitic energy loss of a hydrogen fuel cell system is from the compressor which provides the air needed. The effectiveness of this system rests on this singular unassuming component. The careful design of a high speed and oil-free electric motor which powers this vital unit offers an engineering challenge

the UK can uniquely meet.

With a history of engineering innovation and a wealth of talent, Aeristech has created the ideal solution for mobile fuel cell applications for trucks, busses, cars, tractors, forklifts, trains, ships and even aviation. Our patented motor control technology offers customers greater optimisation of performance, efficiency, power-density, and cost in hydrogen fuel cell, heat pumps, and industrial compressor applications. With extensive in-house expertise in motor design, power electronics, and air-bearings supported by high-quality prototyping, test, and low-volume

manufacturing facilities, Aeristech is a leader in the development of cutting-edge technologies.

Aeristech is a UK-based company that develops high-performance electric motors, inverters, and oil-free compressors, ideal for Hydrogen Fuel Cell Systems, Industrial Compressed Air, HVAC and e-Supercharging. Our growing company is based in Warwickshire where we also have our testing facilities.

www.aeristech.co.uk



Simulation software

Realis Simulation is a trusted partner to the world's leading transport manufacturers, OEMs, and Tier 1 suppliers. We develop simulation software to deliver fast, repeatable and predictive results across existing and emerging propulsion technologies, enabling the journey

to net zero emissions. Our products model all major propulsion technologies, rapidly answering the 'What ifs' in a timely and cost-effective manner, reducing the requirement for expensive hardware testing. The suite of leading-edge simulation tools facilitates design

and calibration programmes as we transition into the future, supporting clean combustion fuels, sustainable powertrain systems, efficient vehicle transmission and optimised hybrid internal combustion/electric solutions.

www.realis-simulation.com

Energy storage & power conversion technologies

Richardson RFP specializes in design support and component selection for power conversion and energy storage applications. Our focus is assisting our customers in developing a design that performs with the highest efficiency, highest power density and highest reliability. Choose from a broad line of active, passive and thermal products from market-leading suppliers for your power converter/inverter designs. Learn how we can help you reduce development cost and time-to-market through our unsurpassed design, assembly and logistics resources.

Component selection

- Aluminum electrolytic, power film and high frequency ceramic capacitors
- Current Sensors
- Diodes
- EMI/RFI filters
- Gallium Nitride (GaN) Power Transistors
- Gate drivers
- Heatsinks
- IGBTs
- Integrated power-converter modules
- Magnetics
- MOSFETs
- Power resistors
- Power supplies – AC/DC, DC/DC
- Silicon carbide (SiC) discretes and modules
- Ultra/Supercapacitors

Providing

- Global Distribution with Local Presence
- Design Support from Prototype to Production
- Innovative technologies- including GaN and SiC- from Market Leading Suppliers
- Evaluation platforms and reference designs to speed time-to market

www.richardsonrfpd.com



Stamped component solutions

Brandauer, a Queens Award for Enterprise Winner for International Trade, provides over a billion stamped components into multiple sectors every year. Supplying into the North American, European, Middle Eastern, African and Southeast Asia regions from in-house manufactured precision progression tooling, we have seen increased requirements for stamped components since the electrification revolution and we are looking to expand our market share with the ongoing investment in new people, technology and state of the art research and development collaborations.

We turn impossible concepts into viable stamped solutions and boast the following capabilities:

- world class, multi sector engineering business with 200 billion parts per year capacity
- 5 dedicated stamping departments

- precision stamped components to micron tolerances
- 2-micron EDM wiring and machining capability
- challenging materials including (Titanium, SS301, 316, 304, over 30 Copper Alloys and Gold, Silver and Palladium finishes
- down to 0.05 mm material thicknesses
- specialist in-house tool development and a design for manufacture consultancy service
- innovative automation under controlled conditions

We make billions of tiny, stamped components every year, the types of components that make the bigger machines work. They go into everything from the domestic kettle, the large hadron Collider, power steering control units and the next generation of EV electric machines.

We are looking to share our award winning capabilities in precision stamping and toolmaking with potential customers and research and development collaborators to improve and deliver low-cost, high-performance electronics applications across the globe.

Our existing stamping experience covers a wide range of electrification needs; including lamination stacks thinner than paper, solderless press fit connectors, wire bond ready power electronics lead frames and copper busbars, supplied from the UK to India, China and the USA.

If you are keen to work with the best European toolmaker and high-speed stamping provider; then please contact me via linked in or :

www.brandauer.co.uk



INVO-EDU – new on/off highway heavy commercial vehicle EDU / E-Axle product range

Involution Technologies is focused on the engineering and delivery of electrified powertrains for heavy vehicles and transmissions for the Renewable Energy market Tidal and Wind Turbines.

Legislation is driving Commercial Vehicle OEMs to introduce EVs to meet emission requirements.

“At present, many fleets with electric truck or bus experience report a loss of efficiency with electric vehicles vs diesel vehicles due to reduced flexibility to use vehicles across routes.”

*Automotive World Magazine
July 2023*

The INVO-EDU features a novel kinematic gear arrangement and transmission control unit (TCU), integrated with the latest high-performance twin drive Helix power dense through-drive motor and power electronics. The Invo-EDU is capable of powering any on/ off highway commercial, construction, or agricultural vehicle whilst exceeding

the traction performance of the ICE drivetrain it replaces. This unlocks the frustrated market potential, allowing electric drives to be fitted to all large on/off-highway, commercial, construction and agricultural vehicles or even rail vehicles.

Performance

Peak/Rated Power 650/400 Kw
High launch torque (37kNm prop) -
No GVW limit.
Uninterrupted torque, over a large constant power range (20:1) -
No route limits.
Continuously variable ratio optimized

efficiency over Duty cycle –

Greater range.

Robust design, maintenance-free –

Low service cost.

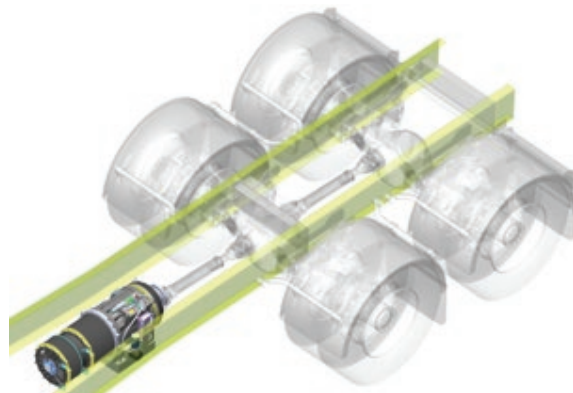
Compact design – **facilitates installation.**

INVO-EDU is a novel EDU/TCU, targeting Heavy on/off highway applications that can power any heavy vehicle with a performance to match or exceed the ICE driveline.

Invo-EDU is capable of being retrofitted into existing vehicles.

An E-Axle option is also available.

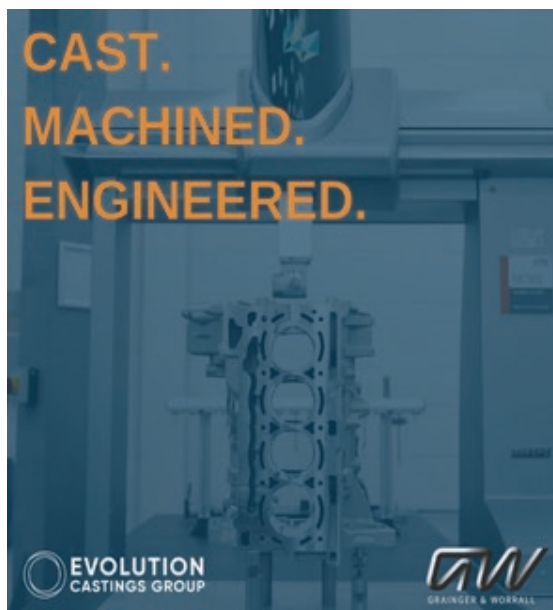
www.invo-tech.com



Complete casting solution

Grainger & Worrall stands at the forefront of engineering and crafting intricate, high-performance aluminum cast and machined shapes. We actively pursue challenging projects, pushing boundaries to discover innovative solutions that unlock the full potential of our cast designs. Leveraging the flexibility of the sand casting process, we create highly complex, high-integrity castings in various alloys, ensuring optimal performance.

Whether we're embracing rapid prototyping or championing lightweighting

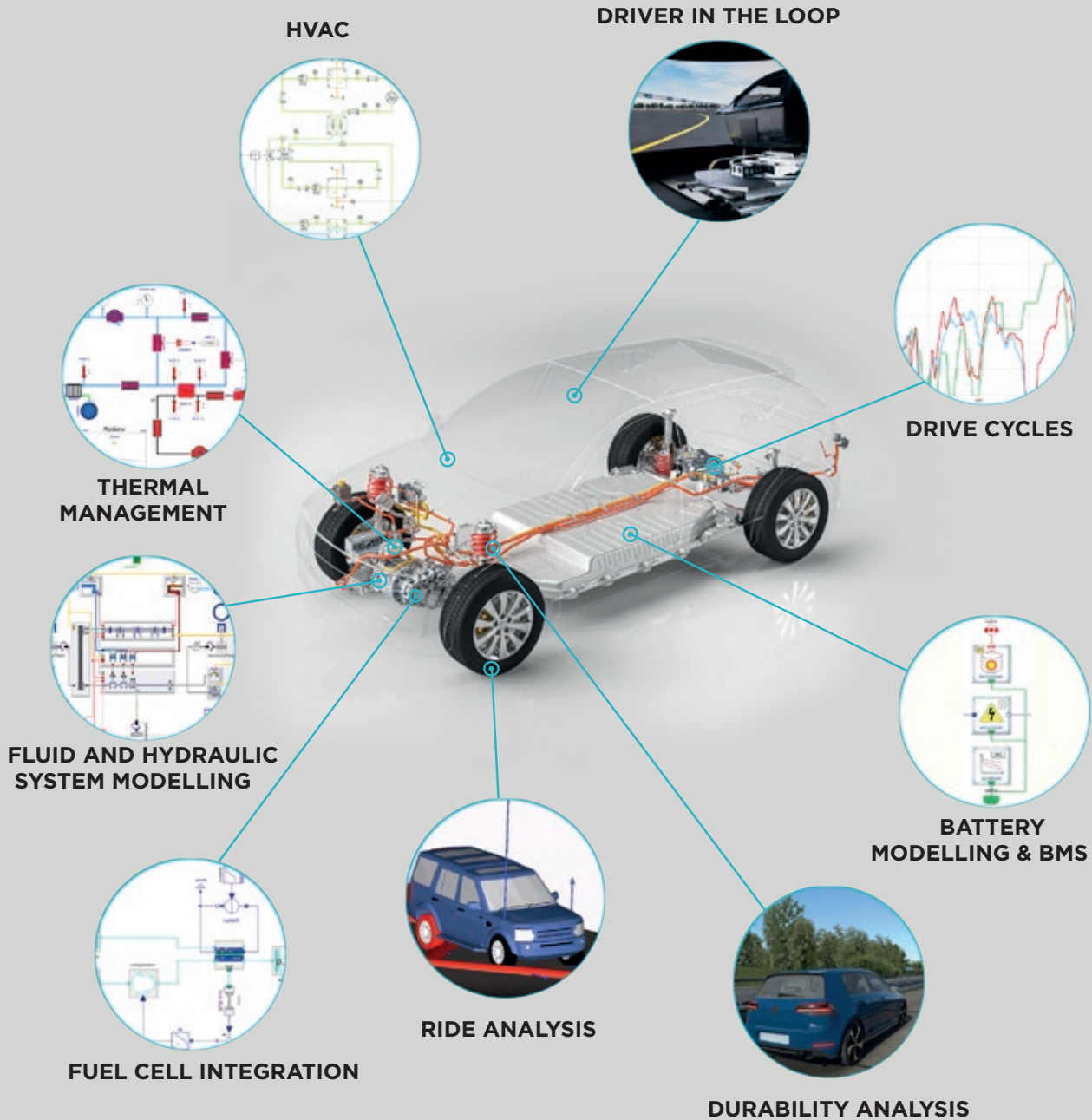


for efficient, durable components, every part we produce is meticulously crafted to meet the quality standards our customers demand. Our cutting-edge machine shop delivers precision down to the micron, supporting the creation of finely machined solutions.

Grainger & Worrall remains dedicated to providing a comprehensive casting solution, aiming to be your trusted partner for top-notch cast and machined components.

www.gwcast.com

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