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Events **Newsletter**

Mersey and Western Cheshire Network

January 2026 – September 2026

All our events are free to attend for IET members and non-members alike, pages 18–19

MetaCity Liverpool – A Unique Digital Twin of a City Region

Updates from Academic, Industrial and Research Partners

The Institution of Engineering and Technology

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The 2026 Annual Dinner

Friday **6th February 2026**

£70 for individual tickets for Members, Non-Members and Guests
£40 for Student Members
See page 41 for full details

Friends of the Network

The Mersey and Western Cheshire Local Network is run by volunteers, who each year arrange free-to-attend lectures, technical visits, workshops, and annual dinners.

These activities would not be possible without the support of our Friends of the Network. These organisations support the Local Network in many different ways, from sponsorship of the local network, taking advertisements in the two events newsletters that are published each year, taking tables at our Annual Dinners, funding places at our Annual Dinners for young engineers, providing speakers for lectures and allowing technical visits to their factories, engineering offices and academic institutions. Without their help and support, it would not be possible to run the high-quality events that we strive to deliver.

We are grateful for the support given both in the past and going forward into the future by our Friends of the Network.

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Thank You for Your Support!

Chair's Message

I am very pleased to welcome you to this, our latest, Network Newsletter – and to wish you all a Happy New Year!

As always, we volunteers have been busy organizing and hosting a number of interesting events/visits during this last period and for those who attended there was no disappointment. For those who couldn't make it, you will find some brief reports in the next pages.

Once again, our upcoming events pages are a little 'sparse' but that does not mean we are taking it easy!

Far from it. There will be more to come before September but we are still finalising the details so, please keep an eye on your monthly IET Events email.

We all know it has been a very wet period recently and this may have caused some to forget the drought conditions of just a few months ago. So, it is opportune timing that we have a new Chair of our Energy & Environment Special Interest Group – Nigel Lowe.

There is also a great deal of interest in Nuclear Energy recently 'fueled' by the announcement of SMR's at Wylfa on Anglesey. And this is just a small part of the UK's Energy Security & Net Zero.

Nigel has a message for you on page 4.

It has been described as "the Premier Engineering Event in the North" and "not to be missed".

Do you have your places booked for our Annual Dinner at Liverpool Hilton City Centre Hotel on 6 February?

If not, there is still time to join us. There will be over 100 Engineering Professionals, Academics and Senior Managers in the room for you to network with and enjoy the proceedings! Contact me for information/tickets.

Please, enjoy this edition, join in with our events – and volunteer if you can!

Godfrey Evans, Chair

Mersey and Western Cheshire Network

Contents

Education Officers

Report on Education Officers' Activities

We have been quite busy this year. Roger and Alan were both at Kingsmead Primary School where we had supplied balloon buggies, which were well received, and during the science week provided events using ping-pong ball throwers. LED torches and hoop gliders.

Roger also had several visits to Queens Park High School to help Nick Watkins with the Thursday STEM club. This involved around 20 students in a number of activities with the last one being 'fire writing' which involved a sheet of tissue paper being used on which a solution of sodium nitrate was used to write words or draw pictures. When the solution was dry a glowing splint was applied, and the writing smouldered to gradually follow the path made by the sodium nitrate. It worked fine, but was very smelly.

Roger was asked to attend Highfield Primary School in Blacon to give a presentation on what Engineers do in June and also asked to talk to a group of children at St. Clares Primary School.

Roger was asked to attend Godwin primary school in Blacon to give a presentation on what he did as an Engineer. The presentation took about 30 minutes and covered joining the RAF as an apprentice, working on Vulcan bomber and jet fighter aircraft and then leaving the RAF to work at companies such as GEC Elliot process automation, Raytheon and eventually starting his own small company and inventing various items.

Despite expecting to only carry out two presentations it proved to be so popular that eventually four presentations were made. The children asked many questions, and we think a good number of them will look at Engineering as a future career.

Kingsmead Primary School balloon buggy racing

A box of the IET Balloon buggies was provided as well as kits of hoop gliders. It was hoped to give out some of the IET magnetic bookmarks but they appear to be no longer available.

Alan has sent an email to The Cheshire College South and West Crewe, requesting them to nominate a candidate who they consider would be worthy of receiving the IET Engineering Student Excellence Award, and waiting for their reply.

Alan was busy with carrying out Mock Interview Events at Shavington and Leftwich High Schools in March no further Careers related events are in the diary at present.

At our last meeting, we discussed up and coming Sustainability awareness Events/Initiatives for Schools and Colleges in collaboration with the IChemE.

Roger Todd, Alan Dixon

Energy and Environment Group

Introducing the Energy & Environment Group

Nearly every week there is a major news article around energy and or the environment be it about nuclear, tidal, solar, wind, contaminated land and waterways or emerging technologies. Engineers, at all levels, play a pivotal role in these fields. Their geographic areas of employment is spread out across the entire catchment area of the IET Mersey and Western Cheshire Local Network which has over 4500 members.

Your Local Network, looking to service your professional needs, is looking to develop and grow a special interest group entitled "Energy and Environment". This maybe by convening special evening meetings where guest speakers present on relevant topics:

- Afternoon workshops on new legislation;
- Special visits to appropriate sites; or
- School and sixth form debates engaging the next generation of engineers who will work in this sector.

We are looking for folk who can help us develop this special interest group by either taking part in on-going committee activities, or helping with a particular one-off event; or suggesting future topics. Moreover, membership of the IET is not needed. You may be a teacher who could help with a school event; a local business person who would like to raise awareness of your business' role in this field of technology; a retired engineer willing to pass on your many years of experience.

If you are interested in the above and have a positive contribution to make, please contact:
nigel.lowe@ietvolunteer.org.

Energy and the environment is a vitally important sector to our economy, nation and our children' and grand-children's future so if you can play a part in the development of this group within the Mersey and Western Cheshire Local Network, you will be very welcome.

Nigel Lowe

Student Excellence Award at Cheshire College South & West

John Chapman, a student at Cheshire College South & West has been recognised for his dedication as an Engineer with a meticulous eye for detail. John's Course Tutor recommended him for this award also praised him for his exceptional engineering drawing & design work.

Presenting John with a certificate of recognition, Godfrey Evans, Chairman of the Mersey & West Cheshire Local Network commented that the smile on his face showed just how much this meant to him and, when also told of the cash prize, John was encouraged to think of using some toward a Student Membership with the IET!

John was asked to give his thoughts on the course he has now completed:

"I completed the two-year T level Engineering in Design and Development course at Cheshire College, South and West. We covered design principles and processes.

I have learnt to perfect a design brief by getting a detailed understanding from the customer as to what they need. I can create detailed design specifications, investigate and research existing competitor's products, talk to people to work out the gaps in the market, produce annotated sketches and precise drawings by hand and on CAD, build the product, billing the considered materials and components, adhering to health and safety regulations and working sustainably, producing accurate calculations and evaluation. My work has developed as each design project we were given.

I enjoyed the Occupational Specialism project where I designed and built a fully functional lifting device to a specific brief, and my employer set project where I designed a water buoy.

I have particularly enjoyed CAD as it has enabled me to broaden my skills and knowledge of Inventor Professional, this software has taught me to 3D print and diversify my skills with drawings. In addition, during my work experience I was able to put this knowledge into practice at PRG Trailers, Audlem. I feel this experience widely developed and enhanced my skills by working on real projects within the industry.

From completing this T level, I have secured a place to study a BA Hons degree in Automotive and Transport Design at Staffordshire University with a view to developing my design skills further and working for one of the major vehicle manufacturers."

Alan Dixon, IET Education Officer for the Local Network, said he hopes that John continues to enjoy his studies and hopes he continues to shine in his career.

Alan also said that there has been a long association with the College and hopes that this will continue, with the College producing more future talent into our profession!

And, from Tim Whitefoot:

"The engineering department are all very proud of John's achievement. We wish him all the very best in his future career and hope that he visits CCSW in the future to inspire our next group of engineers in Crewe."

Tim Whitefoot (tutor), Godfrey Evans and Alan Dixon with John

Godfrey Evans

Search "IET Mersey & Western Cheshire" on social media sites to keep up to date with events and activities!

Electronics and e-Systems Group

Deployment and Usage of 5G Broadcast Streamed Contribution and Distribution

On Tuesday, 21st of October 2025 we were entertained by a presentation on the topic of Broadcast and Streamed Contribution and Distribution. The presenter, Laurence Murphy, is from Salford University, and opened by explaining how achievable and assignable bandwidth has always been a restrictive and limiting factor in sharing content.

He explained how the creation of new multi-standard technologies is by default, driving towards wireless functionality. There are potential plans to deliver live TV over 5G in 2027 which will potentially support up to 10 Gbps with a minimum of 200 Mbps even in rural areas. However various factors have delayed implementation including Covid, limited range transmitters and their installation along with public perception and network security. However, 5G is a rolling programme and the next couple of years will see a more sophisticated standard which will mirror the analogue to digital switchover in terrestrial networks. A major factor will be Stand-Alone (SA) capacity which enables dedicated and delineated capability.

Looking back at the Olympic sporting events it can be seen that bonded SIM packs were used to relay live signals and enable coverage at Hub areas. In the Broadcast field, sport has usually been the driver for significant innovations which then drives for broader coverage events at an acceptable risk. For the recent King's Coronation, Stand Alone 5G networks were created for the most important sections of the Coronation route. The network had a capacity of 100 Mbps and was used by multiple broadcast companies for news and feature production

For programme making performance is imperative so networks use the 5G stand-alone (SA) mode with 4G being used for radio. A bitrate ceiling of 12 Mb/s was used for News contributions. The network received very positive feedback from broadcasters with the sharing of a single non-public network to over 20 International broadcast outlets. Network slicing was used to good effect one slice used for

Enhanced Mobile Broadband (eMBB) to accommodate mobile users and another slice being used for video upstream from mobile cameras.

For the FIFA World Cup in Qatar 2018 significant changes to traditional coverage were utilised, routing up to 20 individual camera feeds back to the UK for processing and mixing to provide a single-unified workflow to streamline operations and setup.

Laurence moved on to outline development work on combining technologies to integrate Fibre, LEO (Low Earth Orbit) and multi-SIM 5G aggregated capacity for large, streamed events to cater for failures of transatlantic and international submarine fibres when covering larger events such as the World Cup.

The presentation concluded with an outline of how 6G has the potential to provide a solution for Latency and Diversity issues by moving away from the consideration of 6G not as a telephone communication standard but a real consideration as a next generation Data and Interconnection methodology worldwide.

A very informative presentation for which Laurence received a well-deserved vote of thanks.

Gordon Nicholas

Mersey and Western Cheshire Network

A Brief History of Hearing Loss, the Forgotten Sense

At the Birkenhead YMCA on the 7th of October 2025, Tony Murphy of Sonova UK gave a presentation about hearing loss, an often-forgotten human sense.

He commenced with a description of his company, based in Warrington UK, explaining its prominence in the field of hearing aids and supply of other equipment to other manufacturers.

He explained that the purpose of the talk is to demonstrate the benefits of hearing aid technology and the challenges that a person with a hearing-related disorder may encounter.

It is a common misconception that we hear with our ears. This is incorrect. We hear with our brains; we see with our brains and every other sense we have is experienced through our brains. We generally consider our senses to work in isolation, seeing and hearing. In fact, we use all our senses at the same time. Our brain collates all the information, pieces it together and creates a picture of the environment that we are in. Naturally we tend to focus on vision, however every human activity will involve hearing to a greater or lesser extent. Hearing is the only sense we use 24 hours per day. It is even active in a foetus before we are born.

Hearing loss is not fixed. There are different levels, rated from mild to profound. The mild losses, relate more to the anatomy of the outer ear and benefit more from hearing aid technology. Greater levels of loss may be treated with cochlea implants. These involve inserting electrodes directly into the cochlea rather than a hearing aid which relies more on conduction by air. However as stated previously we hear with our brains, so how a person perceives this sound is more complex and we cannot return hearing to “Normal” as with glasses, for vision

Tony then moved on to give an overview on Acoustics. He explained how this plays a significant part in understanding the subject. The pinna of our outer ear is shaped to guide sound into our ears, and we use them to detect where sound is coming from by analysing the frequencies of this sound. With hearing devices this is more challenging. There are algorithms to simulate this, but every human being is different, so they are not perfect. The other major factor is the limitations of the hardware. As with most industries, a hearing aid manufacturer does not design and make all its own components. The two major parts, the microphones and the speaker, are made by one company (Knowles). Due to the nature of hearing aids, the microphones are incredibly small and there are power limitations of the hearing aid battery. Hence the frequency response and the range that a hearing aid microphone will work effectively in noisy environments, is limited. This is generally termed, the critical listening distance. This is generally around 2 m from that person in an average environment.

The solution to this at present is to use some form of additional wireless technology. This is analogous to take a microphone out of the hearing aid and placing it nearer to the person or person you wish to listen to. They still use hearing aid microphones, as a person will get used to them in terms of the sound they produce. However, being a larger device, it will have a bigger battery and with the ability to have multiple microphones they can overcome some of these challenges.

Wireless technology can help. Hearing aids also utilise an increasing amount of internal wireless technologies as it’s not always practical to use additional devices. Telecoil was the first technology to be utilised. This is based on inductive technology. It is the oldest form and was first used in 1928. It is a basic analogue receiver so can be prone to interference. As such it cannot be an automated activation. However, in terms of simplicity and current use it is still probably the most widespread technology from Post Office counters, to lifts and theatres. Not all hearing aids will have a T-Coil as it is a large item to insert and there is usually options if required apart from the smaller aids. As such it will probably be around for at least the next 10 to 15 years.

Bluetooth has proved incredibly useful to hearing aid wearers using Bluetooth LE (Low Energy) for programming, including remote programming outside of the clinic, communication between sets of aids to improve directionality and scene analysis for improved speech clarity along with Apps to optimise hearing use. You can also have Bluetooth Classic for full stereo when listening to music or using your hearing aids as a wireless headset for the phone, in the car or an online meeting. Currently there is over a billion BT devices realised every year that are compatible with this, so this opens huge opportunities for other features such as: Translation or speech to text.

At the conclusion of the presentation the audience warmly applauded Tony for what had been a very detailed approach to the subject with excellent factual descriptions throughout.

Tony Murphy

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A 'Behind the Scenes' Technical Visit

Liverpool John Lennon Airport
Faster. Easier. Friendlier.

Mersey & West Cheshire Local Network members and guests have been treated to a unique experience of a small part of the operational aspects of a busy, International Airport on 24 September 2025. Robin Tudor, PR & Communications Manager, welcomed the group into the Cavern Suite, located in the Old Control Tower at the Airport.

Robin gave us an update on the Airport's activities and performance over the last decade and showed, graphically, the effect and timescale that the Covid Pandemic had on their operations – and obviously not unique to Liverpool.

Operations have recovered and are showing growth against pre-pandemic figures too.

He also discussed the more recent developments in "Passenger experience facilities" which are aimed at creating an atmosphere that results in both Customer Satisfaction – and Loyalty.

Andrew Dutton, Head of Environment & Sustainability, then gave an overview of the work that has (and is still) contributing to the Airports aim of Decarbonisation by 2040.

The main current activity is to bring a new 14-acre Solar Farm online during October 25 and, aptly, this will provide 25% of the airports electricity needs.

There are many more opportunities/ideas under review while working towards their target which include Heat Pumps (both air & ground source), Sustainable Aviation Fuel (SAF) and Hydrogen as a fuel. Electrification of the Ground Fleet will be a big challenge as the electricity infrastructure will need significant upgrade to utilize it.

Following the presentations we were taken through the passenger experience. Viewing the Check-in area and seeing the developments in Self-Check in, then through Security towards the Departure Lounge.

Robin showed us a small selection of the items that had been confiscated during the Hand-Luggage checks this week!

These included Craft Knifes, Screwdrivers, Kitchen Knifes, liquids over 100 ml – and a toy gun.

All found by utilizing the very latest 3D x-ray scanners that allow inspection – without the need to open bags.

The very latest Body Scanners have been recently installed (as in all UK airports) meaning that both passengers and their hand luggage are 100% inspected – all in the cause of Security and Safety for all.

Walking through a Security Door, we were ushered onto a waiting shuttle bus which took us to the Airport Fire & Rescue Station where we heard about the response requirement of 2–3 minutes from alarm sounding to being on-site at any emergency on the facility.

The crews have a range of vehicles available to use for any incident from an "in-grown toe nail", Cardiac Arrest through to a major incident involving aircraft either on the ground or in the adjacent River Mersey.

We were also given a demonstration of the most advanced machine, designated Fire 2, with its capacity of 12 000 litres of water that can be delivered within 2 minutes if necessary.

And even though the wind direction was accounted for, 'somehow', we still had a little shower! (Oops smiled the Operator).

That said, it really is an impressive piece of kit!

Conveniently, just through a Security Turnstile and we were back at the Old Control Tower for the close of the tour.

This is one that everyone said they would, not only, recommend but would do again if ever possible!

Thanks to all of the Airport Staff who took time to talk to and guide us around.

Godfrey Evans

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Medipump, a Pump with no Moving Parts!

Overview

Medipump is an innovative application of the laws of physics to produce a simple pumping device that has medical applications. The system has the potential to produce high accuracy and reliability whilst offering the benefit of slashing the costs of the pumping equipment. The system can cover several medical pumping applications and replace items such as Volumetric Controllers, Drop Rate Controllers and Infusion pumps. It also has applications in feeding pumps. In addition to fulfilling the basic pumping requirements the system has the potential to offer new features and methods of alarm detection that are simpler to implement than traditional devices. The system can also use, to large extent, existing 'giving sets' that will reduce the cost of disposable parts. Finally, there is the potential that the basic system could eventually migrate to the micro scale for use as a pumping agent in the 'Lab-on-a-chip' technology. Currently no pumping devices operate satisfactorily at this scale.

Current medical pumping equipment

The current range of medical pumping devices use several pumping methods of which the most popular is a peristalsis pump. The peristalsis pump operates by squeezing a plastic or silicon rubber tube. The quantity of fluid pumped is determined by the rate of the pump head rotation, the number of pumping fingers and the internal diameter of the pumping tube. The pump is expensive; the tube is prone to wear and deforms during operation and needs frequent replacement. This can lead to the accuracy of the device gradually deteriorating. Drip controllers require some method of determining the drip rate.

Most delivery devices, that require an accuracy better that ±10% have to use additional means of checking flow rate and hence require additional sensors. In essence they are controlling a process indirectly and have to use additional equipment to verify the calculated flows.

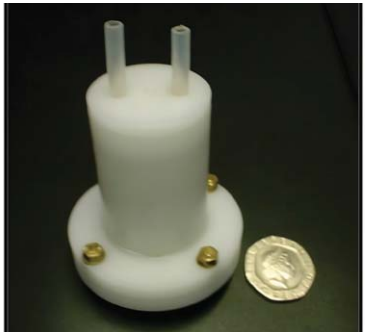
Medipump does not use a motor of any type. It produces a direct pumping action, and all its sensors are related directly to the pumping action. Medipump is actually a pump that has no moving parts other than two check valves. The Medipump pumping variables involved are easy to calculate and control so the result is fluid delivery that is accurate. Due to the simplicity of the Medipump system the building cost is less than conventional systems even when the additional safety devices, required by medical machines, are fitted.

It is believed that the operational principles of Medipump could even be scaled down to the level of microstructures. This would produce microscopic medical pumping devices that could be used to administer drugs internally over long periods of time.

Medipump is probably the most innovative application of basic physics to medical pumping applications for many years.

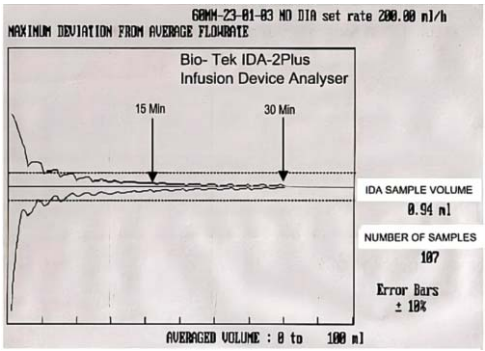
Principles Demonstrator

The Medipump Demonstrator shows how small the actual pump can be (a typical pumping cell is shown in the photograph). A control box holds the interfacing electronics and the interface to the outside world. The demonstrator unit can show pumping from a lower reservoir to a top reservoir. It is also possible to run a number of 'cells' in parallel to provide a continuous flow and failsafe redundancy.



Due to the nature of the system, it will not only pump fluids but also gases and the whole system can self-prime from empty.

Flow rates from a few ml/h to over 1000 ml/h can be achieved at high accuracies. See 'trumpet' graph below. In addition, operating efficiencies of 10% to over 50% have been achieved.



System Processing

The system is controlled by a microprocessor. The current user interface is via three pushbuttons and a 16×2 LCD display unit. An extension of the system will allow operational and collected patient data to be transferred to a remote data collection point.

Here the data can be kept as a historical record and also checked for alarm conditions. This will enable nurses/ doctors to be alerted when an alarm condition is detected.

Roger Todd

LIVERPOOL JOHN MOORES UNIVERSITY

The Institution of Engineering and Technology

Comparative Study of Incoherent UV and IR Nanosecond Laser Texturing of CFRP Composites for Improved Adhesive Bonding

This article summarises the main findings of a PhD study that investigated the use of incoherent UV light as an adjunct or alternative to IR laser surface preparation of Carbon Fibre Reinforced Polymer (CFRP) composites to improve adhesive bonding strength. For the first time, this work demonstrates that incoherent UV light at 254 nm can enhance the adhesive bond strength of CFRP by up to 75% compared to untreated samples and approximately 10% higher than IR laser-textured surfaces. However, combining UV irradiation with IR laser texturing whether applied before or after did not yield any significant additional benefits.

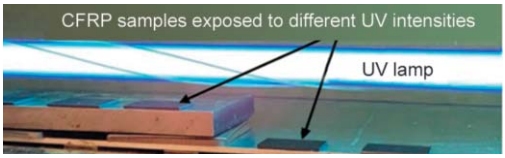
CFRP composites are increasingly used in aerospace, automotive, and energy industries due to their high strength-to-weight ratio and fatigue resistance. However, joining CFRP components remains challenging. Mechanical fastening often causes fibre damage and delamination, whereas adhesive bonding provides a lighter and more durable alternative, dependent on effective surface preparation.

Conventional techniques such as sanding or peel ply can damage fibres or introduce contaminants. Laser-based treatments generally offer cleaner and more controlled surface modification. For CFRP composites, previous research using ultraviolet (UV) and infrared (IR) lasers has shown promising results but revealed certain limitations, high cost in the case of UV lasers and thermal damage associated with IR lasers.

Regarding incoherent UV light (non-laser), some recent studies have explored its use to enhance the adhesion properties of polymeric and non-polymeric materials. Most involved UV/ozone exposure, either by adding ozone directly or using UV sources below 240 nm, which generate ozone and reactive oxygen species that oxidise and modify the surface. These treatments have shown significant improvements in joint strength compared to conventional methods such as grit blasting and primers. However, the process requires ozone-resistant facilities and presents safety concerns due to ozone toxicity, making it less practical for large-scale applications.

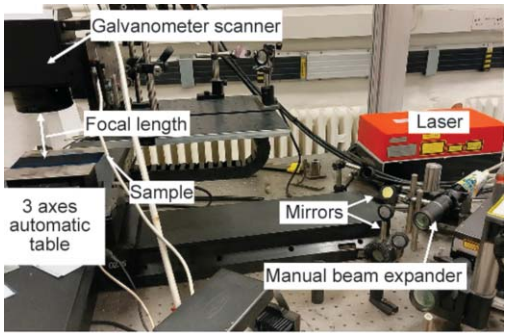
This article summarises the main findings on the effect of 254 nm UV light from a germicidal lamp in enhancing the wettability and the adhesive bonding of CFRP surfaces and compares its performance with IR fibre laser texturing, used individually or in combination.

The UV light treatment was performed using a germicidal UV lamp (TUV Amalgam T6130WXPTSEG10.2q, Philips UK) emitting >95% at 254 nm. Lamp intensity at the sample was calculated from its power and geometry. The lamp was housed in a ventilated box to minimize heating, and surface temperature was monitored with a thermal camera.



Surface treatment with incoherent UV light

The laser setup comprised an infrared (IR) fibre laser with an optical system and a three-axis (x, y, z) automated stage. It used an SPI G3 20 W nanosecond pulsed fibre laser (UK) with a 1064 nm adjustable beam expander (Linos 2–8×), four silver mirrors (Thorlabs), a galvanometric scanner (Nutfield Extreme15-YAG), and a 100 mm f-theta lens (Linos Ronar F-Theta). The scanning pattern and parameters were determined through a factorial optimisation study to ablate the surface resin and expose underlying carbon fibres with minimal damage and the lowest water contact angle (WCA). A single overscan was used. Optimised settings were pulse length 200 ns, scan rate 850 mm/s, hatch spacing 35 µm, repetition 25 kHz, pulse energy 78 µJ, beam diameter ≈ 51 µm, and fluence 3.82 J/cm^2, with pulse and hatch overlaps of ≈17 and ≈16 µm in air.

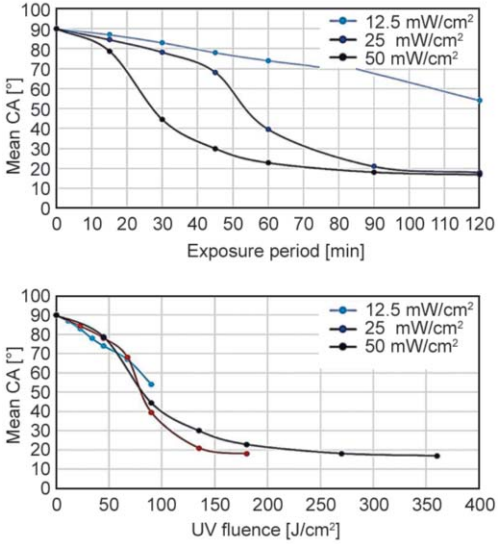


Laser equipment and experimental setup equipment

CFRP laminates, about 1.5 mm thick, were autoclave-fabricated from five layers of SHD MTC510-UD300-T700 prepreg laid at alternating 0°/90° orientations. Mechanical testing showed a tensile strength of approximately 1500 MPa, about five to six times higher than the expected adhesive strength.

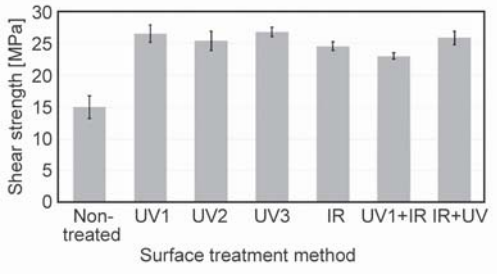
Surface wettability was evaluated via water contact angle (WCA) measurements using a goniometer (ACAM 101, KSV Instruments Ltd, UK) and the sessile droplet method.

Adhesive strength was assessed with Single Lap Shear (SLS) tests according to BS EN ISO 1465:2009, using Araldite 420, a two-component, room-temperature-curing epoxy adhesive, to join the coupons. The average WCA was determined from 10 samples for each surface condition, including the as-received material. Laser-treated samples exhibited WCA below 10°, while samples exposed to the highest UV fluence showed WCA around or just under 20°. No significant further reduction was observed for UV fluence above 150 J/cm^2.

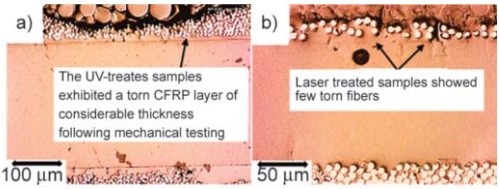


Mean WCAs for CFRP samples treated with different UV intensities/fluence vs exposure periods.

Single Lap Shear (SLS) tests were conducted on three replicates for each surface condition, including as-received, UV1 (50 mW, 60 min), UV2 (25 mW, 120 min), UV3 (50 mW, 120 min), IR (laser-textured), UV+IR (UV1 followed by IR), and IR+UV (IR followed by UV1). All surface treatments resulted in a significant (70–80%) increase in bonding strength compared to untreated samples. UV-treated samples exhibited higher strength than those treated with IR laser alone or in combination with UV. Average bonding strengths were ~27 MPa for UV1 and UV3, slightly above 25 MPa for UV2, and below 25 MPa for IR-only samples. Pre-treatment with UV before laser texturing led to a slight reduction in bonding strength, whereas applying UV after laser texturing improved it. For combined treatments, these variations were not statistically significant due to the limited sample size. Notably, failure modes for UV-treated samples differed substantially from those observed for IR-treated samples, whether alone or in combination with UV. The non-treated samples exhibited Adhesive Failure (AF), where failure occurred at the interface between the substrate and the adhesive layer. Laser-treated samples showed Light Fibre Tear Failure (LFTF), with up to three fibre layers being torn. This suggests that IR laser texturing may have weakened the bonding between the surface carbon fibres and the surrounding matrix resin, consistent with findings reported in previous studies. In contrast, UV-treated samples displayed distinctly different failure behaviour compared to those treated with laser alone or in combination with UV. While laser-treated samples primarily exhibited LFTF, UV-treated samples showed predominantly Cohesive Substrate Failure (CSF), characterized by a torn substrate layer up to approximately 0.25 mm thick. This indicates that the interfacial adhesion strength surpassed the cohesive strength of the substrate material.



Comparison of the bonding strength via SLS tests among different surface conditions



Fracture analysis of CFRP cross-sections after Single Lap Shear (SLS) testing: (a) UV-treated sample showing a thick torn layer; (b) laser-treated sample. Images obtained using optical microscopy.

In conclusion, surface treatment of CFRP using incoherent UV light resulted in greater bonding strength compared to IR laser texturing. The predominance of Cohesive Substrate Failure (CSF) indicates that the interfacial adhesion strength exceeded the substrate's interlaminar shear strength. While UV treatment requires longer exposure times, it facilitates high-throughput processing and can be further optimized through the use of reflectors or diffusers. However, subsequent investigations within this project demonstrated that different CFRP materials exhibit distinct surface wettability responses to UV treatment, likely due to variations in resin chemistry and surface morphology, whereas materials with a thick or heterogeneous outer matrix layer present challenges for effective processing with IR laser treatment at 1064 nm.

Ahmed Al-Mahdy

Technical Visit to AMRC North West, Samlesbury

IET Merseyside and West Cheshire Network visited the Advanced Manufacturing Research Centre NW (AMRC-NW), at Samlesbury, near Preston, UK in November 2025. There were 12 attendees consisting of members and guests.

The visitors were welcomed by Iain Martin, Head of Engagement. Iain started proceedings with a presentation about the AMRC-NW. This centre is a satellite of the AMRC at the University of Sheffield, originally created in 2001 by Prof. Keith Ridgeway in collaboration with Boeing. This AMRC was one of the founding centres of the High Value Manufacturing (HVM) Catapult established in October 2011.

AMRC-NW is a gateway development built on the Samlesbury Aerospace Enterprise Zone. There are two similar developments, AMRC Cymru, in Broughton, North Wales, and most recently a HVM Catapult Digital Factory Hub in Baglan, South Wales run by AMRC Cymru.

AMRC works with manufacturers through a combination of catapult and research funding and commercial contracts. The 3 thirds model is something the AMRC work to maintain for balance and is a broad target for the catapult centres as it is about using public funding to generate research and private funding.

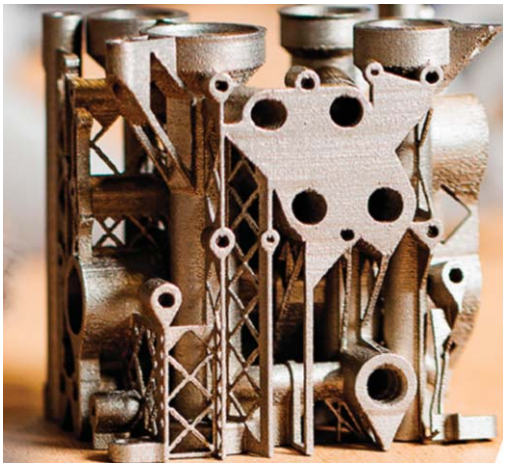
This was followed technical presentations covering four areas of the centre's activity. The first was by Bugra Tureyen, Technical Fellow, Additive Manufacturing. The centre runs several additive manufacturing systems. They have two metal powder bed fusion systems that build components layer by layer using a laser to fuse the top surface of the powder bed. The bed is lowered by a layer, and a new layer of powder is placed and the process repeated to form the final component.

They are "Directed Energy Deposition" (DED) systems, where powder is blown at a laser generated melt pool and traversed to form the component. DED offers a high build rate, and higher build volume. New material can be applied to existing components for repair or modification.

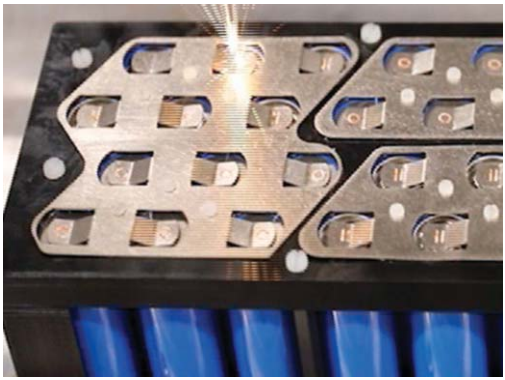
There is a WAAM3D wire arc additive manufacturing robotic system. This uses wire arc welding to build components in 3D. Wire arc deposition offers significant build rates, and the process is highly suited to large fabrications.

Finally, AMRC-NW is home to Europe's only MELD Friction Stir Deposition system. Using the same process concept as friction stir welding, the system can build metallic components without melting the feedstock, it is purely a solid-state process. The low heat input reduces residual stresses in the built components.

Jasmine Singh, Project Engineer in Automation talked about her work in robotics as part of the Batteries and Automation team. As per their theme, her team has varying capabilities of electrical & electronics, robotics and automation, and joining & surface engineering.



Complex Powder Bed Fusion AM component



Battery assembly illustrating a laser welding operation to secure tabs on cells

With the growth in electric vehicles and propulsion, energy storage, the manufacture of high energy density batteries requires both the maintenance of high tolerances, robust process parameter controls, and due to the nature of modern lithium ion-based batteries, strict attention to safety.

Battery assembly research is an AMRC capability unique to this North West team. This ranges from addressing

challenges such as preprocessing live cells, battery assembly and cell & module welding using their laser welding capability. Jasmine discussed the robotic automation system they developed to do the same and on-going plans to scale these up for "cell-to-pack" assembly of larger battery packs. A key issue is to ensure safe operation of the system. The overall system has been designed to both minimise risk and contain any damage. AMRC-NW is the only centre that has demonstrated automation and welding on “live” batteries.

Due to the nature of the team's skill sets, they work on various applications other than batteries as well with SMEs, commercial automation projects with their partners and research-intensive projects with academic consortiums. She described the development of systems with a range of applications including one with the automation of cosmetic sample analysis for a microbiology lab. As part of this project she proposed and demonstrated a robotic specimen processing system wherein a collaborative robot arm (a UR5e) was programmed to manipulate petri dishes housed in custom holders she designed. The arm would then tend to an auto-pipetting machine which was programmed to handle pipettes and dispense the samples into petri dishes after which the robot would collect these samples and present it to an automated liquid dispensing prototype.

Dr Wahaab Qurashi, Theme Lead Connectivity, then presented on connectivity and, in particular, the use of 5G technology to control production systems, not only in an individual facility but over several facilities even on a global scale. AMRC-NW leads the 5G Factory of the Future project to provide an open access industrial testbed aiming to help industry move towards a smarter and more sustainable future.

True digital manufacturing can be unlocked using 5G

A key feature of this work has been the development of 5G devices that allow data collected on production machines to be delivered to the production management systems, and further afield. A key issue is timing. The transmission of data is subject to delays and jitter, and these must be understood and controlled in a distributed digital manufacturing scenario.

Finally, James Valentine, Senior Technical Engagement Manager, Low Carbon Technologies spoke about the work

Digital Dashboards can give real time data visualisation for decision making

in an area that applies from the smallest businesses to the largest enterprises. The AMRC-NW was developed as a low carbon smart factory demonstrator in 2021 and has been demonstrating low carbon technologies and processes to manufacturers since then. It has invested c£2.5m in low carbon tech and is continually evolving this area. The aim is to help manufacturers halve their carbon footprints by 2030 and be net-zero by 2050.

The Internet of Things (IoT) is a technology allowing data collection and analysis of all aspects of the production environment, and to create tools such as digital dashboards, equipment monitoring and proactive maintenance, environmental monitoring and adaptation.

James described case studies from projects the AMRC-NW had undertaken for companies in Lancashire. For instance, in one company it was discovered hot air was gathering in the roof space of one section of a factory. Using fans and filtration it was possible to move this hot air to use for climate control in another part of the factory.

The visit finished with a tour of the “factory floor”. The various additive manufacturing systems were viewed together with samples produced. There is also a materials laboratory for conducting metallographic analysis, strength and fatigue measurements together with an X-Ray CT scanner, used for looking at porosity in AM components.

A robot cell was viewed, as well as the robotic battery welding cell running in a dry run moved. The area where the servers and 5G equipment was described, together with another laser system that could be used for a range of applications including laser marking. The final system was a robotic cell that could be used for automated tool changing.

The visitors found that the AMRC-NW is a valuable resource for the NW and Lancashire in particular. Experienced engineering staff tackle a wide range of issues in modern, digital manufacturing for companies ranging from small SMEs to large multinational enterprises.

Martin Sharp
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Report on Micro-Epsilon Webinar "Automation in Industrial Metrology"

The ability to capture reliable, high-resolution process data is becoming as important as the materials and machines themselves. Metrology is no longer a peripheral quality-control activity; it is a foundational requirement. This was brought into focus in a recent webinar presented by **Micro-Epsilon UK**, a leader in precision sensors for displacement, temperature and colour.

The webinar focused on real applications where robust, inline metrology is providing essential information for process optimisation and decision-making. A compelling cross-section of use cases, demonstrated how precise, continuous measurement is enabling manufacturers to reduce waste, enhance quality, close feedback loops, and unlock new levels of automation.

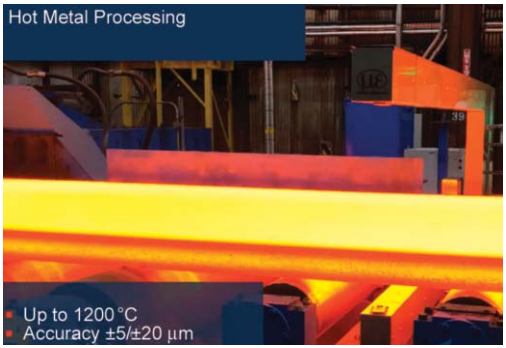
Thickness Measurement:
A Keystone of Process Control

A foundational example explored during the session was **thickness measurement**, a requirement spanning everything from strip metal and extrusion to battery electrode manufacturing and composite layups. Many producers still rely on sampling at the start and end of a production run, or even manual checks requiring line stoppages, introducing uncertainty and failing to capture trends developing during continuous production.

Micro-Epsilon demonstrated how automated, inline thickness systems transform this challenge. Depending on the process, the measurement approach may involve sensing across a roller, across an extrusion die gap, or in free space. Using a combination of technologies, the company has built systems capable of continuously monitoring material during production—providing real-time quality assurance.

A striking example came from the metals industry, where manufacturers sought **micron-level measurement of hot metal strip at temperatures around 1200 °C.** Until recently, many facilities relied on handheld callipers for thickness checks—even when the strip was nearly molten.

Micro-Epsilon's response was a specially engineered thickness gauge capable of operating such hostile conditions. Mechanical frames that expand by several millimetres under intense radiant heat were designed with intelligent compensation models and high-temperature optical windows were developed to withstand thermal stresses without cracking. Blue-lasers, operating at shorter wavelengths, were employed to avoid overexposure from the red-orange glow of the hot metal. The result is a system matching the performance of radiation-based gauges while offering superior accuracy on thicker materials, and one that can be retrofitted to existing mills.



Thickness gauge for high temperature metal strip roll

Battery Electrode Manufacturing

There is intense pressure on battery production lines to both scale and deliver exceptionally consistent products. At the **UK Battery Industrialisation Centre** (**UKBIC**), confocal chromatic sensors are integrated into an inline gauge capable of maintaining tolerances of just **±3 microns**, supporting industry requirements as tight as ±4 microns. System accuracy reaches the sub-micron regime, a critical capability for ensuring electrode uniformity.

Metal Strip Processing at Mahle Engine Systems UK

Traditionally, the company relied on sampling to assess metal strip thickness, allowing variations mid-coil to go unnoticed. Inline gauging discovered that thicknesses can drift more than 100 microns in the first 40 metres – far outside the tolerance required for downstream bonding processes. This new system enabled immediate intervention, showing the operational value of high-resolution feedback.

Automated Visual Inspection of Painted Surfaces

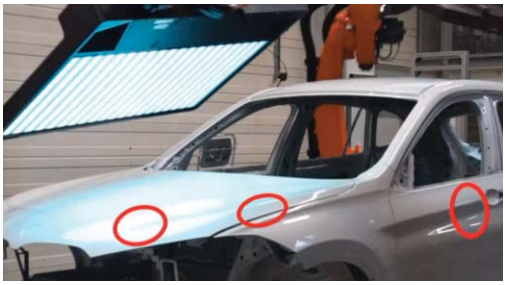
Leading manufacturers such as BMW have widely circulated videos showing robots automatically detecting and repairing paint imperfections. Micro-Epsilon introduced the measurement technology underpinning these systems: **reflectControl**, for inspecting glossy and reflective surfaces.

Human inspectors remain widely used in many factories, but manual inspection brings challenges – fatigue, inconsistency, colour sensitivity, training variability, and slower cycle times. Even under optimised offline conditions, human detection rates plateau well below what industrial standards require for flawless finishes.

reflectControl addresses these limitations by projecting structured patterns onto the body. Two cameras capture the

reflected pattern, and deviations are analysed to generate multiple image types highlighting dents or scratches. Beyond 2D analysis, the system can reconstruct the surface in full 3D, quantifiable, defect dimensions with remarkable precision.

A confocal point-scanning method – while extremely accurate – required around 30 minutes to scan a 30×30 mm area. reflectControl captures the same area in under one second, achieving correlation with interferometric measurements to within 8 nanometres. This enables factory-scale inspection of up to 108 regions per vehicle, with total cycle times under 60 seconds using multiple robots.



High Resolution Surface Inspection

The 3D data is essential not only for detection but for automated repair. Knowing whether a defect sits above or below the surface determines whether material must be filled or removed, enabling robots to perform polishing or correction autonomously. The density and clustering of defects also provide feedback to upstream processes.

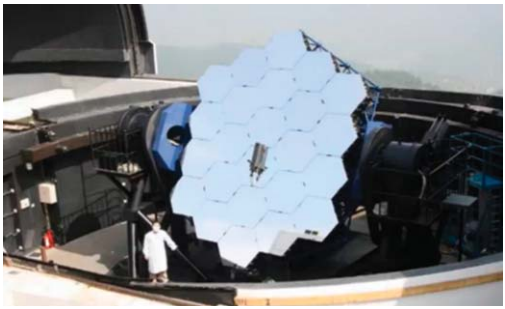
Precision Sensing for the World's Largest Telescope

The **European Southern Observatory's Extremely Large Telescope** (**ELT**) project in Chile requires unprecedented precision in aligning its segmented primary mirror – each segment approximately 1.5 metres across. To form a single optical surface more than 30 metres in diameter, every segment must be controlled to nanometre accuracy across three axes, compensating for thermal drift and other changes during an eight-hour sweep of the night sky.

Micro-Epsilon developed a twin-channel Eddy current sensor built from a novel low-expansion material, achieving thermal stability better than **50 nanometres per Kelvin**. More than 5000 sensors are integrated into the telescope's active control system, delivering one of the highest-resolution displacement measurement implementations ever deployed.

Metrology at the Heart of Semiconductor Fabrication

Perhaps the most technologically dense portion of the webinar addressed the semiconductor industry, where sub-nanometre stability is essential. The latest generation of microchips relies on **Extreme Ultraviolet** (**EUV**) **lithography**, a process that uses 13.5 nanometre wavelength light generated by firing high-energy lasers at 40 000 droplets of liquid tin per second, heating them to around 500 000 °C to produce EUV-emitting plasma.



ESO Extremely Large Telescope (ELT)

Within these machines, every optical component – mirrors, beam steering systems, projection lenses – must be aligned and stabilised with astounding precision. Micro-Epsilon sensors play critical roles throughout the system: confocal sensors align optics, capacitive sensors measure lens-carrier tilt, and Eddy current sensors provide nanometre-level feedback for stage synchronisation. All equipment operates in ultra-high vacuum, requiring careful material selection to prevent outgassing that would destabilise the environment.

Conclusions: The Future of Automated Manufacturing

Across the diverse applications presented, a common thread is clear: **precision measurement is the backbone of intelligent manufacturing**. As Industry 4.0 continues to mature, sensors and metrology systems are no longer bolt-on enhancements; they are integral to achieving automated process decision-making and closed-loop control.

The webinar effectively illustrated that choosing the right sensor technology – from blue-laser triangulation to confocal chromatic, capacitive, inductive or Eddy current measurement – is only part of the challenge. Equally important is integrating these sensors within the mechanical, thermal and software environments of the production system. Engaging early with metrology specialists enables manufacturers to design more robust and tailored solutions.

Micro-Epsilon's examples demonstrated that with the right combination of sensing technologies, mechanical architecture and intelligent data processing, almost any feature – thickness, geometry, surface quality, displacement, alignment – can be measured in real time, even in extreme environments from steel mills to outer space.

For engineers, researchers and automation specialists, the webinar served as a reminder of advanced metrology. As manufacturing pushes further toward autonomy, the question posed at the end of the session was particularly apt: **How will you automate the future – and what measurements will make it possible?**

Martin Sharp
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The Institution of Engineering and Technology

IET Sectors

Events: January 2026 – September 2026

Mersey and Western Cheshire Network

Built Environment | Design and Manufacturing | Digital | Education and Skills | Energy | Engineering Safety | Healthcare | Transport | Innovation and Emerging Technologies

DATE	EVENT AND LOCATION	PRESENTER	SECTOR	GROUP	TIME	CONTACT	CPD
Wednesday, 5th February	**Technical Visit to Glass Futures** James Roby Way St. Helens WA9 5DT	TBA	Design and Manufacturing	Manufacturing and Management	Start 10:00 a.m. Finish 12:30 a.m.	Louise Johnson Online registration	3
Tuesday, 16th June	**Leadership Webinar:** **The Silent Drain on Productivity You Can't Ignore** Online – MS Teams	Jerry Hopkins	Design and Manufacturing	Manufacturing and Management	Start 2:00 p.m. Finish 3:00 p.m.	Jerry Hopkins Online registration	1
Wednesday, 30th September	**Sensor Applications in Digital Manufacturing** Online – MS Teams	Glenn Wedgbrow, B.Eng. (Hons)	Design and Manufacturing	Manufacturing and Management	Start 12:30 p.m. Finish 1:30 p.m.	Glenn Wedgbrow Online registration	1
TBC	**Development of Aircraft Antennas and the Challenges Faced** Liverpool University, TBC	Geoff C Cooper, CBE FRAeS CPhys MInstP (Cooper Antennas) Professor Ian MacDiarmid BEng, MSc, MBA, CEng, FIET (Liverpool University)	Aerospace – IET TN Sector	MWC LN jointly with the IET Innovation Management Technical Network	Start TBC Finish TBC	Godfrey.Evans Dr Christopher Proudfoot Online registration	TBC

Event Programme January 2026 – September 2026

January

Technical Visit to Glass Futures
Date: *Wednesday 25th February 2026*
Time: *Start 10:00 a.m.*
Finish 12:30 a.m.
Venue: James Roby Way St. Helens WA9 5DT
Speakers: *TBA*

Discover the forefront of green manufacturing at Glass Futures' research centre in St Helens. Located in a 65 000 ft² facility, you will engage with a live pilot furnace that leverages next-generation fuels, sensors and automation to transform glass production. The visit also offers you the chance to explore advanced robotics, Industry 4.0, circular-economy trials and low-carbon initiatives. Connect directly with specialists shaping zero-carbon processes – whether you are in glass or other energy intensive industries, join us and be part of the innovation driving sustainable manufacturing.
Online registration / CPD 3 hrs
Contact: *Louise Johnson,*
Louise.Johnson@glass-futures.org

June

Leadership Webinar:
The Silent Drain on Productivity You Can't Ignore
Date: *Tuesday, 16th June 2026*
Time: *Start 2:00 p.m.*
Finish 3:00 p.m.
Venue: Online – MS Teams
Speakers: *Jerry Hopkins*

The Silent Drain on Productivity You Can't Ignore – The cost of a disengaged employee.
A 45 minute interactive webinar on how to minimise this while gaining the benefits of higher employee engagement. An essential event for those engineers who are managing a team or looking to develop their management skills. The IET Merseyside and West Cheshire Local Network are pleased to welcome back Jerry Hopkins in 2026 for its highly successful "Leadership Seminar" series.
Online registration / CPD 1 hr
Contact: *Jerry Hopkins,*
jerry@hopkinsandball.com

Event Programme January 2026 – September 2026

September

Sensor Applications in Digital Manufacturing
Date: *Wednesday, 30th September 2026*
Time: *Start 12:30 p.m.*
Finish 1:30 p.m.
Venue: Online – MS Teams
Speakers: *Glenn Wedgbrow, B.Eng. (Hons)*

Digital manufacturing requires robust, quality in-process data. Micro-Epsilon UK Ltd are leading providers of high precision displacement, temperature, colour sensors and dimensional measurement systems for industry. The webinar shows how these can be applied to a process to gain the essential product/process data used to improve efficiency, quality and reduce waste. Use cases will be presented illustrating the application of the company's sensor products in manufacturing and related applications.
Online registration / CPD 1 hr
Contact: *Glenn.Wedgbrow,*
Glenn.Wedgbrow@micro-epsilon.co.uk

TBC

Development of Aircraft Antennas and the Challenges Faced
Date: *TBC*
Time: *Start TBC*
Finish TBC
Venue: Liverpool University, TBC
Speakers: *Geoff C Cooper, CBE FRAeS CPhys MInstP (Cooper Antennas)*
Professor Ian MacDiarmid BEng, MSc, MBA, CEng, FIET (Liverpool University)

Development of aircraft antennas and the challenges facing the aircraft including lightning strike, a nuclear electromagnetic pulse and flight through high intensity radiated fields from broadcast transmitters and radars. Fundamentals of radio frequency (RF) antennas and extend this to the challenges of RF antennas used on aircraft. The majority of the presentation will be the design and development challenges of antennas for the present-day, including the capabilities for assuring installed performance. There will also be a glimpse of the challenges of antennas for the future.
Online registration / CPD TBC
Contact: *Godfrey.Evans, Godfrey.Evans@ietvolunteer.org*
Dr Christopher Proudfoot
christopher.proudfoot@ietvolunteer.org

All our events are free to attend for IET members and non-members alike

For more information on how the IET supports CPD please visit http://www.theiet.org/membership/career.cpd
If you do not have access to the internet, registration can be done via e-mail or telephone to the contact listed

Glass Futures – A Sustainable Future Enabled by Glass: Forthcoming Technical Visit

Glass is found everywhere: in buildings, vehicles, electronics and packaging. It is also energy-intensive to make – and therefore a high-impact target for decarbonisation. Glass Futures is the industry's answer: a not-for-profit research and technology centre, its' Global Centre of Excellence in St. Helens, UK gives manufacturers, suppliers, academics and technologists the ability to trial new fuels, processes and monitoring systems at an industrially-relevant scale. The centre brings together people, equipment and funding so the glass industry can cross the so-called "valley of death" between laboratory ideas and commercial implementation.

Glass Futures, St. Helens

Origins and rationale

The idea for Glass Futures arose in industry leadership wanting to accelerate decarbonisation across the glass supply chain. The organisation itself was established after industry discussions in the mid-2010s, and was formally created with an explicit remit to make glass the low-carbon material of choice. From that origin grew an ambition to build a dedicated R&D and training facility – an "open" experimental line that members could use to test practical, scalable innovations rather than small-scale lab demonstrations.

Why St. Helens? The town sits in the historic heart of UK glassmaking; placing the centre there provides continuity with skilled local labour and aligns with regional regeneration objectives. The 165 000 ft^2 Global Centre of Excellence formally opened in mid-2023 after a multi-partner delivery and funding effort.

Partners and funding: a public–private model

Glass Futures is not a single company project: it's a membership-based RTO (research & technology organisation) created by and for the glass sector, supported by academia, local and national government and private investors. Several key elements made the centre possible:

- Industry membership: major glass manufacturers and supply-chain companies are members and participants. Members include global producers who operate hundreds of furnaces between them, and who bring practical problems for the centre to solve.
- •Local civic support: St Helens Borough Council provided the site and a head-lease arrangement; the Liverpool City Region Combined Authority put in grant support.
- National government and research funding: Glass Futures has worked closely with UK government departments and research bodies, plus research partners in universities and institutes.
- Private sector investment and delivery partners: the building and ownership model involved developers, institutional investors and specialist contractors, so the centre could be delivered at scale and with long-term sustainability.

This mixed model, industry subscription plus public grant and private investment, made it possible to fund an experimental furnace and a suite of test rigs without any single company carrying the whole burden.

Capabilities

At the heart of Glass Futures is an experimental, open-access pilot line capable of producing up to ~30 tonnes per day of glass – a scale large enough to reveal combustion, heat-transfer, refractory and emissions behaviours that small lab melts cannot show. The building is configured to accommodate different production formats (container and flat glass), instrumentation, and abatement / heat-recovery systems. That combination allows engineers to test not just component ideas but system integration.

Crucial technical features and capabilities:

- **30 tonne per day pilot furnace and integrated line:** industrially relevant throughput to evaluate furnace designs, burner systems and process control strategies before committing to capital-intensive rollouts.
- **Abatement and heat recovery:** flue-gas treatment, waste-heat recovery and monitoring equipment are part

Technical Visit to Glass Futures
25th February 2026; 10:00 to 12:30 GMT

Discover the forefront of green manufacturing at Glass Futures' research centre in St Helens. Located in a 165 000 ft^2 facility, you will engage with a live pilot furnace that leverages next-generation fuels, sensors and automation to transform glass production.

The visit also offers you the chance to explore advanced robotics, Industry 4.0, circular-economy trials and low-carbon initiatives.

of the pilot setup so projects can be evaluated across energy, emissions and material yields.

- **Flexible testing for fuels and raw materials:**trials can include fuel switching (hydrogen, biofuels, electrification trials), higher cullet contents, alternative batch chemistries and additive strategies to improve melting behaviour or reduce CO_2.
- **Digital instrumentation and inspection:** the facility is designed for advanced control, digital twins, optical inspection and condition monitoring so reliability and quality improvements can be delivered and measured.

Recent milestones underline its capability: after opening in 2023, the centre reached furnace commissioning milestones and in mid-2025 lit its experimental furnace for operational testing – a major step towards running international trials on lower-carbon glass production.

Typical project themes

Glass Futures organises projects across a compact set of high-impact themes:

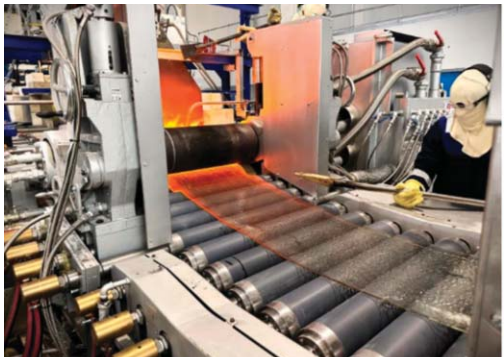
1. **Fuel switching and combustion** – practical trials to evaluate hydrogen and biofuels, burner redesigns, flame stability, NOx formation and retrofit paths for existing plants. This is of direct interest to combustion and thermal engineers.
2. **Raw materials and circularity** – increasing cullet content, new batch compositions or surface treatments to lower melting temperature and viscosity, and testing of contaminated recycled streams. Materials scientists and process engineers can quantify melting kinetics and downstream product effects.
3. **Heat recovery and energy systems** – capture and reuse of sensible heat, steam-cycle integration, ORC/CHP options and system-level modelling to improve plant efficiency. Mechanical and energy engineers can prototype and measure real performance gains.
4. **Emissions abatement and CCUS readiness** – trialling abatement technologies, flue treatment and capture options to reduce direct CO_2 and other pollutants. Environmental and chemical engineers can validate capture economics and integration.
5. **Digital control, monitoring and quality** – advanced process control, model predictive control, digital twin creation and inline optical inspection to reduce defects and energy use. Controls and software engineers can test controllers on a live line.

Demonstrating low-cost biofuel

How Glass Futures turns research into implementation

The key accelerator is access: members bring real industrial questions and gain time on the pilot line to generate the data needed for scale-up decisions. Projects are typically structured so that academic or SME innovation is de-risked with industrial trials; if successful, members can then adapt the validated approach to commercial furnaces. This "open testbed" model shortens deployment time and spreads cost and risk across stakeholders.

Glass Futures is a pragmatic, industry-led effort to move glassmaking into the low-carbon era. For engineers, the value is concrete: the chance to see integrated systems at industrially relevant scale, test ideas against real process constraints, and gather the data and contacts needed to move from concept to implementation.



First glass rolled from experimental furnace

Why join this IET Technical visit:

An IET Technical visit delivers these practical benefits:

- **See new technology at scale:** seeing a 30 tonne per day pilot furnace, its burners, refractories, flues and heat-recovery hardware gives immediate context to scale-dependent problems (thermal gradients, refractory erosion, process dynamics).
- **A chance to bridge disciplines:** Glassmaking touches materials, combustion, structural, electrical and software engineering. On-site demonstration projects emphasise integration challenges that are often overlooked in siloed R&D.
- **Practical networking and knowledge transfer:** You can meet operators, process engineers, academics and suppliers – the kind of cross-pollination that turns prototypes into commercially viable retrofits or new-build designs.

What to expect on a visit

- A walkthrough of the centre and pilot line (including safety briefing) illustrating furnace shell, burners, cullet feed, and inspection stations.
- Technical briefings on active projects and data from recent trials. The availability of trial data will depend on confidentiality agreements of projects and whether any commercially funded trials are currently in progress or have recently concluded.
- Q&A with the GFL team; a chance to ask specifically about TRL (technology readiness level) gaps, repeatability of trials and how the research conducted at Glass Futures will be taken through to full industrial implementation.

Schedule your technical tour today!

If you are working in industries that have significant requirements for energy, materials, controls, emissions or plant reliability, *regardless of whether or not glass is a material important to your business*, **a technical visit to Glass Futures** provides rare access to a purpose-built, industrial-scale experimental rigs that mirrors operational realities. You will return with: measurable case studies and practical insight into integration challenges (refractories, burners, heat-recovery) and how to reduce execution risk.

Martin Sharp
martin.sharp@ietvolunteer.org

The Isle of Man

UCM Engineering Student Honoured with IET's Award

A University College Isle of Man (UCM) Engineering student, Ryan Christian has been awarded the Institution of Engineering and Technology (IET) Merseyside and Western Cheshire Local Network Prize (which the Isle of Man is part of), for Student Excellence, recognising his outstanding commitment and performance in engineering studies at a non-accredited educational institution.

This prestigious award celebrates students who are pursuing courses within the IET's broad scope of interest, such as electrical, mechanical and systems engineering, at higher or further education establishments that are not formally accredited by the IET. Ryan's achievement exemplifies the spirit of the award, which aims to spotlight emerging talent across diverse learning environments.

Ryan began his Engineering journey on UCM's Technicals in Engineering Diploma course, where his passion for the subject quickly became evident. Driven by a desire to enter the industry, he successfully secured an apprenticeship with the Isle of Man Steam Packet Company, combining hands-on experience with academic study. He continues to balance work and education through an apprenticeship and is on track to complete his HNC in Engineering next academic year.

Sam Warren, Head of the Environment & Sustainability Faculty, said: "Throughout his studies, Ryan has demonstrated exceptional dedication and professionalism. His attendance and punctuality have been exemplary, and his academic performance has been consistently strong. Known for his quiet confidence and determination, Ryan approaches challenges with a practical mindset and a genuine enthusiasm for applying theoretical knowledge to real-world problems – both in his work and personal interests.

Ruth Watterson, IET Education Officer for the Isle of Man, added: "Ryan's commitment to personal and professional growth, combined with his reliability and technical aptitude, made him a standout candidate for this award. He embodies the values we seek to promote through this prize – integrity, curiosity, and a passion for engineering."

As part of the award, Ryan received a certificate of achievement and a monetary prize, along with the opportunity to engage further with the IET's professional community. The Local Network Prize for Student Excellence continues to support and inspire students like Ryan, helping to build a more inclusive and dynamic future for the engineering profession.

Sam Warren, Sarah Hoile, Ryan Christian and Ruth Watterson

Roxy Langstaff
Marketing Manager, University College Isle of Man
Roxy.langstaff@ucm.ac.im

Report on Primary Engineer

Since 2005, Primary Engineer has been on a mission to bridge the UK's skills gap by forging strong links between industry and education. We know that the key to inspiring the next generation is you.

We can't overstate the vital role volunteer engineers play in nurturing and developing future talent. Through our fully funded programmes and competitions, you can become a real-world role model for young people.

In 2024–25, we successfully connected 2384 engineering and technology professionals with pupils across the UK. These connections are essential, as they bring:

- Real-world context into the classroom,
- A clear view of the incredible breadth of engineering careers,
- An understanding that engineering is at the heart of lifelong learning.

Anticipated labour market changes threaten to worsen existing skills shortages. Future success relies heavily on 'essential employment skills' like problem-solving and creative thinking, not just specialist knowledge, according to a 2023 National Foundation for Educational Research report.

We're also fighting a narrowing of aspirations in young people who often lack awareness of the vast diversity of skills and roles within the engineering sector. Your involvement helps broaden their horizons when it matters most.

We offer a range of flexible volunteer options – both school-facing and non-school-facing – designed to fit your busy professional life.

- *CPD and Chartership:* Your volunteer hours can count toward your Continuing Professional Development and even help meet chartership requirements.
- *CSR Objectives:* Help your organisation meet its Corporate Social Responsibility goals with meaningful, impactful engagement.

Ready to make a difference? IET members can be part of the story and become a Primary Engineer 'Engineer Inspirer' by registering for more information: https://www.primaryengineer.com/engineers/

Primary Engineer®
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Steph Shencoe
Steph.Shencoe@primaryengineer.com
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The next chapter in innovation leadership

Novel

The leadership innovation programme

Funded by UK Government | horizons | Liverpool City Region Combined Authority | Metro Mayor Liverpool City Region

MetaCity Liverpool – A Unique Digital Twin of a City Region for Supporting Informed Decision-Making, Using Cross-Sectoral Data and Information

What is MetaCity Liverpool?

A city-scale digital twin, MetaCity Liverpool features interoperable, real-time rendered virtual communities, services, and tools that are accessible synchronously and persistently for purposeful use by an unlimited number of users, each experiencing a unique sense of presence and seamless data continuity. By integrating diverse datasets from across the city, the platform generates a wealth of information that offers unparalleled transparency and insight into the Liverpool City Region. Access to this data empowers businesses and governments to make better-informed decisions, gaining a competitive edge that results in streamlined processes, enhanced efficiency, reduced service costs, and ultimately, accelerated economic growth.

With innovative data, businesses can make better-informed decisions supported by pragmatic evidence and insights, gaining a competitive edge. This can result in improved efficiency and streamlined processes, reduced waste, better living, increased productivity, and the identification of new revenue streams and opportunities for growth.

Benefits

- MetaCity Liverpool is a flexible, cloud-based platform that is easily accessible and highly adaptable, with the potential for expansion and application in other locations.
- Its comprehensive suite of tools and data-driven capabilities makes it an invaluable asset for urban planning, sustainable development, health care, and heritage preservation.
- `By enabling informed decision-making and fostering economic growth, MetaCity Liverpool paves the way for cities to become more resilient, sustainable, and connected.

State-of-the-Art 3D GIS Analytics Platform

A powerful 3D GIS data platform, compatible with Cesium and powered by proprietary digital architecture and developed by the Virtual Engineering Centre, MetaCity Liverpool enables advanced geospatial visualisation, modelling, and analysis.

High-Resolution Scanning of Liverpool

Covering an impressive 210 km^2 of the Liverpool City Region, including Freeport areas, the teams utilised photogrammetry and LiDAR with ±3 cm spatial accuracy to provide a highly detailed, accurate, and reliable data source.

Open-source air quality data is placed over the model to highlight areas of opportunity and bring data to life

Broad Industry Applications

Suitable for diverse sectors, MetaCity Liverpool supports tasks such as investment planning, social housing development, air quality monitoring, city event coordination, and even emergency responses.

Enhanced Government Decision-Making

Providing essential data insights for government agencies to make informed decisions, MetaCity Liverpool can support infrastructure development, healthcare planning, housing policy, environmental management, and beyond.

To find out more information, please contact: vec@liverpool.ac.uk

Emma Green

Report on FORD Halewood Plant

On 17th September the IET Mersey and Western Cheshire visited Ford Halewood Ford Halewood's approach to innovation, Industry 4.0 applications, and the implementation of the Ford Production System (FPS) and Lean Manufacturing principles as part of the implementation of Electric Power Units.

Key areas covered include at an introductory presentation Halewood Products and Innovation
The presentation begins by introducing "Halewood products" and then transitions into "Ford Halewood & Innovation".

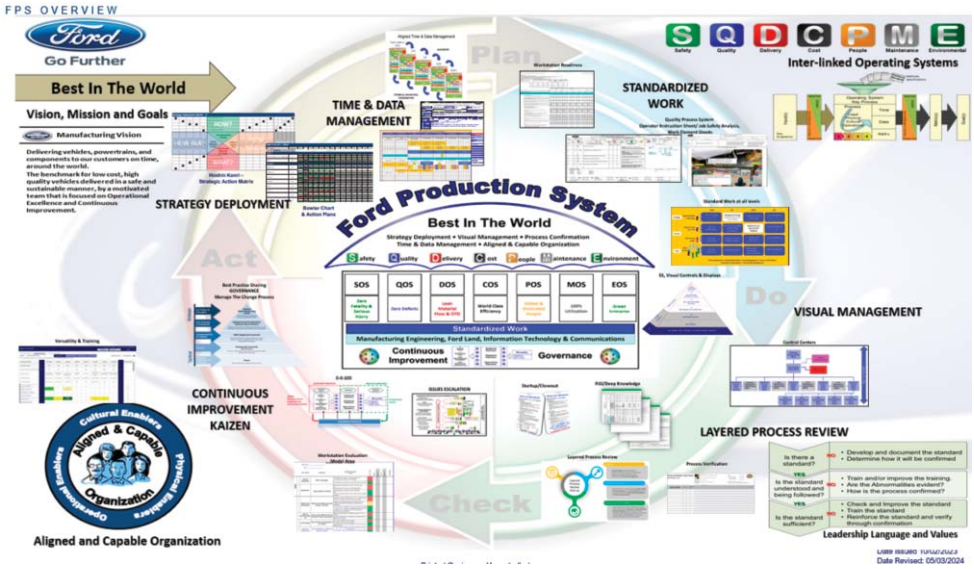
Real-World Industry 4.0 Use Cases
Ford Halewood is actively implementing Industry 4.0 technologies, including Engineering Delivery, Augmented Reality, Centralised Data, Facility Layout, Artificial Vision, Industrial Internet of Things (IIoT), and Virtual Comissioning.

Setting New Standards through Innovation
Ford Halewood aims to set new standards for quality and efficiency in manufacturing. This is achieved by building skilled cross-embedded teams, leveraging strengths through replication, creating short paths to innovation, and fostering an agile, customer-centric process. The strategy supports an "Always on Factory" by improving quality, reducing maintenance, and enhancing operational decisions. Support mechanisms include Advanced Robotics, Automatic Guided Vehicles (AGVs), Vision Systems, Additive Manufacturing, Data Analytics & Engineering, and Process Digitalization.

Godfrey Evans: welcoming our visitors to Ford Halewood's Innovation Area

Ford's 6 Pillars of Innovation
Advancements in manufacturing technology at Ford are structured around six pillars: Robotics (Cobots, Automation, AI Robotic Integration), AGVs (Systems, Data Insights, Logistics Processes), 3D Printing (Polymers, Metal, Rapid Prototyping, Digitalised Part Stores), Computer Vision (Quality Assurance, Thermal Monitoring, Safety Monitoring), Digitalisation (IIoT, Real-Time Monitoring, Dashboards, VR/AR), and Data Analytics (Predictive Maintenance, Cloud-based Analytics, Big Data Insights).

Innovation Process
Ford utilizes a "Funnel Tunnel" strategy to manage innovation projects, moving from Idea to Proposal, Prototype, Implementation, and finally, Ready for Replication.



Practical examples of innovation include using Boston Dynamics robot dogs for condition-based monitoring and EK Robotics AGVs for active commissioning.

Ford Production System (FPS) and Lean Manufacturing

The FPS is described as a "Results Driven" system focused on "Delivering Business Results" through continuous improvement and waste elimination. It incorporates a "Lean Maturity Model" and benchmarks against "LEAN Manufacturing" best practices, emphasizing strategic planning, cost reduction, profitability, and a learning organization. The system is structured with Vertical/ Horizontal Alignment, defining roles and processes for strategy deployment, standardized work, visual management, and continuous improvement.

Lean Manufacturing Principles

Lean Manufacturing is defined as a method to shorten the time between customer order, product build, and shipment by eliminating waste. Its core principles include Standardisation, striving to be "Best In Ford/World," efficient Inventory Management, an Empowered Workforce, Continuous Improvement, Layered Process Review, 5S Visual Management, clear Communication, and a strong Problem-Solving Culture.

Tools and Systems for Measurement and Management

Ford Halewood employs various tools for measurement and management, such as a Lean Maturity Model application for monthly scoring across Safety, Quality, Delivery, Cost, and People. A Report Generator provides sample data for the Lean Maturity Model glidepath and monthly scorecard. The plant also uses a SharePoint structure for its Business Control Centre (BCC), Plant (PCC), Department (DCC), and Zone (ZCC) to manage information. Data and Digitisation are crucial, with examples provided for stores requisitions, maintenance spend analysis, daily production consumption, and predictive inventory analysis. Performance is tracked using an "Auto Scorecard/ Bowler" dashboard for key performance indicators (KPIs) in areas like Safety and Quality.

The new manufacturing processes, equipment and Innovations were explained in a detailed factory tour.

Phil Boden

IET Manufacturing Technical Network

Report on IET Manufacturing Technical Network

The IET Manufacturing TN continues to promote and raise awareness of developments in manufacturing and technology – IET EngX (theiet.org).

During the 2nd half of 2025 we have held meetings on the Future of Lean Manufacturing (September 16th), Quantum Technologies and AI (20th November).

For Lean Manufacturing, Konstantinos Salonitis of Cranfield University showed there is a parallel between Lean Waste and Green Waste and how this can be used to link lean thinking to sustainability. Ken Jones, Founder and Director of Lean Manufacturing Deployment Ltd, talked about AI driven Kaizen and the critical importance of digital re-imagination of the total process as a means of overcoming barriers to lean transformation.

The webinar on quantum technologies focused on where quantum computing is being applied in manufacturing, what quantum computers are made of, and which products and technologies are currently supporting quantum development. Quantum computing is rapidly evolving from theoretical promise to practical implementation. As industries face increasingly complex challenges in logistics, materials science, and process optimization, quantum technologies offer new pathways to efficiency, innovation, and competitive advantage. Tessa Dale, Oxford NanoScience Ltd, covered the use of cryogenic cooling in enabling Quantum technology and development, and Gabriele Compostella, IBM, explored the motivation and potential for quantum computing in the manufacturing industry and the types of use cases to which it may be applied, providing examples from the IBM Quantum Network.

More details on these events can be found here: Manufacturing.

Looking ahead to 2026, the TN is already planning a wide range of topic areas that reflect the evolving needs and interests of the manufacturing community. Our keynote speakers and real-world case studies ensures that events are not only informative but also practical and relevant to engineers working in diverse roles. Planned events include:

- AI, Ethics and Manufacturing (Jointly with Merseyside & West Cheshire LN) (27th January);
- Manufacturing in Space (24th February);
- Composites and Advanced Materials (Q2);
- Soft Robotics (Q2;)
- Modular Manufacturing (Q3);
- Manufacturing Automation in 2050 (Q3);
- Industrial Strategy in Manufacturing (Q3).

For more information on any of our events, including recording of past events please see our web-page: (+) IET EngX

If you are interested in contributing to and/or helping drive our TN activities, we have openings for volunteers to join the TN and help reshape and expand the Executive. These opportunities range from simply attending a committee meeting, to bring new ideas to the table, through to organising, running, and promoting events. For more details, please contact us at Manufacturing-TPN@ietvolunteer.org.

Dr Chris Proudfoot – IET Manufacturing TN

The SEA Provides the Focus for all Aspects of the Surface Engineering Industry

History & Background

The Surface Engineering Association* (SEA) is a UK-based trade association and represents the interests of around 350 companies across the whole of the surface engineering supply chain – from chemical suppliers and equipment manufacturers through to coating applicators and end users. It was formed in 1997 by the amalgamation of the Metal Finishing Association (MFA) and the British Surface Treatment Suppliers Association (BSTSA). They were joined in 1999 by the Paint & Powder Finishing Association (PPFA), in 2000 by the Contract Heat Treatment Association (CHTA) and in 2005 by the Wolfson Heat Treatment Centre (WHTC).

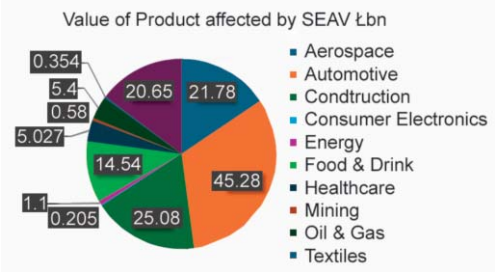
Although the SEA is a relatively young organisation, the MFA's beginnings can be traced back to 1887, when the Platers' and Gilders' Trade Section of the Birmingham Jewellers' & Silversmiths' Association was formed. We have retained our links to the world-famous Birmingham Jewellery Quarter and our office and those of our parent Group, the British Allied Trades Federation, are still located there.

The UK's surface engineering and advanced coatings (SEAC) industry is worth over £11bn and affects products worth £140bn. Surface engineering and advanced coatings play a vital role in the UK Manufacturing Sector.

In order to support its members, the SEA has representation on many influential committees and working groups and supports member companies with regulatory affairs, compliance issues and applications for authorisation under the UK REACH Regulations. The SEA has an impressive record of lobbying for changes in legislation and assisting members to meet their legal obligations and is in regular contact with all relevant authorities.

The SEA is also an active participant in CETS, the European Committee for Surface Treatments. In addition to the SEA, the committee comprises representatives of similar organisations throughout the EU and meets regularly to discuss topical issues, European standardisation and impending EU directives.

To encourage best practice and to honour companies within the UK industry which have achieved the highest standards, the SEA runs a biennial awards scheme for quality, marketing, environmental performance and outstanding achievement by both a company and an individual.



Value of products affected by surface engineering & advanced coatings

UK REACH & Chromium Plating

Recently the SEA assisted over 70 UK-based businesses to obtain authorisation under UK REACH for the continued use of chromium trioxide in various surface treatment processes. Why is this important? This allowed the companies to continue to provide both decorative and hard chromium electroplating processes whilst protecting both human health and the environment.

Legislation regarding chromium plating has been in place in the UK for almost 100 years, since the Chromium Plating Regulations 1931 were introduced. The SEA has worked tirelessly to promote best practice and to introduce specific guidance to assist companies in complying with their legal obligations. Following the introduction of the REACH Regulations, initially in the EU and then being transposed directly into UK Legislation following Brexit, chromium trioxide was identified as a SVHC – Substance of Very High Concern and its use eventually became subject to authorisation. Without an authorisation covering specific uses, companies could no longer use chromium trioxide. You will see marketing material, from other organisations, stating that chromium trioxide is banned in the UK, but this is not true, chromium trioxide is subject to authorisation under UK REACH.

How do I know if a chromium plating company is authorised? You can ask the company for the authorisation number they are operating under and then check this on the HSE website at https://www.hse.gov.uk/reach/applications-for-authorisation.htm

The authorisation process is very costly, time-consuming and bureaucratic and it imposes strict operation conditions and monitoring requirements to ensure protection of human health and the environment is maintained. The SEA has introduced an approved scheme, Fit4Chrome, to assist companies in maintaining their authorisations and promoting that they are fit to continue using chromium trioxide for chromium plating activities.

Godfrey Evans

*The Surface Engineering Association is part of the British Allied Trades Federation, a company limited by guarantee and registered in England & Wales number 69391. The registered office is Federation House, 10 Vyse Street, Birmingham B18 6LT, UK.

The Importance of Building Cyber Resilience within Your Business and Wider Supply Chain

Cyber attacks are top of the news agenda with recent high-profile attacks on Jaguar Land Rover and Marks and Spencer, forcing both businesses to stop operations, resulting in huge financial ramifications. These large-scale attacks are a wakeup call for the engineering and technology industry to understand building cyber resilience into their business operations.

Small and medium-sized businesses frequently lack robust cyber defences and therefore can be especially at risk and can become stepping stones for attackers attempting to reach larger businesses.

The rapid advancement of generative AI has also meant that cyber criminals can now launch more sophisticated and larger numbers of phishing attacks. A phishing attack is a message, such as an email, which impersonates a genuine message, encouraging the user to click on a link, which can then lead to a larger more serious cyber breach.

The engineering industry now needs to view cyber resilience as a business critical function that is of the same importance as health and safety, for example. The North West Cyber Resilience Centre is part of a police-backed nationwide network, which provides guidance and advice around building cyber resilience within the business community to help prevent attacks.

DI Dan Giannasi, head of cyber and innovation at the NWCRC, explained, "A simple click on a phishing link in an email can lead to a much bigger expansive cyber attack, which can go on to have huge ramifications for any business and its wider supply chain."

"For small and medium-sized businesses seeking support in building cyber resilience, the NWCRC provides support through awareness-raising, staff training, and senior leadership training, including boardroom-style exercises, to build a strong cyber culture."

Practical advice for the engineering and technology industry

Password security:
All employees should understand good password hygiene, which includes unique and secure passwords for every account, the use of password managers and multi-factor authentication where necessary.

DCI Zoe Russo from North West Regional Organised Crime Unit (NWROCU), DI Dan Giannasi from NWCRC, Cheshire Police & Crime Commissioner Dan Price and DCI Chris Madocks from NWCRC

Access and user management:
Use multi-factor authentication (MFA), monitor privileged accounts, and limit access with the principle of least privilege for all critical systems. User management is vital - access should be immediately revoked or amended if an employee leaves the business or changes job role.

Supply chain assessments:
Businesses should ensure they undertake regular security assessments on all suppliers, including third-party software providers, and have evidence of robust security practices.

Incident Response Plan:
Every business should have an Incident Response Plan, which includes every action and communication that needs to happen in the event of a cyber breach first being reported. This should include emergency response and immediate actions, through to communications with suppliers and logistics partners and post-incident review.

See NWCRC website for more resources and advice around cyber security for small to medium organisations: https://www.nwcrc.co.uk/

Carolyn Hughes

Reading the Newsletter on both Android and Apple devices using Adobe Liquid Mode:
https://www.adobe.com/acrobat/hub/how-to/what-is-adobe-liquid-mode.html

SP Energy Networks

Your skills can power a better future.

Engineers, Project Managers, Surveyors, Construction and Crafts.

Flexibility Summit in Liverpool

On 17 September 2025, SP Energy Networks held the first-ever Flexibility Summit in Liverpool – welcoming over 100 attendees from across the energy sector.

The event featured a packed agenda across three rooms, including main stage presentations, panel discussions, breakout sessions. The purpose was to bring all parts of the value chain within the Flex journey together to collaborate and discuss not only how the SPEN flex market has grown since launching its month ahead market in winter 24 but also what needs to be done to grow participation further in Flex Markets.

Nia Lowe, Head of DSO

Some highlights from the day included:

- Welcome from Kate Stansfield, Head of Sustainability and Net Zero, Liverpool City Council
- Opening and closing remarks from Gerry Boyd, Head of Flexibility and a keynote on DSO in action by Nia Lowe, Head of DSO
- A panel session with key decision-makers from Ofgem, Electron, the Department for Energy Security and Net Zero, University of Strathclyde PNDC, Elexon, and the National Energy System Operator
- A fireside chat with six of the most active flexibility service providers – Electric Miles, EV. Energy, Axle Energy, Equiwatt, ScottishPower and AMP Clean Energy challenging us to keep improving and innovating.
- Feedback from the day has been overwhelmingly positive, with stakeholders praising the event's energy, and focus on real-world solutions. Here's what attendees had to say:
- Hugo Chandler, New Resource Partners – "Such a pleasure to attend a conference where delegates truly converse! This meeting of minds is vital to drive the evolution of flexible grids that can manage massive new investments in clean energy assets. Thank you – I look forward to the next one."
- Lois Clark, Baringa – "This was a brilliant event, striking the right balance between presentations and progress updates, with challenging panel discussions and interactive breakouts. The breakouts were positive and well received in getting people thinking and talking, and I personally came away with some useful insights."
- Gerry Boyd, Head of Flexibility SPEN commented "This is just the beginning. We want to ensure that everyone – no matter their background or expertise – can play a part in flexibility. We're ready to work with our stakeholders to shape the future of the energy landscape".

Panel Session

Facts: SPEN is currently procuring Flexibility services from a range of providers on a month ahead basis with over 100 000 Assets registered on its 3rd party market platform Piclo. The service requires demand turn down or generation turn up at an agreed time in exchange for an agreed price. Anyone who is connected in SPEN licence areas can participate if they have a controllable asset such as a CHP or battery.

SPEN has secured 1 GWh of Flexibility so far in in 2025, this ensures that network is utilised in an efficient way deferring the need and cost of reinforcement.

SPEN are also procuring Operational Flex on a bilateral basis for pre and post outage support ensuring grid resilience in order to make sure customers stay connected

To find out more on how to participate in Flex please get in touch with the SPEN Flexibility Team on: Flexibility@spenergynetworks.co.uk

Attendees Networking

Pamela Mathieson

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Printing the Future of Composite Tooling: How Large-Format Additive Manufacturing Is Changing the Way We Make Moulds

In the world of composite manufacturing, the most time-consuming part of any project isn't usually the component itself it's the tooling that came before it. From plugs and moulds to fixtures and patterns, these large structures define the accuracy and repeatability of every composite part that follows.

Car model printed in 92 minutes

For decades, manufacturers have relied on tooling board as the go-to material for producing these forms. The process is tried and tested: blocks of tooling board are glued together, machined to shape, sealed, and finished. It works. But it is also slow, manual, and inherently wasteful.

As industries move toward lighter, faster, and more sustainable production, attention is turning to large-format additive manufacturing (LFAM) – a new way to produce tooling directly from digital design data.

Engineering Automation for Advanced Manufacturing

Based in Liverpool, CNC Robotics has spent over 15 years designing and integrating robotic systems for machining, carving, and additive manufacturing across sectors such as aerospace, automotive, marine, healthcare, and creative industries.

Unlike typical machine tool suppliers, CNC Robotics develops complete, custom robotic cells – combining industrial robots, machining spindles, extrusion hardware, and software to create flexible, automated solutions that bridge the gap between digital design and production.

The company's systems are used across the UK to machine everything from carbon-fibre components and composite moulds to large scale props and models.

From Tooling Board to Tooling Paste

Traditional tooling board machining remains a cornerstone of composite production, but it comes with unavoidable challenges: large material waste, long preparation times, and significant floor-space demand for board storage and glue-up.

Recognising these constraints, CNC Robotics have developed an additive alternative that delivers the same performance with greater efficiency. The result is Paste_Pro, a robotic LFAM system designed to 3D print polyurethane tooling paste directly into near-net-shape parts.

A Practical Shift

The principle is straightforward: instead of machining away 50% of a tooling block, Paste_Pro prints a near-net shape that requires minimal finishing. Once cured, the part is still CNC-machined to final tolerances.

By printing only what's needed, the system significantly reduces waste and setup time:

- **Material waste:** reduced from 40–50% to around 15%.
- **Preparation time:** no glue-up or board assembly.
- **Storage:** paste supplied in sealed drums, eliminating the need for board racks.
- **Part size:** limited only by robot reach, not board dimensions.

The parts pictured to the right, a recent demonstrator of a full automotive model, printed 1200×700×400 mm in 140 minutes, with CNC finishing completed in under five hours - ready for painting and inspection. The image shows a printed part on the right, and the milled version on the left, showing how little material is needed to be machined to get to achieve the final surface finish.

Full model printed vs milled

Why It Matters

For engineers, the appeal of large-format additive manufacturing isn't in novelty but in practicality. The Paste_Pro integrates cleanly with existing digital workflows, offers measurable time and material savings and enables a more agile approach to tooling.

As more manufacturers look to bring tooling production in-house, systems like Paste_Pro show that additive processes can coexist with established machining operations. Rather than replacing traditional CNC, they make it more efficient.

A printed part cut up, showing the fully dense layers

See the Paste_Pro in Action

For manufacturers wanting to explore this technology first-hand, CNC Robotics is hosting a dedicated 3D Printing Workshop at their facility in Liverpool. Open to all SME businesses interested in additive manufacturing, the session will give you the chance to see the Paste_Pro system in action, watch live large-format printing, and gain practical insight into the costs, workflow and day-to-day operation of a robotic LFAM cell. Scan the QR code to sign up to the event.

Max Barnett

IET Mersey and Western Cheshire Network

Where Do Engineers Come from?

All of the 'active' members and volunteers within the Mersey & Western Cheshire Local Network are aware of the excellent work that has been done for many years by our Education Officers. Unfortunately, there are only two at the moment.

Education Officers and STEM Ambassadors are our Institution's direct connection to schools and colleges – and it is this contact that will help encourage the next generation(s) of Engineers and Technicians that the country really need in all areas of Engineering.

For that to happen we must create a stronger Education Officers Group to reach out to more Schools and Colleges.

YOUR NETWORK NEEDS YOU!

But, more importantly,

YOUR COUNTRY NEEDS YOU!

This is simply because, without Engineers we ***will*** become a Nation of Shopkeepers!

This is our message to all those Engineers and STEM professionals, in our Network, to step up and help reach as many of the 100s of schools and colleges in our region as possible.

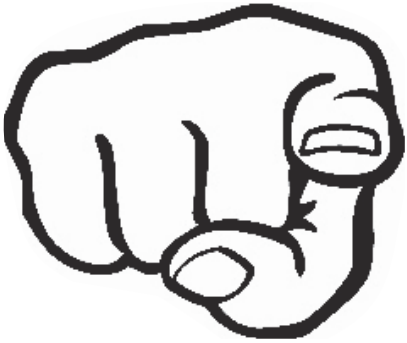
So that we can create a solid foundation to this, we have set out ambitious mission and vision statements of what success could look like in 12 months time.

Mission Statement

The IET M&WC Education team works with Schools and Colleges to promote the values of the IET, encourage students to consider a career within STEM, work with teachers to improve learning experiences *and inspire the next generation of Engineers.*

Vision Statement

The IET M&WC Education team will become the 'model' for all IET Local Networks. It will create and promote a sustainable and consistent relationship with as many Schools and Colleges in the region as practicable, provide sufficient education officers across our region, ample resources to aid STEM curriculum and by working with All About STEM to reach schools in need of assistance.



GET INVOLVED!

JOIN THE EDUCATION OFFICERS GROUP!

PROMOTE ENGINEERING TO YOUNG PEOPLE!

Godfrey Evans

4wardFutures is a Warrington based charity that is working to empower young people of all backgrounds to take control of their future careers and progression opportunities by engaging with employers, universities, and professional organisations against the backdrop of a world that is rapidly changing through the impact of innovation and new technology.

https://www.4wardfutures.org.uk

Satellites and Society Project (SaS) – We are excited to announce that 4wardFutures has been awarded funding by the Institute of Physics to deliver the SaS project. Working in collaboration with Professor Paul Roach from the School of Physics and Astronomy at Cardiff University and Celtic Terahertz Technology, this initiative brings space science to families. The project features two Family Workshops where children and parents/carers explore how satellites help us understand and protect our planet. Participants use infrared cameras to see invisible light and take part in a hands-on Design a 3D Satellite Craft workshop.

As part of the project pupils create their own Blue-Sky Questions

Blue Sky to Green Earth Project (BS2GE) – With support from Dr Ged Bell and Niklas Templeton from STFC Daresbury Labs, 4wardFutures has launched the STFC Spark Award-funded BS2GE project at the first two schools. BS2GE connects learners with STFC-funded researchers and professionals, showcasing how cutting-edge 'Blue Skies' research contributes to solving real-world sustainability challenges. Through interactive workshops and events, students discover how fundamental scientific research translates into practical solutions for our planet. The project aims to inspire young people to see STEM careers as viable pathways, understand the steps needed to achieve them, and recognise their broader societal impact. As part of the workshops, pupils develop their own Blue-Sky Questions and engage with real researchers.

Get Involved: Are you an STFC-funded researcher or professional? We'd love for you to share your work and experience with young people through the BS2GE project. Please contact us to learn more.

Merseyside Aviation and Aerospace Project (MAA) – Supported by Professor Serge Wich from Liverpool John Moores University, PhD student Flavia Severiano from the University of Liverpool, and Jess Ferrington from NATS, the MAA project has now engaged three primary schools. Funded by the Civil Aviation Authority, this initiative introduces young people from disadvantaged areas to the exciting world of aviation and aerospace. Students learn about the work involved in designing, building, and operating aircraft, including spacecraft and drones, and explore the diverse career opportunities within these sectors. Participants also engage in hands-on activities such as plane design challenges, making the learning experience both educational and inspirational.

AI Futures Project – Following a successful pilot programme, 4wardFutures is expanding their AI Futures project. We are partnering with Keele University's STEM club programme and Sir Thomas Boteler C of E High School to deliver additional workshops. The AI Futures project helps young people aged 8 to 18 understand the impact that artificial intelligence is having, and will continue to have, on their current and future career opportunities. Through interactive sessions, students explore real-world AI applications and consider how they might work with this transformative technology. Get Involved: If you're working on AI applications in your field and would like to share your expertise with young people, we'd love to hear from you.

Virtual Sustainable Futures Careers Expo - As part of the development of their Sustainable Futures programme, 4wardFutures have been hosting a Virtual Sustainable Futures Careers Expo.

https://www.4wardfutures.org.uk/sustainable-careers-expo

By participating in the Expo, companies, individuals, and organisations from all sectors can: Share the work they are doing to combat climate and ecological challenges; Demonstrate how they are reducing their organisation's carbon footprint and environmental impact; Provide insights into progression and career opportunities for young people; Connect directly with the next generation of STEM and environmental professionals.

For further information about any of our projects or if you are interested volunteering or working with us, then please contact us at: media@4wardfutures.org.uk or via https://www.4wardfutures.org.uk

How Can STFC Support Your Business?

Science and Technology Facilities Council

Innovation Clusters | North West Space

The Science Technology and Facilities Council (STFC), part of UK Research and Innovation (UKRI), is a world-leading multidisciplinary science organisation. Their goal is to deliver economic, societal, scientific, and international benefits to the UK. STFC operates world-class research facilities across the UK, including Daresbury Laboratory at the Sci-Tech Daresbury campus.

Daresbury Laboratory has a wide array of facilities and expertise available to industry, including the Innovations Technology Access Centre, the Hartree Centre, the Campus Technology Hub and the Accelerator Science and Technology Centre.

Innovations Technology Access Centre (I-TAC)

STFC provides specialist equipped laboratory facilities to give ambitious entrepreneurs, start-ups and SMEs in biology and chemistry sectors the space to support and grow. Known as I-TAC, the facilities are an affordable solution for businesses to access an impressive array of technologies, equipment, technical and business expertise. This reduces the risk associated with research and development, particularly for early-stage companies.

Offering flexible leases and fixed rental costs, I-TAC laboratories are provided for companies that require wet laboratories, including materials, chemistry and biology companies. They are equipped with fume cupboards, biosafety cabinets, gases. The suite of equipment includes essential and specialist laboratory equipment and high precision analytical equipment.

Our incubation companies also benefit from access to expert business support, routes to finance and early-stage funding, as well as a national network of public and private sector partners who can support their growth journey.

If you are interested in the facilities at I-TAC, please contact: incubationlabs-dl@stfc.ac.uk.

Campus Technology Hub (CTH)

The STFC's Campus Technology Hub supports organisations, from start-ups to larger primes, to rapidly translate new ideas into reality through access to expertise, equipment, space, and a collaborative business ecosystem.

The CTH has a flexible approach to accommodating project work – whether it's prototyping or improving manufacturing processes – and provides scaling businesses access to leading equipment, reducing the risks associated with the development and trial of new products. The CTH's experts are also on hand to provide impartial advice and support to explore the art of the possible, accelerating time to market.

Capabilities include additive manufacturing, digital prototyping, the 5G ecosystem and a living laboratory:

- **3D printing:** The additive manufacturing facilities enable rapid prototyping for design validation, user testing, field trials and pre-production evaluation. These technologies can produce components using over 50 different polymer and metal materials.
- **Digital prototyping:** Delivering immersive solutions through virtual and augmented reality, digital assets for MP4 presentations and web-based applications during new product development.
- **5G ecosystem:** Future telecom technologies, including enhanced open 5G connectivity, dedicated high-performance private network, secure data storage and a dedicated lab for building and more.
- **Living laboratory:** Equipped with infrastructure including 5G, LoRaWAN and IoT platforms to allow SMEs to accelerate product development, validate solutions and access expert technical support.

The CTH also offers flexible laboratory and office space, from open plan to lockable work benches and offices. If you are interested in working with the team at the CTH, please contact: emmanuel.dupuis@stfc.ac.uk.

Hartree Centre

STFC's Hartree Centre helps UK businesses and organisations of any size to explore and adopt supercomputing, data science, and artificial intelligence (AI) technologies for enhanced productivity, smarter innovation, and economic growth. They work across sectors including life sciences, healthcare, manufacturing and clean energy.

To support with their work on high-performance computing, they have recently launched a powerful new supercomputer, the Mary Coombs, which will give businesses and public sector organisations access to world-class computing power and expertise.

Crucially, the Hartree Centre emphasise the extensive training support offered, to complement their capabilities. This allows organisations to adopt new technologies to navigate their individual goals and working landscapes. Their key training process includes process optimisation, innovation acceleration, dataset understanding and digital skills and they possess both the infrastructure and the

people to harness this expertise. This includes research software engineering teams, and a chemistry and materials group.

By working on collaborative R&D projects with industry partners, companies can work commercially through projects or pay for access on their machine, and the centre can effectively dial-up, and dial-down support based on individual needs.

The Hartree Centre is also well connected to external funding sources and its own Hartree National Centre for Digital Innovation (HNCDI) programme, in collaboration with IBM.

There are several ways to work with the Hartree Centre. They have a broad portfolio of capabilities, and pride themselves on being sector agnostic.

To find out more, please visit their website: https://www.hartree.stfc.ac.uk/.

If you are interested in collaborating with the Hartree Centre, please contact: hartree@stfc.ac.uk.

Accelerator Science and Technology Centre (ASTeC)

ASTeC operates a wide range of cutting-edge R&D facilities, which are available to help industry meet its research and development goals. They enable businesses to test, validate, and improve their products and processes, through world-leading particle acceleration facilities and expertise.

These facilities include their Compact Linear Accelerator for Research and Applications (CLARA) which is a medium-energy electron beam, designed to develop and test next-generation accelerator technologies, shaping the future of medicine, high energy physics, material science and more. The Linac Test Facility has been developed to investigate the potential for compact linear accelerators to be utilised in application areas such as security scanning, radiotherapy, non-destructive testing and wastewater treatment.

Their clients come from an extensive list of industries, including but not limited to, security, energy, healthcare, materials and advanced manufacturing. By working with ASTeC, companies can expect a faster, more positive and cost-effective outcome for their R&D programme, and each individual project can be precisely tailored to customer requirements, whether that's a one-off contract payment for prototype testing, or longer-term partnerships with academia.

If you are interested in working with ASTeC, please contact: anthony.gleeson@stfc.ac.uk.

Sci-Tech Daresbury

In 2010, a joint venture including STFC, Halton Borough Council and Langtree formed the national science and innovation campus known as Sci-Tech Daresbury. The partnership has led to increased collaboration, new buildings, establishment of clusters and world-class science facilities. Sci-Tech Daresbury provides a range of post-incubator and scale-up laboratory facilities suitable for wet biology and wet chemistry labs, pilot plant facilities and instrumentation labs.

These labs range in size, from 750 to 2000 square feet, and have access to specialist infrastructure including fume extraction, 3-phase power, compressed air, nitrogen and cooling water.

Looking ahead, Sci-Tech Daresbury will start construction on an additional laboratory building as a part of its Project Violet Phase Two development, providing laboratory floorplates of 5000–20 000 square feet – suitable for scale-up laboratory and pilot plant facilities and low volume high value manufacturing.

If you are interested in enquiring about laboratory facilities at Sci-Tech Daresbury, contact: info@sci-techdaresbury.com.

Kerry Keenan

Updates from Academic, Industrial and Research Partners
Bilfinger UK

Honouring Service on Remembrance Day: Bilfinger UK Recognised with Bronze Award

As the nation pauses to reflect on the sacrifices of the Armed Forces community this Remembrance Day, Bilfinger UK proudly announces its recent recognition with the Bronze Award from the Defence Employer Recognition Scheme (ERS) – a milestone that underscores the company's growing commitment to supporting those who serve.

This award follows Bilfinger UK's formal signing of the Armed Forces Covenant, a pledge to ensure that members of the Armed Forces – past and present – are treated with fairness, respect, and opportunity in the workplace. The Covenant reflects a shared responsibility across society to support veterans, reservists, and military families.

"Achieving the Bronze Award is a meaningful first step," said **Sandy Bonner, President of Bilfinger Engineering and Maintenance UK**. *"It reflects our values and our commitment to building a workplace where those with military experience can thrive. On this day of remembrance, we honour the sacrifices made by the Armed Forces community and reaffirm our promise to support them – not just in words, but through action*."

The Defence Employer Recognition Scheme encourages employers to support defence and inspire others to do the same. The scheme encompasses Bronze, Silver, and Gold awards for organisations that pledge, demonstrate, or advocate support for defence and the Armed Forces community, aligning their values with the Armed Forces Covenant.

Claire Dingwall, Recruitment Manager at Bilfinger Engineering & Maintenance UK, added: "*Joining the Armed Forces Covenant and achieving our Bronze Award recognises the value that members of the armed forces community bring to our workforce. It further cements our commitment to providing meaningful employment opportunities and support to Service personnel, reservists, veterans, the cadet movement, and military families. This marks an important step in our journey to strengthen engagement with the armed forces community and ensure our values align with those who protect and serve.*"s

Sandy Bonner, President of Bilfinger UK with Ray Watt, Highland RFCA Defence Relationship Manager, and Claire Dingwall, Recruitment Manager, Bilfinger UK

Highland RFCA Defence Relationship Manager Ray Watt said: "We are delighted that Bilfinger UK has chosen to actively demonstrate its support to our Armed Forces by signing the Armed Forces Covenant and joining the Defence Employer Recognition Scheme."

Stacey Lynch

IET Nuclear Technical Network

The Nuclear Technical Network and Collaboration with Your Local Network

For those who are unaware of the IET Technical Networks (TN) - they operate in a similar manner to the IET Local Networks (LN). Like your LN, the TNs are organised by a committee of enthusiastic IET members and are committed to providing lectures, communications, events and conference activities. The subtle difference between LNs and TNs is that LNs are geographically based, and cover a wide range of topics, whereas a TN will focus on a particular technical topic of interest.

The IET Nuclear Technical Network does what it says on the tin and is 100% focused on all things Nuclear. It is organised by a diverse and experienced group of nuclear professionals and has been successful in organising webinars, on a range of nuclear related topics, and a successful in person conference in 2024. The TN has a strong base in this area, with companies like Sellafield, Amentum, BAe and EDF all represented within the committee so a connection between the TN and your LN is already strong.

There is a joint effort ongoing to enhance this collaboration, with both groups looking to set up a series of nuclear related evening talks in the future, starting in Q1 or Q2 of 2026. Nuclear is undergoing a significant renaissance, with for example the announce of new SMR reactors on Anglesey in North Wales so it seems opportune to build on this with a strong level of LN / TN collaboration. This may even extend to a full day session at some point – so exciting times ahead and hopefully the new collaboration will provide some enjoyable topics of interest for you as LN IET members in the Mersey/West Cheshire area – watch this space!

Ian Belger

Designing Engineered Components and Systems for Modular Construction

Jigsaw Business Group specialises in new product development and modular concept design, delivering expertly engineered, cost-optimised components and systems tailored for safer, faster, and greener building projects. Our solutions are meticulously designed and tested to the highest standards for seamless integration into production ready solutions for commercial, residential, and infrastructure builds.

Why this matters to the IET audience

Modular construction is reshaping how engineers, designers and contractors deliver buildings. For the IET readership – practising engineers, technical leads and systems integrators – the appeal is practical: repeatable quality, measurable performance and reduced programme risk.

IET readers value engineering rigour, traceable design decisions and demonstrable compliance. Jigsaw's work aligns with those priorities by delivering:

- **Right-first-time digital design** that reduces iteration and accelerates verification; this saves engineering hours and limits rework on factory and site.
- **Controlled quality and high compliance**, with engineered tolerances and test evidence that simplify approvals and handovers.
- **IP-backed, project-specific solutions** that let clients preserve technical differentiation while benefiting from repeatable manufacturing economics. For systems engineers specialists, these attributes mean clearer interfaces, predictable integration points and fewer late-stage surprises.

Inception: requirements, targets and the risk of quicksand

Jigsaw builds a set of requirements and explicit design targets before any conceptual work begins. Requirements cover functional performance, regulatory constraints, transport and handling, manufacturability, usability and lifecycle sustainability. Design targets translate those into measurable parameters: mass limits, connection tolerances, acoustic performance, fire ratings, assembly time and carbon budgets.

Getting these targets right at inception matters. Think of a building programme as a structure – if your foundation sits on quicksand, every downstream effort becomes costly and fragile. Defining requirements and targets up-front is how Jigsaw avoids that quicksand: it ensures the product space is constrained to feasible, testable alternatives that meet project priorities.

Ideation and design alternatives

With targets set, Jigsaw proceeds to ideation: parallel design alternatives, rapid digital prototyping and objective trade-off analysis. Multiple concepts are evaluated against the same targets so decisions are data-driven, not subjective. Parametric modelling and virtual validation allow performance comparisons – structural integrity under handling loads, thermal bridging, MEP routing efficiency, and assembly ergonomics – before any physical prototype is cut.

This approach is especially valuable to IET readers who must balance competing system-level constraints: electrical distribution vs fire compartmentation, HVAC modularity vs acoustic requirements, or manufacturing cost vs long-term maintainability.

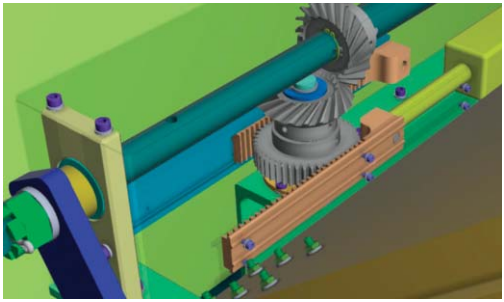
From design to production-ready systems

Jigsaw's engineering process tightly couples design-for-manufacture, design-for-assembly and pre-compliance testing. The result is components that integrate easily on production lines and on site: HVAC modules with factory-fitted interfaces; pre-wired hardware with standardised connectors; intricate pre-assembled cassettes for repeatable final assembly. Clear documentation and change control ensure compliance, tight IP control and adherence to targets.

For infrastructure and building systems engineers, this reduces commissioning time, simplifies asset management and lowers whole-life risk.

Conclusion

For the IET community, partnering with an engineering-first modular component designer means clearer technical baselines, traceable decisions and products that arrive production-ready – not guesswork. By building requirements and design targets at inception, ideating disciplined alternatives, and validating solutions digitally and physically, Jigsaw helps engineers avoid the quicksand of weak foundations and deliver safer, faster, greener buildings. Contact Jigsaw Business Group free of charge to discuss how engineered components and systems can be designed into your next modular project.



Linear actuated gearbox for an automated building ventilation system by Jigsaw Business Group

Yaniv Oren

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2026 Annual Dinner

Mersey & Western Cheshire Network

Join us on 6th February 2026

at Liverpool Hilton City Centre

Meet with prospective partners and build relationships with key people in your field.

Network with engineers from all sectors. Executives, Heads of Departments and Senior Engineers from a variety of organisations will all be attending.

Recognise your employees or host clients with a delicious three-course dinner in a prestigious waterfront setting.

Table Cost: £700 (seats 10)

Individual Tickets £70

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Can't find the contact you need?

You will find contact details for each event in the event synopsis on pages 18–19.

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on these social media sites to keep up to date with events and activities!