THE EUROPEAN METROLOGY NETWORK FOR ADVANCED MANUFACTURING: SETTING THE FUTURE COURSE

JAMES CLERK MAXWELL AND AN INGENIOUS WAY TO MEASURE ELECTRICAL RESISTANCE

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JUNE 2024 ISSUE 32

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NMSA STANDARDS AVAILABLE TO DOWNLOAD

On 11th April, the InstMC National Metrology Skills Alliance (NMSA) had a virtual launch event to introduce the now completed Metrology Skills competency standard.

The event was introduced with a presentation by Dr Mike Percival – Global Head of Manufacturing Engineering, Rolls Royce, who talked about the importance of an industry supported approach to skills. We also heard from AWE and Reliance Precision on the ways the industry has supported so far and plans to implement the standard.

You can watch a recording of the event on the InstMC YouTube Channel at https://youtu.be/4bJPgOLbwf0?feature=shared

PDFs of the standard are now freely available to download from the InstMC website and are available for anyone to start implementing in their organisations, or you may find them helpful as an individual to identify skills gaps or to support with your professional development.

We offer the Core standard which looks at the general competencies and skills required for all metrologists. We have also completed and published two specialism specific annexes to provide competency and skills guidance for those working in specific fields. These annexes focus on Manufacturing and Flow.

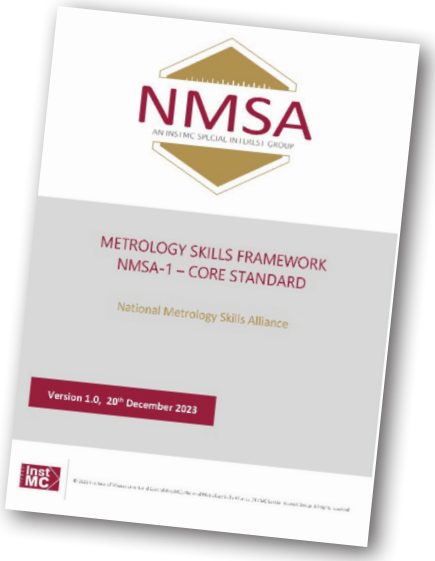
The NMSA is continuing to develop additional annexes to support the Core standard, and these will be published as and when they are ready.

Now that the first edition of the underpinning standard is available, the NMSA will be focusing on the development of professional qualifications for metrologists, as well as an endorsement scheme for metrology training and courses.

The intention is for the qualification to be a peer review competency-based assessment process, taking a similar approach to the Engineering and Science Councils, and we hope to be able to start offering this to members in early 2025.

The NMSA is run as a Special Interest Group of the Institute of Measurement and Control, and we welcome input and questions from the membership and beyond.

If you would like to find out more about the work of the NMSA, or discuss how you, or your organisation can be involved, please send an email to NMSA@instmc.org.



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THE EUROPEAN METROLOGY NETWORK FOR ADVANCED MANUFACTURING: SETTING THE FUTURE COURSE

AUTHORS: ALEXANDER EVANS[1], HARALD BOSSE[2], ANITA PRZYKLENK[2], ALESSANDRO BALSAMO[3], DANIEL O'CONNOR[6], FERNANDO A. CASTRO[6], TANFER YANDAYAN[7], JAN SOUKAL[4], DARISZ CZUŁEK[5], DISHI PHILLIPS[8], ALAIN KÜNG[9], CARLO STEFANO RAGUSA[10], STEN BERGSTRAND[11]

Introduction and summary

Advanced manufacturing has been identified by the European Commission as one of the key enabling technologies (KETs), which are considered to be crucial in creating innovative and sustainable economies while addressing societal challenges. Metrology is a key enabler in the development of advanced manufacturing since improvements are dependent on the ability to measure correctly. These measurements support the aims of zero defects, zero delay, zero surprise and zero waste in production processes [1]. Another KET closely related to advanced manufacturing is that of advanced materials, which are either intrinsic to advanced manufacturing processes, created by them or both. In order to address these challenges EURAMET has supported the creation of the European Metrology Network for Advanced Manufacturing, which includes advanced materials. The European Metrology Network (EMN) for Advanced Manufacturing drives the high-level coordination of the metrology community in this field with the aim of promoting metrology developments for advanced manufacturing. The network is operated by national metrology institutes and designated institutes in close cooperation with stakeholders from academia, industry, and international initiatives with an interest in advanced manufacturing.

Establishing the EMN

The European Metrology Network for Advanced Manufacturing was established in June 2021. It is led by a chair and three vice-chairs from National Metrology Institutes (NMIs) from across Europe. The EMN is supported by metrology experts working at 18 European NMIs and Designated Institutes (DIs) and a stakeholder council of members representing a range of 13 key industrial sectors (KIS) working in advanced manufacturing. The guiding mission of the EMN is to support the competitiveness and innovation of the European advanced manufacturing industry by developing a metrology infrastructure in cooperation with

stakeholders through access to metrology research, services, and knowledge transfer. The approach taken to realise these actions is described in detail in Przyklenk et al., 2021 [2]. The EMN has partnered with associated existing networks and societies related to advanced manufacturing and advanced materials including European Technology Platform MANUFUTURE, EFFRA Made in Europe partnership, euspen, NanoFabNet, and VAMAS.

The EMN is active in several areas to provide support for advanced manufacturing technologies. We firstly maintain dialogue with stakeholders across the advanced manufacturing and advanced materials landscape, with support of the high-level experts of the EMN stakeholder council in order to understand the future mereology needs to be addressed by joint research projects. Secondly, we engage in regular interaction with existing and future European partnerships and international organisations to identify the future needs for metrology related contribution for research programs. Thirdly we both develop and provide specific metrology knowledge transfer to the European advanced manufacturing industry and stakeholders. Fourthly we represent European interests in standardisation and regulation committees which relate to advanced manufacturing. Finally, we coordinate the approach to develop and maintain a European metrology infrastructure of measurement capabilities and services available across the member countries.

These major activities of the EMN can be described as "engage, listen and steer". We engage with stakeholders to identify and define their metrology needs, which leads to steering the strategic direction of metrology research in Europe. We then support the delivery of research to respond to those needs in close collaboration with the stakeholder community, building a virtuous circle to enable a future proof coordinated measurement infrastructure to support the advanced manufacturing sector in Europe.

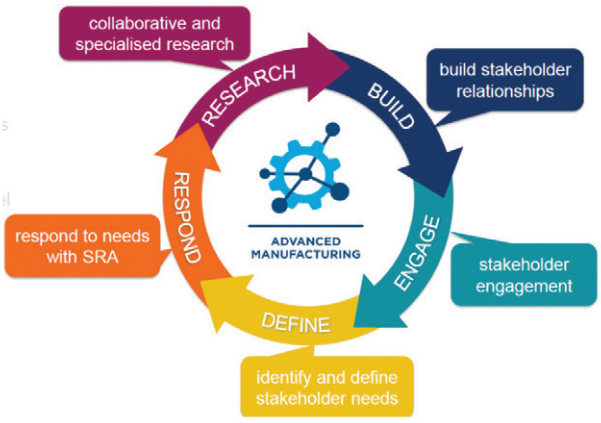

Figure 1. The cycle of "Engage, listen and steer" of the EMNs [4] to define the metrology research needs of advanced manufacturing and advanced materials .

Surveying the landscape

In preparation for the creation of the strategic research agenda (SRA), a period of surveying the landscape of existing strategies for advanced manufacturing and advanced materials was conducted. This was achieved by reviewing national and European high-level strategy documents to identify metrology gaps. It was noted that the term metrology is not always used in these strategy documents to describe the practice of measurement against an SI unit. The identified metrology gaps were filtered into the identification of the metrology needs of advanced manufacturing through a review by experts at the NMIs, DIs and external stakeholder council. These capability gaps acted as a starting point for the creation of the SRA for advanced manufacturing.

Development of the Strategic Research Agenda

The purpose of the SRA is to collate and highlight the key measurement challenges and opportunities for metrology in the field of advanced manufacturing. Thus, the SRA is intended to facilitate both the coordination and prioritisation of advanced manufacturing metrology research and development activity in Europe, and act as a reference document for the wider metrology and advanced manufacturing community. The SRA mainly focuses on the cross-cutting topics (CCT) pertinent to advanced manufacturing. These CCTs include eight topics: 1) Intelligent product design, 2) Advanced materials, 3) Smart manufacturing and assembly, 4) Quality control and testing, 5) Digitalisation and vertical metrology integration, 6) Environment, health and safety, 7) Legislation and standardisation and 8) Knowledge transfer and accessibility. While topics 1-4 are elements of general manufacturing chains, the topics 5-8 describe important boundary conditions for advanced manufacturing.

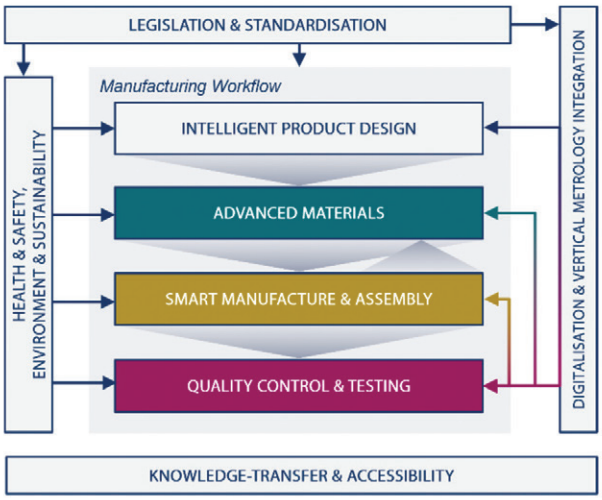

Figure 2. The cross-cutting topics (CCTs) of the EMN for Advanced Manufacturing covering the manufacturing flow [3].

In addition, the specific needs of 13 different Key Industrial Sectors (KIS) of the EMN have been addressed. The SRA content is available in compressed form on the EMN website [3] and the next update is planned in mid-2024. It is a living document that will be maintained by the EMN going forward and is considered a mechanism for obtaining, integrating, and sharing input from all relevant stakeholders. The SRA guides the development of metrology for advanced manufacturing and helps steer the direction of funded research. In addition to acting as a key reference for the metrology needs it also facilitates contributions to cross cutting EMNs and other initiatives such as standardisation committees.

Outreach and engagement

The process of informing the advance manufacturing community of our approach and seeking valuable input from stakeholders has been a key objective of the EMN. This has been achieved over the past three years through a series of workshop events both in person and online.

These events have looked to gain feedback on the most pressing metrology challenges faced by a range of industrial sectors. The field of precision engineering has been addressed through workshops at the annual Euspen international exhibition and conference. The needs of widening countries and EU-13 countries were the focus of a specific workshop held in Belgrade, Serbia.

The EU-13 countries are those new EU members, which have joined since 2004 and widening countries are those EU member states, outermost regions and associated countries that show good development potential in terms of research and innovation. An approach to address the specific needs of a KIS, particularly semiconductor chip manufacturing was achieved through a dedicated open consultation organised by the EMN and EURAMET. This template for interaction will be expanded in the near future to other KIS. In order to increase visibility and act as a focal point for the advanced manufacturing landscape, a dedicated EMN website has been developed which aims to provide the prospective stakeholder of the relevant information of the metrology capabilities of European NMIs and the offers of training and services. The aim is to allow European industry to access the combined knowledge and capabilities of the European NMIs.

Our future perspective

A key task for the future is to maintain and widen our contact with the stakeholder community to keep up to date with developing trends and to identify future metrology requirements in advanced manufacturing accordingly. In addition to supporting regular workshops, we aim to create mechanisms for ongoing stakeholder dialogue, through continuous surveys that are regularly prioritised, feeding into future releases of the strategic research agenda. This information will help us assess the most pressing needs to be addressed through collaborative pan-European research and standardisation activities to support the growth of a world leading advanced manufacturing sector in Europe. The stakeholder community can contact us, access information on our strategies and training events at https://www.euramet.org/european-metrology-networks/advanced-manufacturing

Acknowledgement:

The project JNP 19NET01 AdvManuNet has received funding from the EMPIR programme co-financed by the Participating States and from the European Union's Horizon 2020 research and innovation programme. The authors would like to thank all stakeholders for their valuable contributions in development of the SRA, in particular the members of the EMN stakeholder council.

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[4] https://www.euramet.org/climate-and-ocean-observation/strategy

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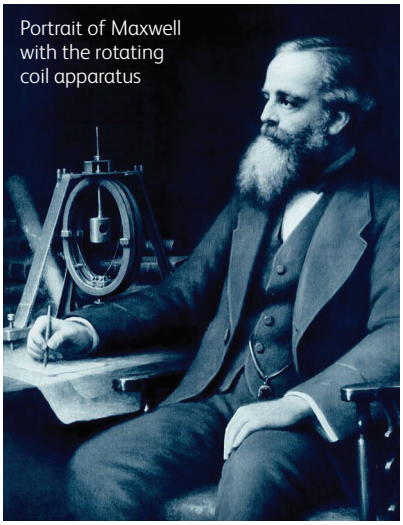
JAMES CLERK MAXWELL AND AN INGENIOUS WAY TO MEASURE ELECTRICAL RESISTANCE

BY PAUL QUINCEY, RETIRED PRINCIPAL RESEARCH SCIENTIST, NATIONAL PHYSICAL LABORATORY (NPL)

Alessandro Volta's invention of the electric battery in 1800 triggered many of the advances that led to the modern world. Previous work on electricity, for example by Henry Cavendish and Benjamin Franklin, could only explore the transient phenomena available from static electricity.

Batteries provided a much steadier voltage and power source for laboratory experiments, allowing electricity and electromagnetism to be properly understood, and practical applications to be developed. Batteries were soon also used for electrolysis, for example by Humphrey Davy at the Royal Institution in London, producing many new chemical elements, and more generally clarifying the components of matter.



Portrait of Maxwell with the rotating coil apparatus

This new quantitative study of electrical phenomena raised big new questions for the world of metrology which were not fully resolved until 2019. Previously, the scientific measurement units that needed international discussion and agreement were for mass and length. Rather quickly this set expanded to include charge, current, voltage, resistance, capacitance and many other quantities. The questions came at several levels: scientists and engineers needed to make measurements that they could compare with each other; theoretical physicists needed a clear framework within which to set out their equations; underlying both of these, and often forgotten in the rush, was the question "What is actually going on here?" Nobody will be surprised to hear that far-reaching decisions were made when the understanding of the subject was still very vague.

One insight that was appreciated early on was that only one new unit, at most, needed defining. If the basic relationships between quantities, like voltage x current = power, and current x resistance = voltage, are treated as fundamental, pinning down one electrical unit pins them all down. The idea of having a unit system, rather than a large set of independent units, was established. As well as reducing the number of unit definitions, this avoids arbitrary conversion factors needing to appear in equations.

Electrical resistance soon took on a central role, because it was frequently measured, for example along telegraph cables, and because standard resistors, in the form of a coil of wire, were relatively stable and simple to make compared to other electrical quantities. But what size should the unit of resistance be and how should it be defined? This was a completely free choice. It was time to set up a committee.

Rising to the challenge

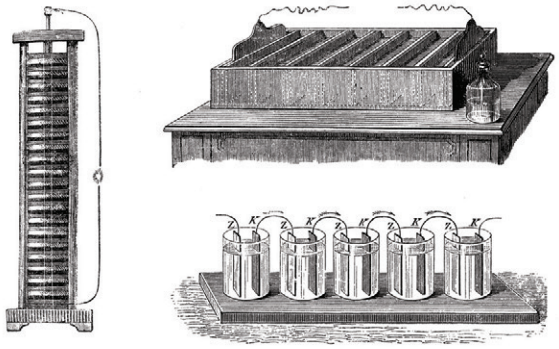
The British Association for the Advancement of Science (BAAS), now the British Science Association (BSA), rose to the challenge in 1861. By 1863 the committee reporting 'On standards of electrical resistance' contained William Thomson (later Lord Kelvin), James Joule, and James Clerk Maxwell.

Resistance could have been treated like mass in the metric system. A suitable material, like pure mercury, could be given a defined resistivity, in the same way that water was given a defined density; if that was too variable in practice, a well-chosen coil of wire, like a reference mass, could simply be declared to have a resistance equal to the resistance unit, at a specified temperature. But the B.A. committee did neither of those things, and instead took a more idealistic view.

In 1832 Carl Gauss had shown that you could measure the intensity of the Earth's magnetic field using only units for mass, length and time, by treating a current as the square root of a force. The B.A. committee chose to follow the same route for resistance, and hence for all electrical and magnetic quantities. This followed the work of Gauss's colleague Wilhelm Weber, who had shown how this could be done in principle.

Maxwell and his colleague Fleeming Jenkin aimed to demonstrate that the resistance of a coil could be measured with high accuracy using this principle. Their equipment (shown in the portrait of Maxwell), was designed by Thomson, and the experiments were carried out in 1863 at King's College London, where Maxwell was Professor of Natural Philosophy between 1860 and 1865.

The equipment worked something like this. The objective was to measure the resistance of the circular coil. This was rotated around its vertical axis at a steady rate of about



Voltaic pile: the first electrical battery to provide continuous electric current to a circuit, invented by Alessandro Volta

7 times a second – the frequency was made easier to determine by a bell ringing every 100 rotations. The movement induced a voltage within the coil because of the Earth's magnetic field. This voltage created a current within the coil, which of course depended on its resistance. And the induced current created a magnetic field that could be compared with the Earth's magnetic field by observing the deflection of a small magnet suspended at the centre of the coil. In this way, with a lot of skill and care, the resistance could be expressed as a value that did not depend on the detailed design of the equipment, using only units for mass, length and time. In fact, resistance determined in this way had the same units as velocity, needing only units for length and time.

After five months of refining the method, they found the day-to-day variation in their results over the last three days was 0.4%. With hindsight, this was not a sound basis for an important decision, but the committee concluded that its proposed method was viable and accurate, and declared that the resistance of a particular coil of "German silver" wire (an alloy of copper with nickel) was 107,620,116 m/s.

Because the values of useful resistances were impractically large in units of m/s (and even worse in cm/s), they recommended that the resistance unit should be defined as 10,000,000 m/s. This was initially called the B.A. unit of resistance, but we now call it the ohm. Standard resistance coils, ultimately certified in ohms by this method, were made and distributed to researchers such as Michael Faraday. Unfortunately, these early standard resistors were later found to differ from their ideal value by 1.3%, so that various pragmatic definitions of the ohm were adopted until more accurate methods were developed.

The benefit of hindsight

Again, with hindsight, Gauss, Weber and the BAAS committee had prematurely anticipated the much later strategy of the SI to fix units by defining fundamental physical constants. They had, in effect, fixed the value of the magnetic constant μ_0 (equal to $1/\sum_0 c^2$) to be exactly the number 4π. In their enthusiasm to remove conversion factors from equations, a physical constant had been removed at the same time. This was not unprecedented – the radian had been defined using similar reasoning in the early 18th century. Unfortunately, the result was a triumph of wishful thinking over good metrology. It would have saved a lot of trouble later on to have had a process similar to the one for mass and length units – adopt a convenient artefact resistance unit, and only define electrical units in terms of fundamental physical constants after suitably accurate experimental techniques and a better understanding of the underlying physics, have been established.

The definition of the ampere

As the distinction between electrical and mechanical phenomena became clear, and the BAAS proposal to make the numbers a more manageable size was adopted, μ_0 came to be defined as exactly 4π x 10-7 H/m. The units can also be written as N/A2 or Ω/(m/s), showing why forcing μ0 to be a number makes you think that a current is the square root of a force, and a resistance is a velocity. This became the SI definition of the ampere, and hence all electrical and magnetic units, from its creation in 1960 until 2019.

Q&A

Ciara O'Donnell

Ciara O'Donnell, Technical Author at Atomic Weapons Establishment (AWE), shares her thoughts on the future of engineering and the importance of quality careers education.

What was the root of your interest in Engineering?

My dad is a Telecoms engineer who has a big interest in electronics and taught me maths and physics from a young age, but I didn't consider STEM as a career until much later.

I didn't have a very traditional route into engineering. When I left school, I studied history, politics and English literature & language thinking that I would go on to study law at university or a degree-based apprenticeship. This started to change when my parents encouraged me to explore my other interests and skills and to research the other areas where I could apply my qualifications. As my parents worked in the engineering field, I thought that was a good place to start my search and that's where I came across the Technical Author role. This seemed like a really great way to combine my communication skills and my interest in engineering which I could develop through a Control & Instrumentation - Technical Author apprenticeship.

What is your vision of Engineering in Britain for the next ten years?

My vision for engineering is for people to have a better appreciation for engineering in Britain. All branches of engineering work to push the boundaries for what we as human beings can achieve and how we live our lives. For example, Control & Instrumentation is used in many different industries, yet it is overlooked because many people do not know much about it and how much it affects engineering processes.

I also think that we should have an engineering sector that is filled with all types of thinkers and minds to keep all industries full of innovation and new ways of working. As someone who had a non-traditional route into engineering, having people with non-traditional subjects help to form the future of engineering will help everyone see just how important the sector is and why all of us should be given the respect and accolades that we deserve.

What should the UK government do to address the shortage of UK engineers?

I think one of the best things the government can do is to invest in outreach programmes for schools (primary and secondary) to help inspire children/young people into engineering. The aim should be to show all the various engineering careers and the different paths that people can enter these.

In conjunction with this, they should also invest time and money into good quality careers education at every level which is implemented consistently across the country. So many people don't know about all the different career options available to them and if more people knew, I believe we would be able to meet the UK's engineering needs

What do you do in your free time to relax?

In 2022, I went on my first solo holiday to Greece and had an amazing time so now I plan a solo holiday, either in the UK or abroad, once a year. I'm heading to Indonesia later this year for a 10-day trip to Bali! I love the challenge of taking myself out of my comfort

zone and embracing different cultures and experiences.

I also play the flute and I joined a flute choir a couple of years ago, so I always make sure I take some time to practice both my solo and group pieces.

When I'm not doing that, I love experimenting with different manicures and nail designs – I have a new colour/pattern every other week!

Given one wish what would that be?

I wish that apprenticeships were shown as an option to all students and not just those who schools deem as 'not academic enough' to get into university. When I was at school, apprenticeships were marketed as an alternative option for those who weren't expected to get into university. There is still a stigma about apprenticeships being for those who 'failed school' which is not the case. While university is a great option, I think that more awareness and information is needed to help students of all ages and parents/guardians see all the benefits of an apprenticeship and how it is such a great boost to a career at any stage.

Other than that … I wish flights were cheaper so I could travel to more places!

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> I think one of the best things the government can do is to invest in outreach programmes for schools (primary and secondary) to help inspire children/young people into engineering. The aim should be to show all the various engineering careers and the different paths that people can enter these.

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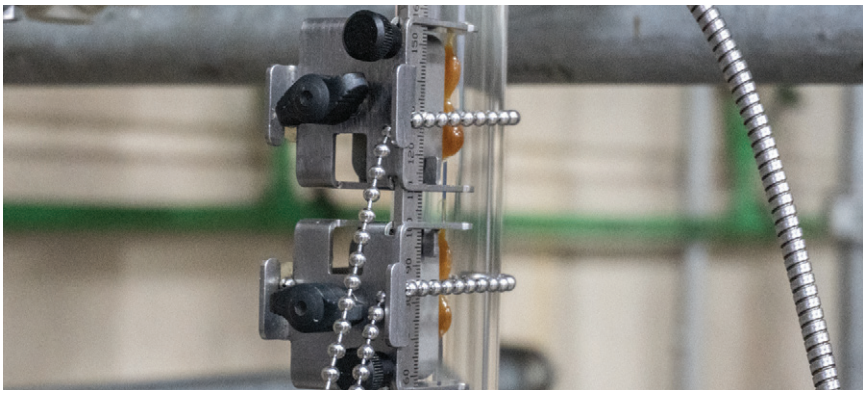
REVOLUTIONARY FLOW MEASUREMENT SOLUTIONS IN EXPERIMENTAL REACTOR PROCESSES

In the field of industrial processing, the need for precise and adaptable flow measurement technologies is paramount for the development, testing, and optimisation of various operations. A leading process engineering company recently showcased the effectiveness of clamp-on ultrasonic flow measurement at their technical centre, utilising this advanced technology in processes involving changing mediums in batch reactors.

To appreciate this specific application, it's essential to first understand the basics of clamp-on ultrasonic flowmeter technology. Using ultrasonic transducers that are externally mounted on a pipe, these transducers emit ultrasonic waves through the pipe wall and medium flowing inside, with the flow rate being determined by measuring the time it takes for the sound waves to travel with and against the flow direction. This non-intrusive technique is particularly beneficial for measuring flow in pipes containing corrosive, abrasive, or viscous fluids, as there is no direct contact between the sensor and the medium.

Challenges in flow measurement

In the company's technical centre, each test system is uniquely designed for specific customer processes. The facility can test a broad range of media, often dealing with corrosive substances, and those that vary from viscous to sticky. A significant challenge arose during an experiment involving the production of an oligomer in a batch-operated heated reactor. The process required accurate measurement of volume flow in the circulation line, complicated by the medium's changing properties – increasing viscosity and density as the reaction progressed.



Collaboration and solution implementation

To address this challenge, the technical centre team collaborated with Flexim's field sales engineer, who provided a portable flowmeter, along with a comprehensive introduction to its operation. The clamp-on ultrasonic flowmeter proved to be an ideal solution, offering several benefits:

1. Non-intrusiveness: The external mounting of transducers means they aren't exposed to corrosive or viscous media, reducing wear and damage risks.
2. High measurement dynamics: The technology can detect even minimal flow rates and low velocities, essential for precise control in experimental processes.
3. Flexibility and versatility: The ease of setting up a measuring point and the transmitter's internal substance database allowed for swift adaptation to various media.
4. Configurability: Users could create custom data sets for specific mediums, improving the accuracy of measurements.

Investment and future applications

Impressed by the portable flowmeter's performance, the company invested in a stationary system with enhanced digital communication features. A significant advantage of this technology is its ability to record flow rates non-intrusively and provide insights into the reaction process by simultaneously measuring the speed of sound in the medium.

The successful deployment of clamp-on ultrasonic flowmeter technology in this industrial setting highlights its potential as a versatile, accurate, and reliable tool for process engineering. It demonstrates how modern measurement technologies can significantly contribute to the efficient and safe design of industrial processes.

To find out more about the capabilities and benefits of clamp-on ultrasonic flow measurement in the chemical industry, contact Simon Millington – www.emerson.com | flexim-uk@emerson.com | +44 (0)1606 781 420

INSTMC 2024 AWARDS

We are pleased to announce that this year's awards ceremony will be co-hosted with the United Kingdom Automatic Control Council (UKACC). Join us on 4th July 2024 at the Royal Institution in London for InstMC 2024 Awards Night featuring the UKACC Annual Distinguished Lecture, to honour our award winners. The event is free to attend, but please book your place as spaces are limited. Visit https://www.instmc.org/events for details.

We are delighted to present to you, the recipients of the 2024 InstMC Awards:

Sir Harold Hartley Award

For outstanding contribution to the technology of measurement and control

Winner: Professor Rodolphe Sepulchre

Rodolphe Sepulchre has been Professor of Control Engineering at Cambridge University since 2013, holding the Chair previously occupied by Sir Alistair MacFarlane and Keith Glover. He spends 25% of his time at Cambridge and 75% at Leuven University in Belgium. He obtained his first degree (1990) and Ph.D. degree (1994), both in mathematical engineering, from the Université catholique de Louvain, Belgium. He was a BAEF fellow in 1994 and held a postdoctoral position at the University of California, Santa Barbara from 1994 to 1996. He was a research associate of the FNRS at Louvain from 1995 to 1997. From 1997 to 2013 he was a Professor in the Department of Electrical Engineering and Computer Science at the University of Liège. He was department chair from 2009 to 2011. He has held visiting positions at Princeton University (2002-2003) and the Ecole des Mines de Paris (2009-2010) and part-time positions at the University of Louvain (2000-2011) and at INRIA Lille Europe (2012-2013).

Rodolphe's research interests are in nonlinear control, Optimisation on manifolds, Coordination, synchronisation, and consensus on nonlinear spaces and in Neural behaviours. In each of these areas he has done outstanding and original work.

In recent years he has initiated and developed the concept of switchlets. These are analogous to the concept of wavelets in signal processing. Switchlets are a way of modelling systems that can generate and modulate complex signals such as those from the brain, which are multi-scale – composed of several different temporal and spatial frequencies. The hope is that switchlets will enable new sensory systems that have the capacity to interpret at multiscale and bridge the fields of engineering and neuroscience. This work has attracted a €2.5 million grant from the European Research Council.

Rodolphe's research publications have accumulated nearly 19000 citations and he has an h-index of 55. His most highly-cited works are the two books "Constructive Nonlinear Control" (1997, co-authored with Jankovic and Kokotovic) and "Optimization algorithms on matrix manifolds" (2009, co-authored with Absil and Mahoney). He has nearly 500 publications listed on Google Scholar. He has also given a TEDx talk (https://www.youtube.com/watch?v=OXoJJX3GOaQ), and plenary talks at the major control conferences.

In 2020 Rodolphe was awarded the IEEE Control Systems Society's George S. Axelby Outstanding Paper Award (for the best paper published in the IEEE Transactions on Automatic Control that year) for the paper "Differential Dissipativity Theory for Dominance Analysis" (co-authored with F. Forni).

In 2008 he was awarded the IEEE Control Systems Society's Antonio Ruberti Young Researcher Prize. He is an IEEE Fellow and has been an IEEE Control Systems Society Distinguished Lecturer. Rodolphe is currently the Editor-in-Chief of the IEEE Control Systems Magazine and was previously Editor-in-Chief of Systems and Control Letters. He has also been an Associate Editor of the SIAM Journal of Control and Optimization, Automatica, the Journal of Nonlinear Science, and Mathematics for Control, Signals, and Systems.

Oxburgh Award

Awarded to any person whose contribution to measurement, instrumentation and control in the field of environmental science and engineering is of outstanding merit

Winner: Dr Rosa Busquets

Dr Rosa Busquets is an Analytical and Materials Scientist based at Kingston University London. She is a co-author on the prestigious UNEP Environment Effects Assessment Panel (EEAP) that assesses the relationships between stratospheric ozone depletion and UV radiation, climate change and its impact in the environment, and human health, co-chaired by Professor Janet Bornman. This requires both an understanding of materials, their oxidation caused by UV, as well as current knowledge of the fate of materials in the environment. She has also recently become a panel member of the Royal Society of Chemistry Science Policy Panel Engagement group (RSC SPP) to feed views from the scientific community to the UN on waste, chemicals, and reduction of pollution and contributes to the UNEP Global Environment Outlook panel. She has expertise in the analysis and the study of the transformation and fate of contaminants in the environment from an environmental chemistry perspective, and experience of nature-based solutions and a sound understanding of sustainable food systems. More recently, she has also been invited to join the UNEP Global Environmental Outlook GEO-7 panel.

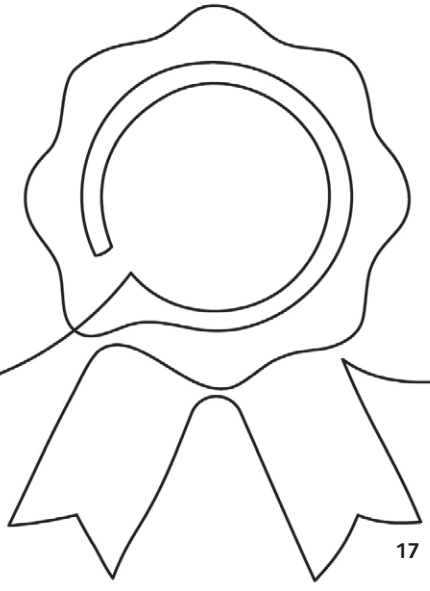
Rosa was a former Marie Curie Fellow, at Mast Carbon International Ltd, and latterly in the Nanoscience and Nanotechnology Group at the University of Brighton. She holds an Honorary Chair at Al-Farabi National Kazakh University in Kazakhstan in the Department of Chemical Physics and Material Science, as well as the post of Honorary Associate Professor at UCL in the Department of Civil, Environmental and Geomatic Engineering. Her international research network is very broad, and she carries out research with colleagues in Ukraine, Thailand and Kazakhstan. She currently leads business incubators in Ukraine that are making a social impact. Her research has been funded by a wide range of national and international agencies, including the Royal Academy of Engineering, Innovate UK, the British Council, EU Horizon, DASA and many others. She has nearly 120 journal and conference publications, including book chapters and she edited a book entitled Emerging Nanotechnologies in Food Science published by Elsevier in 2017.

Callendar Award

For outstanding contribution to the art of instruments or measurement

Winner: Professor Bajram Zeqiri

For over three decades, Professor Bajram Zeqiri's technical leadership and seminal research contributions to the field of ultrasonic measurement has supported traceable calibration and specification standards that have made a major contribution to the widespread success of clinical ultrasound imaging. Through his leadership, the NPL Ultrasound Group has established global pre-eminence among National Metrology Institutes through the development of critical measurement devices such as hydrophones and associated instrumentation, coupled with a detailed understanding of their performance characteristics that influence measurement uncertainty. His group has made significant contributions to the global measurement and calibration infrastructure for sound in tissue-like media. Today, the majority of the world's medical ultrasound equipment manufacturers carry out acoustic measurements directly traceable to Bajram's NPL group for the purposes of regulatory compliance and to support emerging innovative clinical techniques, thereby ensuring the safety and effectiveness of diagnosis and treatment. In particular, his research has driven a detailed understanding of sensors and instrumentation



applied to quantifying key safety-relevant observables such as acoustic pressure and acoustic power, with traceability to derived-SI units. Evolved measurements are now embodied within a number of International Specification Standards that ensure patient safety.

Bajram has a record for innovation driven by requirements from the industrial and medical sectors. Collaborations with industrial partners have been critical in driving adoption of novel developments covering a range of engineering applications. A key innovation was the development of a patented solid-state thermal measurement method for ultrasonic power measurement exploiting the pyroelectric effect in a thin piezoelectric membrane. The high sensitivity of the detector concept is being exploited as part of a new phase-insensitive ultrasound tomographic imaging technique suitable for breast cancer diagnosis, offering enhanced imaging capability over conventional piezoelectric detectors. The subject of two separate patents, genuinely quantitative imaging capability, has been demonstrated with application to breast disease and tissue composition characterisation.

Due to the complex and sensor-hostile environment and the stochastic process of acoustic cavitation (occurring when the sound pressure amplitude is sufficient to rupture the liquid), measurement standards have been very difficult to develop in the industrial ultrasound area. Bajram conceived the concept of the broadband NPL Cavitation Sensor and associated instrumentation, designed to capture the full cavitation bubble collapse with generated signals representing important signatures of cavitation. This research generated fresh insights on cavitation inception and application through a range of unique reference facilities, instrumentation and pioneering experiment. Acoustic cavitation provides the driving force behind many industrial processes and ultrasound therapeutics and his research has been instrumental in reawakening global interest in this area, leading to two patents and real-world demonstrations of controlled cavitation materials processing.

Bajram has published approaching 90 publications (citations >2,350; h-index = 26) and has 6 patents. A number of his innovations have been licensed to UK SMEs significantly assisting their growth over the last 10-15 years. In 2021, he became Fellow of the Royal Academy of Engineering, a year in which he also won the IoP James Joule Silver Medal and Prize. He is currently NPL Head of Science with responsibility for the strategic direction and quality of the science of the organisation.

Finkelstein Award

For notable contributions to measurement internationally

Winner: Professor Elfed Lewis

Professor Lewis receives the Finkelstein Award for notable contribution to measurement internationally, especially reflecting his expertise and achievements in the field of sensors and instrumentation.

Elfed graduated with BEng (Hons) in Electrical and Electronic Engineering from Liverpool University in 1981. He was awarded a PhD from the University of Liverpool in 1987 for work on high speed photography and spectroscopy of electric circuit breaker arcs during the current zero phase. Following this, he worked as development engineer with BICC Telecom Cables, Prescot, Merseyside in conjunction with the University of Liverpool developing chromatic modulation-based sensors for a wide range of applications. In 1989 he joined Liverpool John Moores University where he initiated the research activity in Optical Fibre Sensors. The group developed and investigated sensor systems for environmental monitoring including water contamination and pH. In 1996 he joined the University of Limerick where he is Associate Professor and Director of the Optical Fibre Sensors Research Centre.

He is very well known for his work and contribution not only in the UK and Ireland but internationally. He is a Fellow of the Institute of Physics, of the IET and a Senior Member of IEEE. He has authored and co-authored a wide body of publications – more than 140 journal papers and made in excess of 300 contributions to international conferences. He currently holds 9 patents on Optical Fibre Sensor Devices.

His international distinction in the field is seen in that in 2005 he was recipient of the University of Limerick Special Achievement in Research Award and was awarded a prestigious Fulbright Scholarship with CREOL (University of Central Florida) in 2008. He was Distinguished Lecturer for IEEE Sensors Council for the period July 2013-June 2015, travelling internationally in that role and is currently Vice President for Technical Operations for IEEE Sensors Council, with a global remit for the society.

He has hosted many International Conferences and Symposia and was Chair of the 2001 Sensors & their Applications Conference at Limerick, General Chair of the IEEE Sensors 2011 conference and the European Workshop on Optical Fibre Sensors (EWOFS 2016), all held at University of Limerick. Further, he was the co-chair of the IEEE World Forum on Internet of Things (WFIoT) in April, 2019 and will host the InstMC International Conference on Sensors & their Applications in Limerick in August 2024. He is a Visiting Professor at Harbin Engineering University, Harbin, China, where he has lectured for many years to international audiences and at Summer Schools.

Cornish Award (sponsored by WCSIM)

Given to an individual, group or company that has excelled in some dimension of scientific instrument making within industry, academia, national or international laboratories

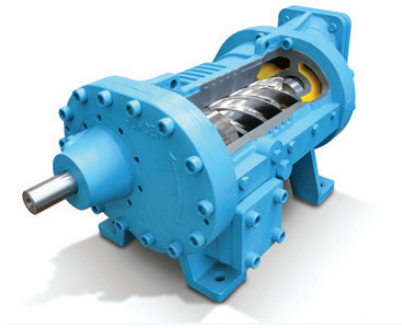
Winner: Dr William Milligan & Professor Ahmed Kovacevic

The award is made to a team led by Dr Billy Milligan (Howden Compressors) and Professor Ahmed Kovacevic FREng (Howden Compressors and City, University of London). This recognises the success of the excellent cooperation across the teams that they lead over many years, which has resulted in significant advancement in the field through better simulation and measurement and its application to creating new and better compressor technology, resulting in significant benefits for the company and for UK industry.

The work has sprung from Howden Compressors, Glasgow, UK, through a 15-year partnership with the Centre for Compressor Technology at City, University of London and other industrial organisations. The work has been focused on enhanced design and simulation to advance the technology of rotating screw compressors and to address the issues of energy sustainability and net zero targets.

The collaboration with Howden was cemented in the establishment of the Howden Chair in Engineering Design and Compressors Technology at City in 2008 which was extended with the establishment of the Howden/RAEng Research Chair in Compressor Technology from 2020-2025. Ahmed established the R&D department in Howden, from 2008, as a key part of the cooperation with significant time being seconded to the company in Glasgow. The outcome of the work has been the design, fabrication and marketing of a new generation of oil injected and oil free screw compressors which allowed Howden to triple their turnover by 2013 and become a leader in screw compressor technology.

The technical challenges addressed have been significant, designed to respond to the rising demands for waste heat recovery which reduce carbon footprint of energy



systems. Key to success has been the structured computer simulation-based engineering design process to allow the development of a new generation of screw machines (M series). This and other adapted compressors from the Howden XRV series were used for power recovery from waste heat by the Nevada USA based company Electratherm to produce electrical energy from the heat rejected from industrial processes. In 2018 Howden formed the Digital Data Advantage (DDA) team to look into the digital features of rotating machinery, transforming the equipment testing experience for customers who can analyse their equipment remotely. Live camera feeds and live trending screens show the data in real-time, directly from the test bed. The augmented reality initiatives lend themselves to further use in the development and use of machinery.

In 2019, Billy & Ahmed recognised that this new generation of oil free screw compressors presented a great opportunity for future reduction of the carbon footprint of screw compressor technology. With a better understanding of the fundamental issues of thermal and flow behaviour through the advanced design and simulation work, led by Ahmed, of compressed gases in clearance gaps of screw machines which are limiting factor for improvements in performance and reliability, a new initiative was created to enable a much wider range of applications. This is regarded as a critical technology for Net Zero, such as important and rapidly expanding areas including hydrogen compression and high temperature heat pumps.

Since 2008, the UK-based cooperation has enabled the filing of 7 patents in the field of screw compressors, the creation of two spin-out companies, the education of 15 PhD students and production of innovative designs which have led to 8% reduction in consumption of electrical energy used by screw compressors which represent 80% of all industrial compressors in the world. It is estimated that this reduced worldwide carbon footprint by 0.1%.

This partnership with industry was recognised by the UK funding bodies which granted several co-funded projects from Scottish Enterprise and the Royal Academy of Engineering as well as numerous prizes and awards. Three members of the Centre for Compressor Technology were awarded the status of FREng.

L B Lambert Award

For meritorious service to the Institute through involvement with Local Sections, Special Interest Groups and InstMC committees

Members of BSI Committee BS6739 led by Mr Ian Callender

The BS 6739: (British Standard) Code of Practice for Instrumentation in Process Control Systems: Installation Design and Practice standard was first published in 1986 and subsequently revised in 2009. The name itself highlights the importance of this standard in the C&I world. Discussions around updating the standard started in March 2020 within the BSI GEL/65 committee (responsible for maintaining this standard) and the InstMC Standards SIG meetings. It was clear that there was a need for and interest from members in revising this standard and the hunt began for a team and project leader.

By the end of the year, the team was founded in the InstMC Standards SIG under the leadership of Ian Callender. It was initially thought that the work would take 12 -18 months and the team could use

Skype (!), and of course no-one could have predicted this would all take place within a worldwide pandemic!

Under Ian's leadership, the standard was first split into sections, each being assigned a leader who would then get together at the steering group meetings, once a month online. The team members spent extended hours in meetings to discuss and update this standard and a few had the additional challenge of being in the international time zone to work during out-of-hours in addition to their day jobs.

Despite some member dropouts, Ian and the remaining active team relentlessly continued to work despite the internal challenges and disturbances in the nation during 2021-22. By mid-2021, BSI had set up the MS Teams channel for better collaboration. Ian kept the team motivated with positive and regular communication and by identifying and utilising the strengths of his team members. The remainder of 2021 and early 2022 saw several technical review meetings where the majority of work was done. In June 2022, BSI took over the editorial work of the standard, and it took over a year for the editing given the size and complexity of the standard.

Eventually, the heavy lifting of planning and leading the task by Ian resulted in a draft copy ready for public consultation early in 2024. The perseverance of the team, despite interruptions, has resulted in the outcome of the standard being ready and close to publication. BSI is currently looking into promoting ideas at the release of this publication.

The Institute through the Lambert Award recognises the service that Ian has provided through his leadership and involvement with active members, section team leaders, steering groups, Standards SIG and the BSI, all during the very challenging time of Covid-19 and using predominantly (for many) new collaboration online platforms such as MS Teams & Zoom.

Honorary Fellowship

Recognising distinguished, and normally long, service to the Institute and/or measurement and control

Winner: Professor Graham Machin

For world-leading contributions to fundamental and applied thermometry, ranging from a leading role in the redefinition of the kelvin to developing reliable temperature measurement solutions in diverse industries such as aerospace and nuclear decommissioning Professor Machin is awarded the InstMC Honorary Fellowship.

Graham also led the Institute as President at a time of significant change and financial risk, positively supporting the staff, officers and Trustees to steer us safely through to the stability we currently enjoy.

He has made world-leading contributions to temperature measurement in a wide range of settings including metrology, industry and health.

In global metrology, four of the base SI units (kg, A, K and mol) were redefined in 2019. Graham led global activity in the successful kelvin redefinition through initiating the NPL acoustic thermometry activity which performed one of only two sub-ppm uncertainty determinations of the Boltzmann constant (k). He also ensured that temperature measurements after the redefinition were consistent with those prior to the redefinition through leading the "Implementing the new kelvin" projects funded by EURAMET (2012-2018). He continued to play a leading role in realising the redefined kelvin through promoting direct traceability to the kelvin (leading the multinational project Real-K), and development of photonic based practical primary thermometry.

Temperature drift in process control leads to reduced product quality, excess energy use and scrap. Graham led global activity to develop new high temperature standards based on high temperature fixed points (HTFPs) (to ~3300 K). He practically applied these to development of the world's first practical high-temperature self-validating thermocouples (INSEVA) to overcome sensor drift enabling always-optimum process control (commercialised by leading UK thermocouple manufacturer CCPI, Europe).

In the field of high value manufacturing, Graham has developed innovative thermometry solutions for leading industrial companies (Rolls-Royce, BAE) ensuring reliable heat-treatment of high temperature turbine blades (+/-1 °C at >1300 °C) and enabling, through developing an innovative temperature control approach, superplastic forming of large hollow turbofan blades.

Practical reliable long-term thermometry approaches are needed for effective nuclear decommissioning and storage of nuclear materials. For example, Special Nuclear Materials (currently in 10,000s of aging stainless-steel packages) are to be repackaged into "100-year-life" containers. Reliable package thermometry is required, but current thermometry approaches cannot achieve the required uncertainty. Graham initiated development of a novel thermometry approach, through traceable phosphor thermometry and demonstrating it could give the required uncertainty over the package lifetime.

In healthcare, Diabetic Foot Ulceration (DFU) prevention is an urgent NHS priority (>£1B/year treatment costs and biggest cause of UK lower-limb amputation [>100/week]). Graham was the first to propose how thermal imaging could potentially detect pre-ulceration (and thus preventing DFU) in vulnerable patients. He then successfully developed a thermal imaging-based device for preventing DFU (commercialised through NPL spinout "Celsius Health").

InstMC Awards Night
&
UKACC Annual Distinguished Lecture
2024

Thursday 4th July

InstMC Awards Night is an annual event where prestige awards are presented to individuals for their outstanding contribution and services to the Institute.

Lecture Title: 'Spiking Intelligence: Towards Reconciling Physics and Algorithmics?'

6.15 pm - Registration
6.40 pm - Introduction & Welcome: InstMC President, Sheila Smith
6.45 pm - Introduction to Speaker: UKACC Chair
6.50 pm - Lecture: Professor Rodolphe Sepulchre
7.30 pm - Presentation of Awards
8.00 pm - Wine & Canapé Reception
9.00pm - Evening Close

The Royal Institution, 21 Albemarle Street, London, W1S 4BS

This event is free to attend. Please book your place at www.instmc.org/events

REAPING THE BENEFITS OF AN INCLUSIVE COMPANY CULTURE

BY ERIK TOMLIN,
EDI PLATFORM MANAGER,
ROYAL ACADEMY
OF ENGINEERING

Embedding EDI practices into the workplace can help startups, scaleups and SMEs attract and retain talent and supports long-term business success.

The Royal Academy of Engineering began a research project in 2019 to understand how best to support engineering organisations develop and embed good equality, diversity and inclusion (EDI) practice. Startups, scaleups and SMEs make up 99% of private sector business in the UK but our research found that there was very little EDI support tailored for them. Available resources were aimed either at large corporates or addressed single issues such as recruitment or unconscious bias.

To fulfil the Academy's strategic objective of supporting the growth of an inclusive economy that works for everyone, it made sense for us to focus on helping these organisations that make up the majority of private sector business that had the least amount of support on how to create more diverse and inclusive workplaces.

Startups, scaleups and SMEs are often laden with challenges such as funding, product innovation, recruitment, structure, and retention. The one aspect that connects all of these challenges is culture. Having previously completed extensive research on the impact of inclusive cultures in engineering, we asked ourselves, 'how can we create a tool that helps organisations understand how to be more inclusive?'

It's clear that there is a high desire in engineering startups to be as inclusive as possible. However, there is very little knowledge and confidence about how to go about this, which leaves space for unintended bad practices. Hiring for 'culture fit' can perpetuate homogenous groups and making an informal and personal assessment of culture 'vibes' doesn't give you a clear understanding of how everyone within your organisation is truly feeling about working there.

We decided to partner with The Honeycomb Works, itself a small start-up business with a mission to ensure everyone at work feels like they belong, can be the person they want to be within the workplace and are free to invent. Using science, technology and data, they focus on behaviour change. Together with the Academy's understanding of the specific needs of engineering companies and ways of working, it felt like an exciting partnership.

Understanding the barriers to an inclusive culture

The Honeycomb Works did additional research into the barriers to inclusion in smaller engineering organisations. They found an over-emphasis on inclusive recruitment at the expense of inclusive cultures. Research shows that racially minoritised people are 16% more likely to leave than their white peers and 1 in 10 women between 20 - 34 will leave the industry each year (AtkinsRéalis, 2021, Career Deflection Report). Whilst it is important to attract a skilled and diverse group of people to join your organisation, without a sustainable and inclusive culture it is near impossible to develop and retain them. Additionally, there is a widespread lack of awareness around what constitutes good, inclusive recruitment practices. In particular, hiring for 'culture fit' or on instinct was often cited as a positive despite this being a significant barrier to an inclusive culture.

A lack of formal processes and informed decision making was also found to be a significant barrier to inclusion. This was particularly present in smaller startups, often because of long term friendships and working relationships of founding employees. The close links between academia and engineering startups also contributed, with ways of working in academia unconsciously replicated in the new business.

This informality meant there was a lack of clarity around expected behaviours. It also contributed to an environment where culture is expected to take care of itself based

on friendship and affinity within the group. This barrier becomes increasingly problematic as startups grow or when someone isn't strongly connected to the core group.

Finally, the biggest barrier to inclusion was simply time and money. Startup leaders didn't have time for research to get an understanding of best practice, nor did they have the money to invest in trying out a range of resources in the absence of appropriate guidance on which to choose and how to assess their effectiveness.

Recruitment challenges and practices, limited resource, and a lack of knowledge can all be barriers to creating inclusive cultures, but it is possible to remove them.

Developing a culture of EDI needs to be as evidence- and data-driven as everything else you do.

The Academy's work with The Honeycomb Works has resulted in the development of Culture+ ('Culture Plus'). Developed especially for the engineering industry, Culture+ is an online platform which supports startups, scaleups, and SMEs as they embed diversity and inclusion best practice. Simple and interactive, it encourages and supports employees to develop everyday habits that are essential to build inclusive cultures and puts a range of useful resources at your fingertips.

Our philosophy in creating Culture+ was that a subtle shift towards everyday inclusive behaviours can happen in tandem with structural change. This, combined with comprehensive impact measurement, will be essential to improve engineering culture for everyone.

As engineers, you don't bet on feelings – you gather data, generate hypotheses, and then gather more data. Your culture needs to be built on this same solid foundation – gathering data to deliver actionable insights. Culture+ provides engineering startups with the tools they need to foster inclusive

company cultures that support their long-term business success. The platform is designed to help remove barriers to an inclusive workplace by teaching users to practice inclusive behaviours until they become habits. By making inclusivity an important component of culture from the start, engineering startups can become more innovative and successful.

The platform upskills all employees through individual training modules that support understanding of inclusive behaviours through 360° feedback. Culture+ then collects data through the anonymised 360° feedback to identify behaviours present (or not) in your organisation, showing your biggest areas of risk and also highlighting inequitable treatment while protecting anonymity.

Culture+ has been an instrumental tool for organisations such as MicrofluidX – a UK-based cell and gene therapy manufacturer anticipating rapid growth. They found the 360° feedback gave their feedback culture more structure, making sure they were being as effective and consistent as possible. The Impact Measurement reports highlighted that women were not observing the same behaviours as their male colleagues in certain areas. This information allowed MicrofluidX to draw focus to these behaviours as an organisation, ensuring they continued to build a psychologically safe environment where people feel free to give and receive critical feedback.

An invitation to work with the Academy

Since Culture+ launched publicly in November, there has been enthusiastic engagement with it from the Academy's Enterprise Programme Awardees. However, it is important to us to reach beyond our own networks and make this tool available to other UK engineering startups, scaleups, and SMEs. Our vision is to help the engineering profession as a whole to unlock innovation in their organisations that is possible through a more diverse workforce and inclusive culture.

We are inviting any UK startup, scaleup, or SME in engineering or tech to one of our monthly group demonstrations of Culture+, or to set up a 1-2-1 consultation with our EDI Platform Manager, Erik Tomlin. We are also keen to work with and encourage larger corporates to lead on EDI with their supply chains.

To find out more visit https://enterprisehub.raeng.org.uk/culture-plus or email erik.tomlin@raeng.org.uk

LOCAL SECTION NEWS

CENTRAL NORTHWEST

It's been a busy first half of 2024 for the Central NorthWest section. We welcomed four new committee members at the end of 2023. Since then, they've been settling in, bringing new ideas and encouraging the overall team in looking at how we can engage with members. We ran out of committee time in November which resulted in a dedicated meeting in January to thrash out some of those ideas. Some of these have now been launched while others are still in development.

Committee Member Introductions

We are delighted to welcome Steve Warburton of Capula, Claire Jones of Endress & Hauser, Jonathon Alexander of Thyson Technology and Darren Glover of ITI. Introductions to each of these team members has been posted on the CNW LinkedIn page over the last few months. A summary is presented here:

Steve Warburton has been involved

in Automation for over 30 years and brings cross industry experience, starting his career with ICI Chemicals & Polymers in Runcorn as an E/I Technician. He then moved into sales / account management with PR Electronics, Honeywell and is now working for Capula. Of the opportunity he said: 'Now I feel the time is right to get more involved with my Local Section and give something back to the industry that has given me a fantastic career and try to encourage the next generation into the engineering industry, especially EC&I and supporting their professional journey.'

Claire Jones featured in the March

2024 edition of Precision as the Q&A subject sharing her journey. She has fully embraced the work of the Institute, including becoming Chair of the Women in Measurement, Automation & Control (WiMAC) committee.

Jon Alexander started his career

post-graduation as an EC&I design engineer for the automotive industry, which quickly morphed into a Software Engineer role after he found his passion for software development. After working in some of the most prestigious automotive manufacturers in the UK, including Rolls-Royce and Lotus, he progressed into Pharmaceuticals. Jon is now the Lead EC&I and Software Engineer for Thyson Technology (part of the nZERO group) in Ellesmere Port, guiding the EC&I and Software teams on critical gas infrastructure projects and world's first, domestic 100% Hydrogen projects.

Jon commented 'I had started to lose touch with the engineering community, and I started to feel as though I was being left behind. The committee position was not something I was actively looking for, but when the vacancy popped up on my LinkedIn page, I felt now was the right time to start giving back and getting more involved. I hope that working alongside the esteemed members of the committee and the Institute will help me to continue to grow as an engineer.'

Darren Glover started his career

with JCB as an Engineering Apprentice, working with the business for 15 years in various roles. He joined ITI, one of the section's long-standing supporters, 3 years ago as Head of Business Unit of the Sheffield office, delivering safety and control solutions to the well-established Oil & Gas client base. He is now the Operations Director for the Safety and Control division. In joining the committee Darren commented: 'The InstMC plays a critical role in supporting so many engineers in the industry and encouraging young people to embark on a career in engineering, so what better way to encourage the next generation and share awareness across the industry than being involved with an institution like the InstMC.'

Technical Talks

This year the Technical Talk programme restarted after the Christmas break, with presentations on 'Alarm Management' by Ian Brown of Mac-Solutions / Solutions PT, 'Machinery Safety

Liverpool John Moores University students

Standards Update' by Dave Green of RPS Consulting UK & Ireland and 'Integrated Cavity Optical Spectroscopy' by Dr Matthew Montage of ABB Ltd. Unfortunately, April's talk was postponed due to illness, but will be rescheduled as soon as possible.

University Engagement

I've personally enjoyed presenting at both Manchester University and Liverpool John Moores University in the first half of the year, on the topic of 'Measurement, Control and Automation in the Workplace'. I'm delighted that this year we have sponsors for the Annual Awards for both universities. The sponsor companies were highlighted in the presentations. The engagement by both cohorts into how they can use their knowledge gained in university within the workplace. I was glad when they realised my lecture was nothing to do with the syllabus and won't be examined, that the students didn't walk out!

Following my talk in Manchester I was privileged to receive a tour

Dave Green, CNW Chair, speaking at Manchester University

of the new campus buildings and enjoyed my return visit in May for the 'Buggy Race' finals when Sella Controls (Award sponsors) attended alongside committee members.

LJMU enjoyed the opportunity to speak directly to ITI Group, award sponsors for 2024. The students engaged with the representatives, Ashley and Chloe, on career paths not solely with ITI but in general industry especially in the area of measurement, control and automation.

Early Careers Engineer Award

We launched our brand new Early Careers Engineer Award (ECE) in April. The aim of the award is to recognise someone within the first 10 years of their career in Instrumentation, Measurement, Control and Automation who has worked on a project using innovative techniques to solve a problem. The winner will receive their award at our CNW Annual Awards night on the 17th October in Manchester.

Dave Green CNW Chair

LOCAL SECTION NEWS

IRELAND

CompuCal Technical Event

InstMC Ireland wishes to thank CompuCal (compucalcalibrations.com) for hosting a Technical Event at their Cork HQ on Monday 29th April 2024. It was attended by representatives of InstMC Ireland and staff from the department of Physical Sciences, Munster Technological University, Cork.

CompuCal is a world leader in calibration management and works with some of the largest global brands and manufacturers. Its Calibration & Maintenance Orchestration Platform bridges the digital divide by providing a cloud platform and accompanying mobile applications, enabling technicians and engineers to complete complex tasks, simply, with a clean, intuitive user interface. It is used worldwide for calibration & maintenance workflow management, certificate & report generation, audit readiness with compliance and validation at its core, through one system. In highly regulated industries, GAMP requirements and the drive to implement Industry 4.0., means customer need digital tools and skills to transform away from legacy paper-based processes.

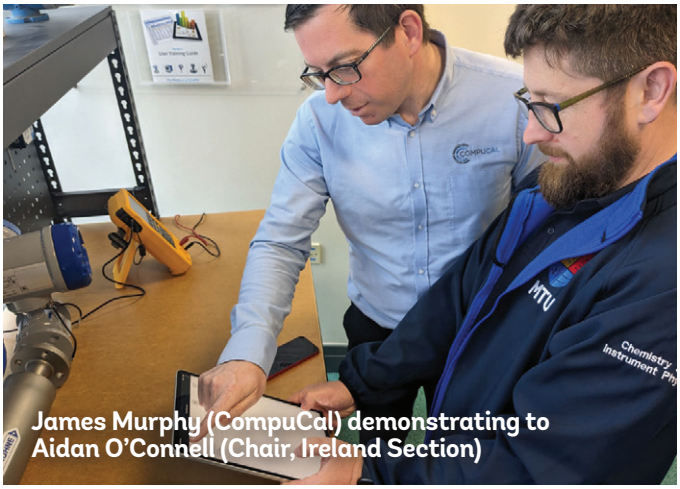
The company was founded over 30 years ago by Eddie Dornan who recognised the technology gap after a local Life Sciences company failed an FDA audit as a result of some missed crucial calibrations. CompuCal's original statement is just as valid today, 'Developed by calibration people for calibration people'.

Munster Technological University (MTU) was established in 2021 but formerly it was Cork Institute of Technology, which dates back to 1974. The genesis of such institutes were centres of specialist technical learning to serve the needs of local industry. In summer 2023, several courses of the Department of Physical Sciences (physicalsciences.mtu.ie) were accredited by InstMC.

MTU are in the process of rolling out the use of CompuCal for their students studying calibration, from Apprenticeship to Honours Degree. This key partnership is just one part of the Department's overall digitalisation strategy. The specific aim here is to introduce such systems to the future users, demonstrate how it enhances work practices, and prove insight into how this can be a critical cog in Whole Lifecycle Management of assets and with the aid of appropriate data analytic tools, possible real predictive maintenance.

CompuCal Presentation


L to R: Dr. Steven Darby (MTU), Ray Wolfe (MTU) Dr. Donagh O'Mahony (MTU), Donal Sullivan (CompuCal), James Murphy (CompuCal) Conor O'Farrell (MTU)


James Murphy (CompuCal) demonstrating to Aidan O'Connell (Chair, Ireland Section)

NORTH EAST

Annual Dinner & Reunion

The North East Local Section Annual Dinner and Reunion was held on 14th March 2024 at Leonardo's in Middlesbrough. Attended by 178 members and guests, representing international and national local companies and organisations, the evening included addresses by Professor Graham Machin (NPL) , John Noon (NE Section Chair), Dr Adrian Davies (South Cleveland Heart Fund), Paula McMahon (Engineering Together) and Martin Gold (Raconteur).

JOIN WOMEN IN MEASUREMENT, AUTOMATION & CONTROL (WiMAC)

Women in Measurement, Automation & Control (WiMAC) is an InstMC network for women, established in September 2023.

The aim of the group is to raise the profile of women engineers through discussion and engagement across a range of topics and activities including: *Leadership, Professional Development, Mentoring, Outreach, Advocacy, Support, Technical Knowledge, Diversity, Public Speaking and much more!*

To date, all group meetings have been online, but we can now look forward to our first in person meeting and networking session on 4th July 2024. Planned to coincide with InstMC Awards Night, we would love to see as many people as possible at both events. The WiMAC meeting will be held in the late afternoon so anyone who would like to attend Awards Night can stay on. Keep an eye on the InstMC website for up-to-date details on the meeting and how you can attend at https://www.instmc.org/womens_network/about.aspx

We are delighted to introduce some of our WiMAC members, through a series of Q&A profiles we have published on the InstMC website. Find out more as they take us through their journey within measurement, automation and control, what inspires them, the skills and knowledge that have helped develop their roles and useful advice on starting out.

Our first three subjects are **Claire Jones**, WiMAC Chair and Application Consultant – Flow, Endress + Hauser, **Turan Daspan**, WiMAC Vice Chair and Lead Instrument & Control Engineer, Apollo Engineering and **Sheila Smith**, InstMC President and Head of Department, Dept. of Applied Sciences, Glasgow Caledonian University.

What originally sparked your interest in engineering?

CJ: I originally started out in an order entry role at Endress+Hauser and working closely with the engineers helped me gain a great insight into the industry which I had never had exposure to before. I am inherently quite inquisitive so for me it sparked my interest to learn what they were doing day to day!

TD: My fascination with maths and numeracy, instilled by my dad's passion for mathematics, laid the foundation for my interest in engineering. Growing up, I found myself drawn to STEM subjects, particularly mathematics and physics. What captivated me even more was the historical application of these principles in science and engineering, shaping key innovations that changed the course of human history.

SS: I come from a farming background and growing up I often helped to tinker with farm implements when they broke down. This was a common occurrence! This originally sparked my interest

in agriculture, however, I could not see a future in that field, pardon the pun, but being curious to know how things worked, as well as a love of mathematics, led me to an undergraduate degree in Applied Physics. Both subject areas are the underpinning of all engineering disciplines. From my UG degree I then embarked on a PhD, part of which was the development of a new instrument for the simultaneous measurement of fluorescence lifetimes. I have therefore been involved in instrumentation, in one form or another, throughout my career.

What do you enjoy most about your role?

CJ: I enjoy speaking to different people from all areas of the industry and with my role this happens every day. I gain so much knowledge from my experienced colleagues and customers around the world, and I love networking with them and forming great working relationships.

TD: What I find most rewarding in my role is witnessing how individuals interpret and implement engineering principles in both overt and subtle ways within their daily lives. I also enjoy the tangible aspect of engineering design - from conceptualisation on paper or software to bringing it to fruition and conducting thorough testing before its final installation and commissioning. Furthermore, my current position affords me the opportunity to continually explore and assimilate new engineering concepts while using transferable skills across diverse industries such as oil and gas, renewables, and decarbonisation, aligning with the ongoing energy transition.

SS: I enjoy two things about my role, the first is interaction with students and being part of their learning journey and secondly interesting research projects which will bring benefit to industry and add to scientific knowledge.

What skills and/or knowledge do you bring to your current role?

What I find most rewarding in my role is witnessing how individuals interpret and implement engineering principles in both overt and subtle ways within their daily lives.

CJ: I love a good challenge, which can prove useful in an application consultant role! There are often complex questions and queries coming through that require a bit of puzzle solving and in-depth technical discussions. The previous knowledge I gained through order entry and going through our graduate scheme has also helped as I have developed skills outside of my technical training which I still use daily.

TD: In my current role, I use a blend of analytical and adaptability skills built through years of professional and personal experiences. I live and work in a culture different from where I was raised, and this has helped me to learn to review, seek understanding and learn courage in challenging situations.

Beyond my technical engineering knowledge, I bring to the table unique alternate perspective on engineering, interpersonal dynamics, and leadership - enriching our collaborative capabilities.

SS: My current role is now more management focused although I still give lectures and am involved in research. I certainly bring many years of research and lecturing in chemical sensor development and associated instrumentation to ensure that graduates of the future are well prepared for the world of work. Skills I need at present are more people focussed and being able to interact with others to influence both senior management and advise students and early career researchers are key to the role I presently have.

What advice would you give to someone starting their career, based on your own experiences and lessons learned along the way?

CJ: My first piece of advice would be don't let anything hold you back if you have a career goal. But even if you don't know what you want to do right now, that is also okay. Sometimes the best things find you, which is what happened to me. My next advice would be to align yourself with those who will support you and push you outside of your comfort zone. For me, having two incredibly supportive mentors within Endress+Hauser was invaluable to me. They still support me to this day and give me that confidence boost that we all need sometimes.

TD: There is a lot to say about this…

At the start of your career, if you are unsure about what you want to do, at least know what you do not want to do; then be willing to work smart and learn; keep learning through your career. Learn the skill and invest in valuable relationships – mentors, peers, sponsors, mentees, etc.

At some point, you may need to charter new paths for yourself; take the challenge with the security of a minimal level of competence in the area and valuable relationships.

SS: I would advise people starting out to ensure that they enter a sector of the industry that they are passionate about. It is also good to be flexible and open to change and new opportunities. Equally, continuing to learn throughout your career is extremely important and vital as engineering will always be changing as new technologies come to the fore.

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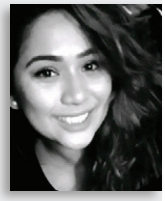

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