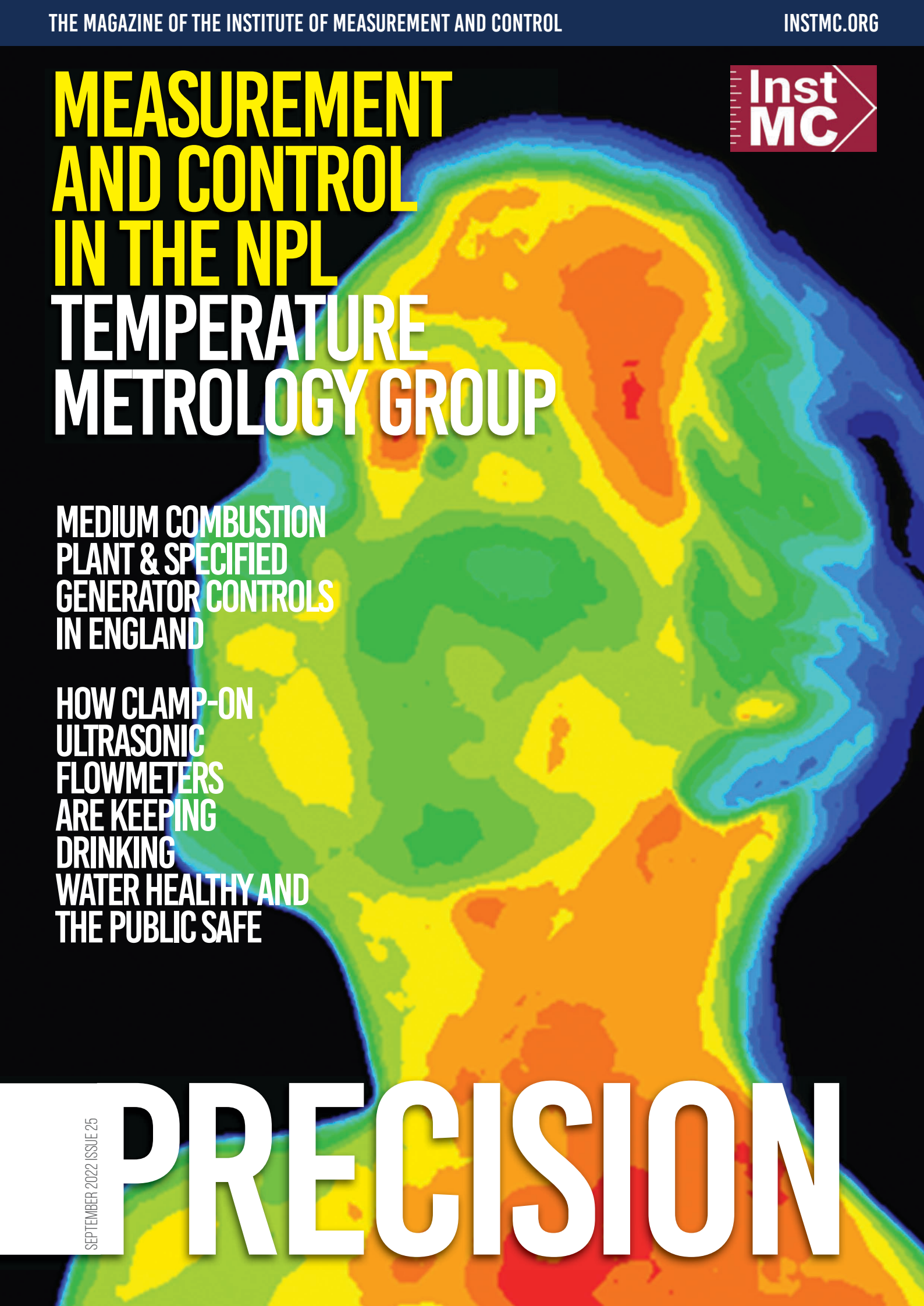
MEASUREMENT AND CONTROL IN THE NPL TEMPERATURE METROLOGY GROUP



MEDIUM COMBUSTION PLANT & SPECIFIED GENERATOR CONTROLS IN ENGLAND

HOW CLAMP-ON ULTRASONIC FLOWMETERS ARE KEEPING DRINKING WATER HEALTHY AND THE PUBLIC SAFE

SEPTEMBER 2022 ISSUE 25

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InstMC

MARTIN BELSHAW INSTMC PRESIDENT 2020-2023

Just under three years ago I became president of the InstMC, a daunting role following in the footsteps of engineering greats, quite literally all too numerous to mention by name, except to note they were engineering greats.

But who back then would have guessed that within three months the world would have changed so drastically and we wouldn't see one another for two and half years! No more dinners. No more meetings. Within three months of my taking office, the prospect of getting to see everybody during my tenure disappeared completely. Overall, a challenge that made our previous ones pale into insignificance However, like before, we would rise to and ultimately survive.

From alternative platforms came alternative opportunities. MS Teams, ZOOM and EPSG blossomed because meetings were suddenly easier to attend and the travel problems both cost and time, disappeared. More people attended and in so doing, more was achieved, more quickly.

If there is one thing we have learned, it's that "blended" working is here for ever. London HQ were good at it even before Covid, switching to entirely home working was relatively easy and seamless, and still is post-Covid as we transition back to blended. It opened our eyes to a better more efficient way of working where the advantages outweigh the disadvantages. The younger members expect it; we should embrace it.

Perhaps the most poignant moments were speaking at the Teesside Dinner, the last before lockdown, not speaking at the Central Scotland Dinner, the first one to be cancelled just a few days later, but speaking again at both events two years later to the day. Good to see tables of happy smiling faces, hear applause and realise that we had more or less survived.

Finally let me introduce my successor Professor A. Sheila Smith, CPhys, FInstP, FInstMC, FHEA, Head of Department, Department of Applied Science, School of Computing, Engineering and Design, Glasgow Caledonian University, who I have known a long time through the EAB, the AAC and many University accreditation visits over the years and I know I will be leaving you in very capable hands. Sheila takes over as President from January 2023.

Meanwhile, it has been an honour and pleasure to represent our esteemed organisation these last three years, difficult circumstances or not. It was not what I expected for sure, but I have done things that I wouldn't have done otherwise. Not least, across PEI groups and representation close to the machinery of Scottish parliament and my hobby horse, education (particularly STEM subjects). If only 1% of what I say somehow influences policy and thus young people's future prospects it's mission accomplished.

Fifty some years ago, I was ten, I knew what I wanted to do just not what it was called, I failed the 11+ and went to a comprehensive school. I never imagined sitting here writing this today, President of the InstMC: that seemed impossible. So, if there is one thing I bring to the party for aspiring younger members it's that just because something seems impossible it does not mean that it is. To everyone else, thank you very much for the privilege.

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INSTMC 2022 AWARDS

Following two years of restrictions due to the Covid-19 pandemic, we are pleased to announce that the InstMC Awards Night will return this year. Join us on 19th October at Prince Philip House in London, to celebrate our 2020, 2021 and 2022 award winners. The event is free to attend, but please book your place as spaces are limited. Visit https://www.instmc.org/events for full details.

Sir Harold Hartley Award
Winner: Professor David Richardson

Callendar Award
Winner: Professor Stephen O'Connor

Finkelstein Award
Winner: Professor Eric Benoit

Cornish Award (sponsored by WCSIM)
Winner: National Physical Laboratory (NPL) Thermometry Team

Institute Award for Exceptional Early Career Engineers
Winner: Miss Annie KOU Wai Chu

L B Lambert Award
Winner: Mr Andy Hudson

L B Lambert Award
Winner: Mr Mike Verran

Honorary Fellowship
Winner: Dr Graeme Philp

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The InstMC Companion Company Scheme has been running since 1992, enabling companies to raise their profile amongst our membership of 3,000 professional engineers in the measurement, automation and control sectors.

ACCREDITATION CORNER ASK TREVOR

What is "traceability", why do I need it?

In order to tackle this question, we need to consider three terms encountered in measurement work.

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PRECISION

The magazine of the Institute of Measurement and Control
Published by: Institute of Measurement and Control
297 Euston Road, London NW1 3AD T: +44 (0) 20 7387 4949
www.instmc.org
www.twitter.com/instmc
https://www.linkedin.com/company/institute-of-measurement-and-control-the-/

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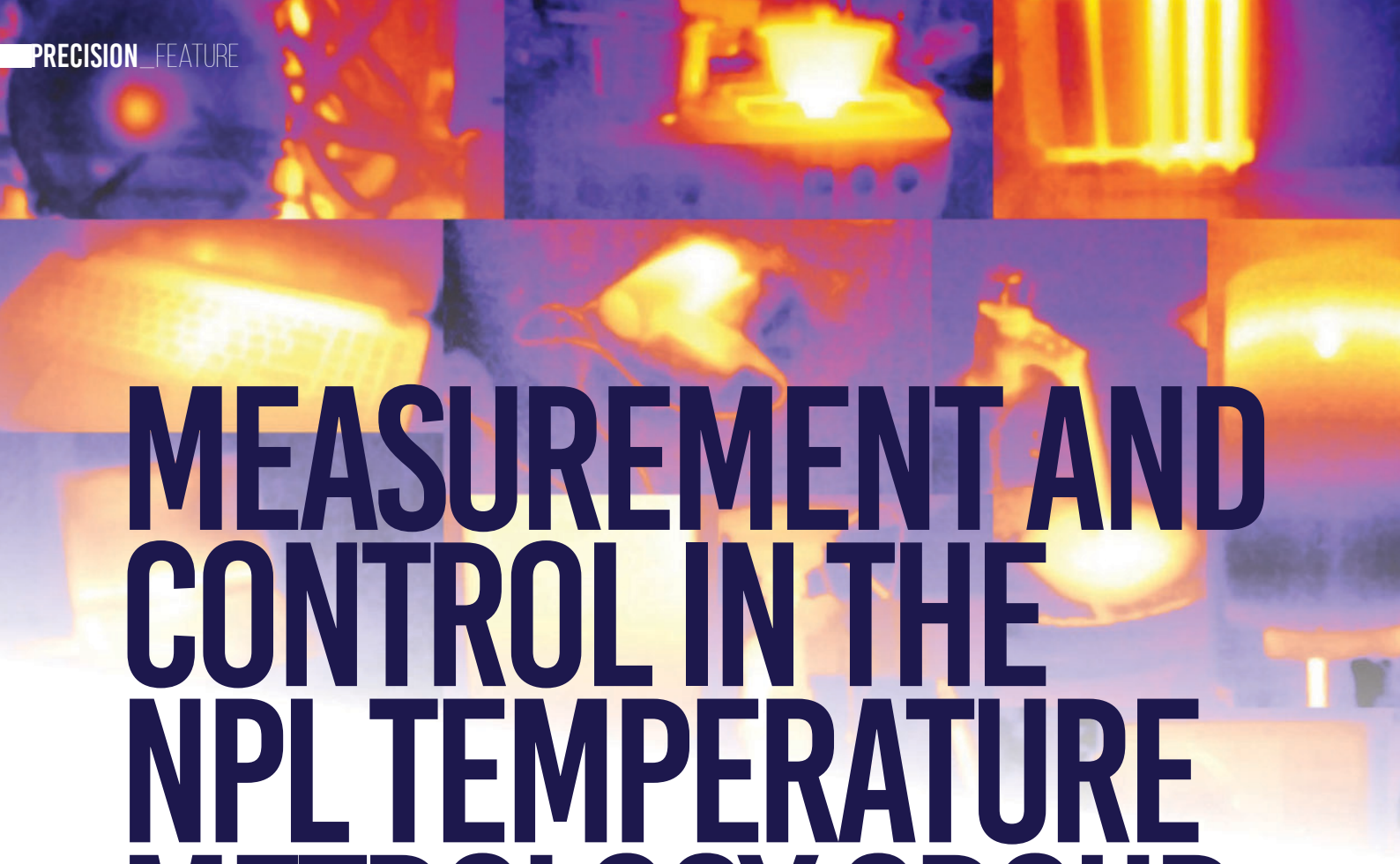
E: steff.smith@instmc.org

Design, print & mail fulfilment
by HMCA Services Ltd
Tel: 01423 866985
E: enquiries@hmca.co.uk

Cover price, where sold, £15



MEASUREMENT AND CONTROL IN THE NPL TEMPERATURE METROLOGY GROUP

Winners of the InstMC 2022 Cornish Award give us an insight into their work.

The Temperature & Humidity group at the National Physical Laboratory is responsible for delivering the UK's world-leading temperature measurement infrastructure in the UK. This includes:

- Maintaining and disseminating the International Temperature Scale of 1990 (ITS-90) which is the internationally agreed approximation to the International System (SI) unit of temperature, the kelvin
- Ensuring UK thermometry standards are equivalent with those of sister National Metrology Institutes (NMIs) around the world through participating in key comparisons
- Contributing to the robust operation of the global measurement system with respect to temperature through participation in and contribution to key international committees[1]
- Undertaking research to ensure the NPL thermometry group can meet upcoming temperature measurement and dissemination challenges.

The thermometry group is comprised of five key technical areas: i) fundamental thermometry – measuring thermodynamic temperature directly using a well-established physical relation such as by measuring the speed of sound in a gas; ii) contact thermometry – thermocouples and resistance thermometers, and maintaining and disseminating the ITS-90 between 4.2 K and 961.78 °C, iii) non-contact thermometry – infra-red thermometry (from -50 °C) and maintaining and disseminating the ITS-90 from 961.78 °C up to above 3000 °C; iv) harsh environment thermometry – flame and combustion thermometry, explosion thermometry, fibre-optic thermometry, fluorescence thermometry for traceable surface temperature measurement, and v) quantitative thermal imaging – thermography for applications such as spacecraft characterisation, nuclear decommissioning, and healthcare. More details on these activities can be found at the group's website[2].

In addition to the fundamental and foundational work underpinning the SI, the group spends much of its time solving measurement challenges for stakeholders across industry, government and academia either on a contract R&D or grant-funded basis. Here some of the group's more applied activities are described.

Applied thermometry

Reliable surface temperature measurement is notoriously difficult and is a common challenge in advanced manufacturing. Examples include measurement of the temperature of billets during forming, forging and heat treatment up to 1000 °C and heat treatment of steel structures before and after welding and/or coating. Conventional techniques such as contact probes suffer from large errors associated with heat flow along the probe, while non-contact techniques such as thermal imaging suffer from errors arising from the unknown surface emissivity and background and reflected thermal radiation. NPL has developed reliable, traceable phosphor thermometry based on thermographic phosphors up to about 800 °C, whereby when the phosphor is periodically illuminated the temperature can be determined either from the decay time of the luminescence or from the relative intensity of specific peaks in the spectral luminosity. This technique is also being combined with quantitative thermal imaging for *in-situ* determination of the surface emissivity.

Combustion is of vital importance in the modern world, for example as a source of electrical power, industrial production, transport propulsion and space heating. Flame and combustion thermometry in research and production settings is often performed with elaborate laser diagnostic apparatus. Despite this sophistication, the accuracy of temperature measurement is typically of the order of 10 % and the methods are not traceable to the SI. This limits the efficiency of combustion processes (which is critically important when seeking to minimise carbon dioxide emissions) and hinders their development. NPL has developed and calibrated a portable standard flame and coordinated its calibration at several specialist facilities across Europe to validate their performance (Figure 1). The standard flame has a well characterised, traceable temperature profile with an uncertainty of about 0.5 %.

The state of the art for contact thermometry at high temperatures up to 1600 °C comprises noble metal thermocouples based on alloys of platinum and rhodium. The propensity of these thermocouples to exhibit calibration drift, often by several degrees and in an unpredictable manner, is well documented. This limits the performance of high value manufacturing processes such as casting and heat treatment of aerospace components. NPL has made great progress in optimising these thermocouples and mitigating their calibration drift, as well as commercialising new types such as an ultra-stable high temperature thermocouple based on wires of pure platinum and palladium.

Much of the recent progress is thanks to a new generation of high temperature 'fixed points' based on alloys of metal and carbon. These comprise a metal-carbon ingot with an invariant melting temperature contained in a graphite crucible with a well for insertion of a thermocouple or sighting of a non-contact thermometer. These fixed points have revolutionised thermocouple and non-contact thermometry calibration which previously suffered from large uncertainties above the freezing point of copper (1084 °C). Two of these fixed points, Co-C (1324 °C) and Pd-C (1492 °C) are now used routinely as part of NPL's contact thermometry calibration services, and the fixed points themselves are also available commercially.

High temperature fixed points have been miniaturised to produce self-validating thermocouples which make use of a miniature fixed-point cell mounted on the end of the thermocouple. As the process environment passes through the melting temperature of the fixed point, the temperature is held constant during the melting process as the fixed-point ingot absorbs heat amounting to the heat of fusion. This results in the thermocouple recording a 'hesitation' in its output. As the temperature is known at this point, the thermocouple can be recalibrated with an uncertainty of about 0.5 °C, mitigating calibration drift. The practical self-validating thermocouple has been licensed to a UK thermocouple manufacturer and trials in industry are underway.

A similar concept has been applied at lower temperatures for use on board earth observation spacecraft, where an *in-situ* reference temperature is needed for calibration of the local temperature sensors. Reliable on-board traceability is required to improve the accuracy of the calibration blackbody used for calibrating the radiometry used for earth observation. For this application the melting point of gallium (about 29.7646 °C) has been demonstrated, providing calibration accuracy of 0.01 °C[3].

Thermal imaging is widely used for measuring the temperature of an object's surface but is very challenging to do quantitatively. NPL has developed state of the art calibration techniques for all short-, mid- and long-wavelength systems, with very low uncertainties. Quantitative thermal images can be used for early detection of foot ulceration in diabetic patients, and this is in the process of being commercialised through a spin-out company, Celsius Health. The group is also developing 3D thermal imaging which accounts for the geometry of the object of interest, and other effects that influence the temperature measurement such as reflection of radiation from neighbouring objects. This makes use of point cloud digitisation and ray-tracing techniques and has been demonstrated in spacecraft thermal testing, nuclear decommissioning, and electrical infrastructure condition monitoring applications.

National challenges

NPL's temperature group is working

on some key national challenges. From a metrology perspective these include new approaches to realising and disseminating the SI kelvin, and working towards practical primary thermometry that yields *in-situ* traceability to the kelvin. From an applied perspective we have been working on developing reliable thermometry approaches to facilitate more effective nuclear decommissioning and storage of nuclear materials.

In 2019 the SI kelvin was redefined in terms of the Boltzmann constant, which relates temperature to energy. This supersedes the previous definition which relied on the triple point of water with a specific isotopic composition. Using acoustic thermometry (Figure 2), NPL played a key role in the concerted international effort to measure the Boltzmann constant, and was one of only two participants with uncertainty lower than 1 part per million. NPL's value fed into the cohort of 2017 CODATA values[4] determined using different techniques by national metrology institutes worldwide, and the consensus value was subsequently fixed. The kelvin is now defined by taking the fixed numerical value of the Boltzmann constant to be 1.380649×10^{-23} when expressed in the unit $J\,K^{-1}$.

The group is also at the forefront of the transition to direct dissemination of the 'thermodynamic' temperature *T*, moving away from the current defined scale using practical primary thermometry. This approach is broadly regulated on a global basis through the *mise en pratique* for the redefinition of the kelvin (*MeP*-K-19)[5]. Besides specifying dissemination roles through the ITS-90 it crucially specifies a number of primary thermometry approaches that could be used with sufficiently low uncertainty to realise and disseminate the kelvin. These approaches are quite different from a defined scale because they realise, and hence measure, the temperature directly rather than requiring calibration to a defined temperature scale.

NPL and a number of other NMIs is developing primary thermometry approaches for next generation temperature standards. These include acoustic thermometry, Johnson noise thermometry[6]. relative primary radiometry above 1100 °C, and so-called 'photonic thermometers' which make use of light in some way such as ring-resonators and Doppler Broadening.

A key advantage of primary thermometry is the opportunity for driftless temperature measurements. For example, Johnson noise thermometry makes use of Nyquist's equation to relate the Johnson noise voltage of a sensor (the voltage arising from the temperature dependent thermally driven motion of electrons) to the sensor resistance and temperature. Since all parameters which influence the temperature measurement are themselves measured, any effects arising from degradation of the sensor (that would cause calibration drift in conventional sensors) are measured, and so the sensor is completely stable at all times. One of NPL's medium to long term objectives is to develop practical primary thermometry which exploits these benefits, specifically yielding traceability to the SI kelvin at the point of use. This would represent a huge advantage for the measurement and control of processes where temperature is a critical parameter, negating the requirement for expensive and inconvenient recalibration or even replacement of sensors, which is the case at the moment.

Another key part of the *mise en pratique* is the determination of the difference between 'thermodynamic' temperature, *T* and the ITS-90 temperature, T_{90}. This will enable users to convert between the two scales which is a necessary part of the transition to measuring *T*. NPL has contributed to these measurements of $T - T_{90}$ by adapting the acoustic resonator used for the Boltzmann constant determination to operate over a wide range of temperatures. Although these differences are quite small they are nevertheless important for global challenges such as climate monitoring (e.g. ocean temperatures).

A third aspect being worked on by NPL is the development of high temperature fixed points for relative primary radiometry at high temperatures above the copper freezing point (1084.62 °C). This is being done by developing an international consensus for the melting temperature of selected high temperature fixed points, which, once fixed, will facilitate practical use of the widely used parametric approximation relating the emitted optical power to temperature for primary thermometry.

NPL is increasingly relying on digitalisation of its services. The temperature group's commercial calibrations are now largely automated, with automatically generated calibration certificates. A web-based interface for accessing calibration data and certificates is under development; this will be accompanied by an API to enable users to access the data from their own software.

In the longer term self-validating temperature sensors and practical primary thermometry to ensure thermometry is always 'right' will be an important part of digitalisation in industry, where increasing reliance on sensors places a high demand on the reliability of the measurements from them. Such sensors will also be essential to ensure sensor networks continue to reliably measure temperature over long periods of time (e.g. those controlling an autonomous factory or power station).

One particular national challenge that NPL is contributing to is nuclear decommissioning and waste storage. Currently in the UK nuclear power is the only large scale zero-carbon means of baseline electricity

generation. Developing effective metrology tools that can deal with end-of-life nuclear power facilities are essential. Currently the scale of addressing the UK's nuclear waste legacy is growing. Solutions developed by NPL's temperature group is facilitating a change in Sellafield Ltd's approach to the storage and containment of the UK's most hazardous nuclear waste by providing the quantitative metrology necessary for the efficient and cost-effective long-term storage of waste/radioactive materials with no compromise on safety. Activities include the application of quantitative thermal imaging to detect anomalous features on waste containers, measurement uncertainty assessment, use of traceable phosphor thermometry to perform temperature measurement underwater in ponds, and reliable very long-term thermometry (100 years), and Multiphysics CFD modelling of air-cooling applications.

For more information about the group and its work contact the group's Science Area Leader jonathan.pearce@npl.co.uk who would also like to thank Graham Machin, Rob Simpson, Gavin Sutton and Robin Underwood for their contributions to the work described here.

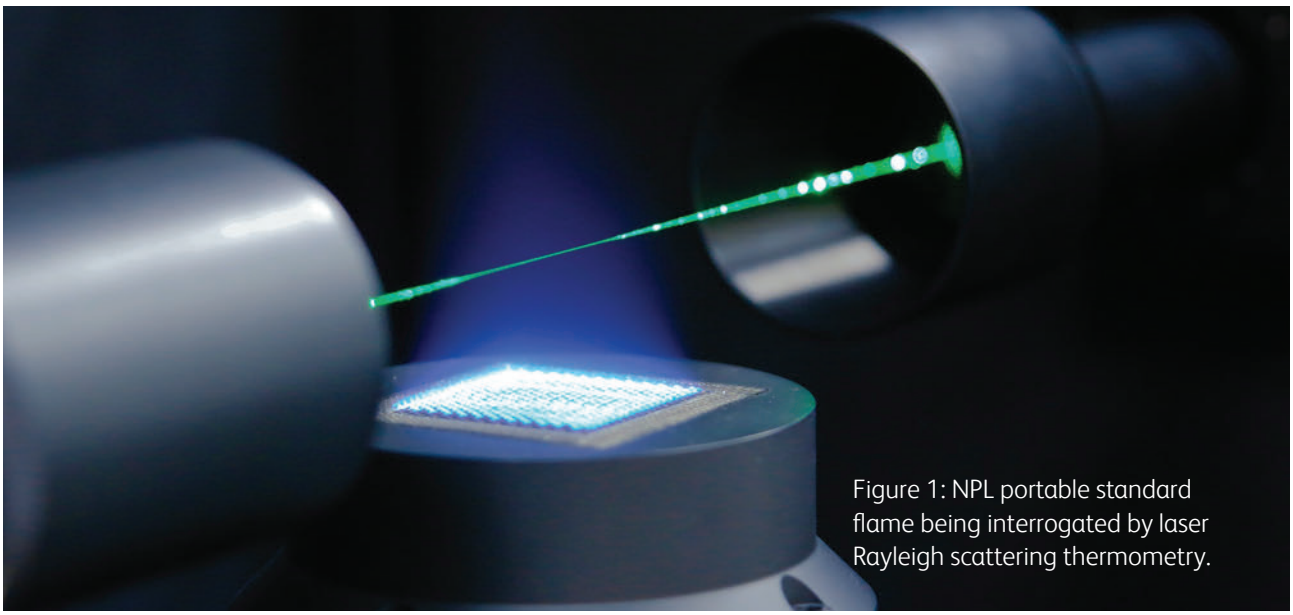


Figure 1: NPL portable standard flame being interrogated by laser Rayleigh scattering thermometry.

[1] Foremost of these are the International Committee of Weights and Measures (CIPM) Consultative Committee for Thermometry (CCT) and the EURAMET Technical Committee for Thermometry (TC-T).

[2] https://www.npl.co.uk/temperature-humidity

[3] In collaboration with RAL Space.

[4] CODATA 2017 Special Adjustment of the Fundamental Constants https://iopscience.iop.org/article/10.1088/1681-7575/aa950a

[5] Full text on the BIPM website https://tinyurl.com/4rr95acw

[6] Collaborative work led by UK company Metrosol Limited https://www.johnson-noise-thermometer.com/

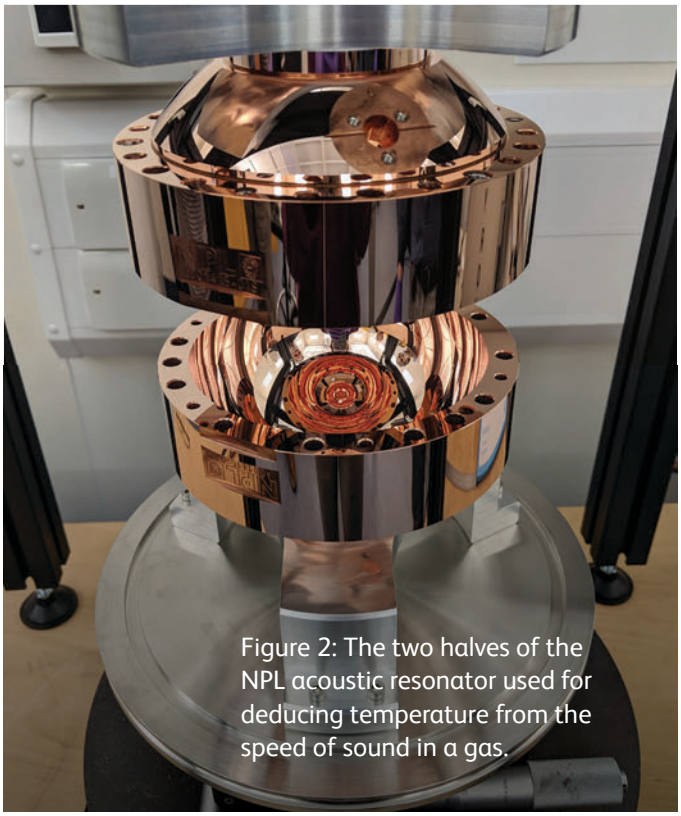


Figure 2: The two halves of the NPL acoustic resonator used for deducing temperature from the speed of sound in a gas.

BY EMMA PRESTON MCIWM,
SENIOR ADVISOR,
ENVIRONMENT AGENCY

MEDIUM COMBUSTION PLANT & SPECIFIED GENERATOR CONTROLS IN ENGLAND

InstMC members living in the UK and Europe may well already be aware of the Medium Combustion Plant Directive (MCPD) EU/2015/2193 that was published in 2015.

Here is a timely reminder of how this Directive impacts medium combustion plant and specified generators in England and what the legal requirements are.

Medium Combustion Plant (MCP) and Specified Generators (SG) emit polluting exhaust gases including oxides of nitrogen, sulphur dioxide, carbon monoxide and particulates which contribute to reduced air quality that can cause harm to human health, the environment and economy.

To control these emissions and improve air quality across the European Union, the Medium Combustion Plant Directive (MCPD) EU/2015/2193 was published in 2015. In 2018 the Environmental Permitting (England and Wales) (Amendment) Regulations (EPR) was published by DEFRA to transpose the requirements of the directive into regulations, it also brought in specific domestic controls to reduce emissions from the operation of specified generators.

What are Medium Combustion Plant (MCP)?

An MCP is a combustion unit such as an engine, boiler or turbine with

a capacity more than or equal to 1 megawatt thermal (MWth) and less than 50MWth burning any type of fuel.

MCP is either classed as new or existing:

- new – if it was put into operation on or after 20 December 2018
- existing – if it was put into operation before 20 December 2018.

What are the requirements under the legislation?

In scope MCP must apply and have a permit in place by:

- 20 December 2018 or before it is commissioned for a new MCP
- 1 January 2024 if it's an existing MCP and the capacity is between 5MWth and 50MWth
- 1 January 2029 if it's an existing MCP and the capacity is between 1MWth and less than 5MWth

The MCP permit conditions will set emission limit values (ELV's). Operators must ensure plant can meet the ELV's by:

- 20 December 2018 or from date of issue it's a new MCP
- 1 January 2025 if it's an existing MCP with a capacity between 5MWth and 50MWth
- 1 January 2030 if it's an existing MCP and the capacity is between 1MWth and less than 5MWth.

For detailed guidance on the MCP regulations you should visit https://www.gov.uk/guidance/medium-combustion-plant-and-specified-generators-environmental-permits

What are Specified Generators (SG)?

A generator is a combustion plant that generates electricity and includes engines, gas engines and boilers that operate as a combined heat and power. The regulations apply to all generators with a capacity up to 50MWth burning any fuel.

The term 'specified generator' covers an individual generator or number of generators on the same site, with the same operator being used for the same purpose.

In most cases the MCP and SG regulation requiring the stricter emission controls will apply to generators and you must get your permit by the earliest date set in the regulations.

Generators are classed as either Tranche A or B. This is determined by factors such as:

- when you had a contract to provide services to the national grid known as a capacity agreement, contract or feed in tariff (FIT)
- its rated thermal input
- its emissions
- the number of hours it operates each year.

Read the guidance specified generator: when you need a permit: www.gov.uk/guidance/specified-generator-when-you-need-a-permit for more information.

What should I do to prepare to meet the requirements?

After reading our guidance if you think that your operations require a permit now then you can apply on the government website:

- Specified Generators:
- www.gov.uk/guidance/specified-generator-apply-for-an-environmental-permit
- Medium Combustion Plant:
- www.gov.uk/guidance/medium-combustion-plant-apply-for-an-environmental-permit

Before you apply you can get pre-application advice: www.gov.uk/guidance/get-advice-before-you-apply-for-an-environmental-permit

If you think you will require a permit in the future to meet the regulatory deadlines then you can keep informed about when and how to apply and contribute to any consultations by completing this survey https://www.smartsurvey.co.uk/s/VTAPQA/ which will give you the option to join the Environment Agency Medium Combustion Plant and Specified Generator mailing list.

You could also set an alert for updates from their website guidance pages – look for the button "get emails about this page" at the bottom of each page you are interested in.

The exact timing and process of making permit applications for existing MCP and tranche A SG's is currently being developed by the Environment Agency.

To help the Environment Agency prepare they would like to invite all operators to complete this survey: https://www.smartsurvey.co.uk/s/VTAPQA/

Sharing your data will enable the EA to:

- resource ourselves
- decide how to spread the load of applications and compliance activities
- create standard rule sets for common operations which will be cheaper and easier to apply for
- produce habitats screening tools for bespoke permits

Completing the survey and reading our guidance will also help you to prepare for future permit applications and compliance activities and allow you to make strategic and financial business decisions about your existing plant.

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HOW CLAMP-ON ULTRASONIC FLOWMETERS ARE KEEPING DRINKING WATER HEALTHY AND THE PUBLIC SAFE

Non-invasive clamp-on ultrasonic flowmeters are attached to the outside of the pipe, enabling the volume flow to be measured without process interruption. By using sound waves to calculate the transit time of a liquid, changes in upstream or downstream flow can be accurately monitored.

This technology is proving invaluable to drinking water plants, where public safety is the number one priority. No longer is there the risk of under or overdosing of chlorine that could present a potential health hazard.

A chlorine analyser alone is not enough to ensure public safety

Working with a drinking water plant operator whose system consists of 134 artesian wells that tap into the Floridan aquifer, FLEXIM carried out flow measurement on small, low flow sodium hypochlorite lines, as it had become apparent that the chlorine analysers currently being used by the operator's 38 unmanned plants were not enough to ensure public safety. The chemical is used to maintain a residual of chlorine throughout the drinking water distribution system, and a pump check valve had become stuck in the open position on one of the sodium hypochlorite metering pump skids, causing a slug of water with an exceptionally high level of chlorine to enter the distribution system. Shockingly, this caused a local resident to suffer chemical burns while showering.

Magnetic flowmeters were proving unreliable

The operator found that the meters that they had installed as a backup indicator of high chemical delivery only worked some of the time. During off peak times the magnetic flowmeter could not detect the flow because the velocity was too low. It was clear that a more effective solution was needed.

Absolute hygiene is assured, along with a guarantee of safety

Because all measurement is carried out externally with clamp-on ultrasonic technology, there is no contact with the drinking water, and therefore no risk of contamination. And safety is guaranteed thanks to

a range of alarm features that are designed to alert in potentially dangerous situations, indicating if a check valve should ever become stuck, if the chemical tank runs dry or a chlorine delivery line bursts for example.

For further information on the technical advantages of ultrasonic meters for the water industry, contact Andy Hammond, www.flexim.co.uk | sales@flexim.co.uk
Tel: +44 (0)1606 781 420

Q&A

Jan Maciejowski

In the hot seat this issue, **Jan Maciejowski**, InstMC Past President and Professor Emeritus of Control Engineering, University of Cambridge (now retired), gives us an insight into his career in engineering.

What was the root of your interest in Engineering?

That definitely came from my dad. He was an electrical engineer, working on mobile communications. In the 1950s and 1960s that field looked very different from smart phones and tablets. It was concerned with mobile transmitters and receivers, as used by the military and emergency services – including the RNLI and the AA. We would sometimes have a piece of kit on test in the family car for a couple of weeks. I was fascinated by the kit itself, by circuit diagrams, and best of all occasionally going into the factory on a Saturday morning (Health & Safety wouldn't allow that these days). I still love the smell of a machine shop, or of solder on an electronics bench.

So, from the age of maybe 9 or 10 I wanted to be an engineer. I would sometimes change my mind temporarily – fighter pilot, bus driver, fireman, even priest briefly – but I always came back to engineering. When I was about 14 my dad started bringing home issues of "Control Engineering". These were being sent to his work for some reason, and nobody there was particularly interested in them. I read them – they were not too technical – and I became fascinated by the subject. It wasn't all process control, control of spacecraft also figured quite a lot, that being the time of the Mercury missions, and a bit later Apollo. The upshot was that when it came time to go to university, I knew that I wanted to study Control Engineering. That made the choice of institution easier, as there were only 5 such undergraduate courses in the UK at that time: Manchester, Sussex, Warwick, Bangor and Sheffield, I think. I was advised not to go to Manchester because I had bad asthma at that time, and Manchester was still a badly polluted city in 1968. So, I went to the University of Sussex instead. It had a pioneering course (which I only realised much later), with all scientists, mathematicians and engineers doing the same first year courses (mostly), all engineers doing the same second year courses, and specialisation only in the third year. I also met my wife Mara in Brighton while I was there.

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

I wish I could be more optimistic about it than I am. But let's do 'vision' rather than 'prediction'. The biggest problem facing us all is climate change, and it is more urgent than most of us admit. I am one of those who believe that mitigating climate change could be, and should be, a major driver of the economy – not only our economy, but the global economy. Switching away from our current dependence on carbon, whether it is to renewables, to hydrogen, to nuclear, or most likely to some combination of these, and doing so quickly enough, will require tremendous innovation in all walks of life, and Engineering must inevitably play a very large role in that innovation.

This must happen everywhere, of course. But I believe that Britain could be a major player in this. We are good at invention, though not so good at follow-through to innovation, we punch well above our weight in fundamental and applied science, and we are good – though patchy – in Engineering. This is a good foundation, but we need to raise our game to eliminate, or at least reduce, the weak points, and I hope that we can do that by turning the threat of climate change

disaster into a stimulus to action. I am encouraged by the government's recently announced ambition to raise the spend on R&D to 2.4% of GDP by 2027 (though I note that the OECD average is already 2.6%!) but creative, consistent and wise policy will be needed to spend that money effectively.

Measurement and Control Engineering will really be an enabling technology for climate change mitigation. From apparently simple – yet woefully badly done – things like controlling our domestic temperatures efficiently, to fancy stuff like controlling electric power networks with massive penetration of local renewable energy sources, measurement and control are going to be needed everywhere. I am sure that machine learning will have a big impact when combined with our 'traditional' methods - look at the recent success of DeepMind in controlling the plasma in a fusion reactor, for example.

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

Education. Specifically, improve science and maths teaching in schools to make them more interesting, and don't force kids to specialise too early. But that is long-term – at least 10 years to get delivery from the 'pipeline'. In the short term, recruit the best internationally, like the USA does, and greatly increase 'continuing education', so that adults can re-train to meet some of the demand.

I have recently been involved in continuing education, working with The University of Cambridge on their new programme of online learning: Cambridge Advance Online (CAO). We have created a Control Engineering course that is endorsed by the InstMC and designed for graduate engineers who find themselves working on control systems and needing to learn about them. It is quite an intense 8-week course, with about 8 hours of work needed per week. The course assumes that you know very little about control to start with, works through basics such as PID control, and reaches advanced material such as optimal control and Kalman filters. There is maths involved, but we use software to do all the calculations.

CAO have several other courses, in areas such as Product-Technology Roadmapping and Bionanotechnology. I believe that the provision of such courses can have a significant impact on the shortage of engineers, once engineers and their employers become more aware of them.

What do you do in your free time to relax?

Well, I'm retired, so it's all 'free time' except when I'm engaged on a project such as writing a course. I like sailing, but I have become more prone to seasickness in recent years, so now it's gentle sailing in the Norfolk Broads and the like. When the Covid pandemic started, four of us formed an online book club. We have now progressed to in-person meetings, at which books are not the only things that are consumed. Our wives didn't believe that an all-male book club would survive, but we have read about 35 books so far since early 2020 and are still going strong. I also like learning languages and am currently learning (modern) Greek – fairly useless in Greece, because they all seem to speak excellent English. Keeping fit and healthy is an increasing preoccupation with age, which I try to do by cycling and swimming.

Given one wish what would that be?

That we had no wars, civil or any other kind.

NEWS ROUND UP

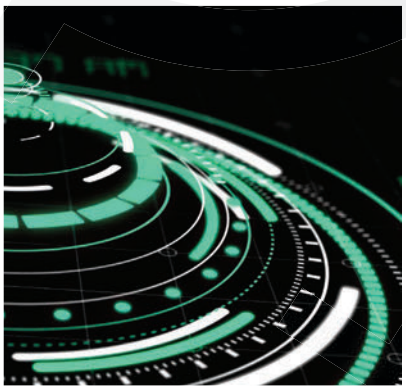
INSTMC SPECIAL INTEREST GROUPS

DIGITAL TRANSFORMATION

Maurice Wilkins stepped down as Chair of the DT SIG at the beginning of summer, having first spun up the SIG then spending three years at the helm. The new committee, Billy Milligan (Chair), Martin Bragg (Vice Chair) and Robert Perks (Secretary) thank Maurice for all the work he has put in over the last three years. Maurice will stay on as part of the steering committee alongside Iain Crosley, Pete Loftus, Ahmad Kharaz and Dominique Hoyi. The DT SIG is currently looking for someone to volunteer as the SIG webmaster.

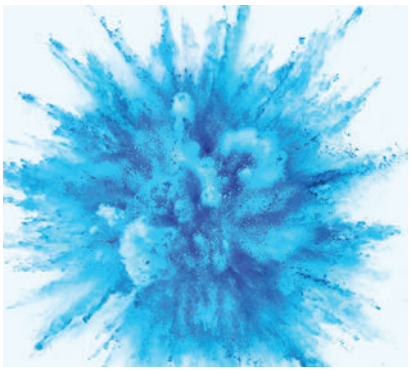
Over the course of the pandemic the SIG has developed a series of guidance notes covering the topic of Digital Transformation. There is a 'Theme Zero' guidance note that is an introduction to the topic and gives an explanation of what is covered in the individual theme guidance notes. These theme topics are 'Process', 'Successful Outcomes', 'People' and 'Assets'. The current plan is to publish 'Theme Zero' first followed by the individual themes.

The DT SIG are planning a series of lectures based on the content within the documents as they are a rich source of information, relevant and topical. These lectures will also help inform the membership on the good work the DT SIG has been carrying out. As an example of this, an article on how Augmented Reality is being used within our industry is being



prepared for an upcoming edition of Precision.

The SIG is also involved in collaboration work with the ISA and GAMBICA on the topic of Digital Transformation and more information will be released on how this will benefit the various memberships in due course.



EXPLOSIVE ATMOSPHERES

The Energy Institute, in collaboration with the Engineering Equipment & Materials Association (EMMUA), have released a second edition of their 'Guidelines for managing ignition risk by inspection of Ex electrical equipment in hazardous areas (including support of IEC 60079-17)'. (EMMUA Publication 246).

The guidelines may be seen to be at odds with the briefing note on Ex Inspection Sample Nomination issued by the Ex-SIG in May 2021.

The guidance proposes a statistical approach to inspection sample nomination and frequency of inspection. In comparison with the method outlined in our briefing note, it requires a higher level of intrusive inspection, (which the guidance does acknowledge to carry a risk of introducing faults), and a higher management and resource burden.

The key considerations on which the Ex-SIG BN approach is based are:

- IEC 60079-17 explicitly states: "Sample inspections should not be expected to reveal faults of a random nature, such as loose connections, but should be used to monitor the effects of environmental conditions, vibration, inherent design weakness, etc." (IEC 60079-17: 2017 4.3.3)
- Faults that would render an asset as a source of ignition would normally be evident through close/visual inspection OR would be revealed by failure of the normal functioning of the device.
- Disturbance to installed equipment should be minimised as far as is consistent with responsible management of the installation.

The Ex-SIG committee remain concerned that adoption of the EI/EMMUA guidelines may require an unwarranted inspection and management burden and level of disturbance to an installation. It remains for the duty holder to identify an appropriate inspection regime for an installation in recognition of the nature of the assets and context in which they operate.

FLOW MEASUREMENT

The FMSIG recently welcomed Mikal Willmott, Improvement Manager, Severn Trent Water to the Steering Committee. It proposed to TÜV SÜD National Engineering Laboratory a recommendation and scope for a Foresight Review of solid-gas flow measurement capability, for consideration as part of the UK Flow Programme. The proposal arises in the context of pollution and health concerns from air borne particulates in the UK. The Programme Expert Group (PEG), which referees Flow Programme submissions, approved a modified version of the proposed scope in June. A letter of support was sent to the University of Bologna, following a request via the Institute enquiry form, regarding an EU call for project proposals on measurement of hydrogen/ natural gas flow mixtures. The SIG is cooperating with the newly formed National Metrology Skills Alliance to develop training and competence standards for flow measurement.

The latest SIG membership count is 240 with affiliations covering a wide range of sectors. The Steering Committee is established and refreshes according to necessity. It

sees a need to engage membership to utilise this diverse representation and more fully contribute to the Institute's goals.

A web master is needed for the SIG website. Further ideas for volunteer engagement would also be welcomed from the FMSIG community. One thought is to establish sub-groups in specific areas, for instance, an R&D sub-group. The steering committee recently commenced dialogue with the UK Fluids Network https://fluids.ac.uk/. This is revealing avenues for cooperation to promote fluid dynamics understanding and measurement science and best practice. InstMC support of UK National Fellowships in Fluid Dynamics is one example: giving guest lectures as part of curricula; facilitating short-term industry experience placements; receiving research presentations; providing letters of support for post-doctoral applicants, etc. A prominent suggestion to emerge from the FMSIG membership survey in 2020 was for an Open Innovation Platform. The SIG Secretariat has now provided a specification for this as part of the new InstMC web portal. It needs volunteers to take forward. Anyone interested in volunteering to form an R&D group to pursue such opportunities or other subgroup; or acting as webmaster, please contact the FMSIG Secretariat (Katrina Davidson katrina.davidson@tuv-sud.co.uk). Your support is needed.

Sub-groups would receive direction from the SIG Steering Committee. Spokespersons will participate in the quarterly Steering Committee meetings. This will provide networking and broadening opportunities. An article on the benefits of volunteering appeared in Issue 23 of Precision Magazine.

FUNCTIONAL SAFETY

FS-SIG will be hosting two free-to-attend webinars over the Autumn:

Process Safety Time and SIF Response Specifications

26th September 2022 12.30 – 1.30pm (BST)

This online event will be an exploration of the factors that determine SIF response time specifications, covering some of the following topics:

- Why the PST definition fails as a specification for SIF response time
- Why the 50% PST rule of thumb can lead to design failures.
- How should we recognise response time growth in our SRS?

Functional Safety Assessments – Chore or Beneficial?

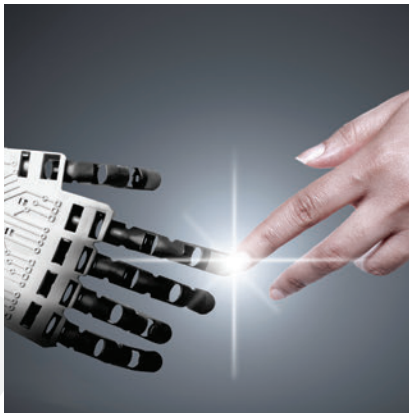
21st November 2022 12.30 – 1.30pm (BST)

The aim of this event is to explore the place of the Functional Safety Assessment (FSA) at various lifecycle phases. The standards require these to be completed in advance of hazards being present and during the operation and maintenance phase.

The fact that they are required can become a chore, but what benefits can be gained by completing them at appropriate lifecycle phases?

The session will be presented by Dave Green, Principal Consultant, RPS Consulting Services Ltd and SIG Exec member, who has experience in COMAH plant operations and consultancy across multiple industry sectors and countries.

For further information on both events, and to register your place through Eventbrite, visit https://www.instmc.org/sigs/functional_safety/news_activities.aspx.



MEASUREMENT

The Measurement SIG is continuing to work on its strategic projects in support of its vision to be a cross-sector group delivering improved implementation and understanding of robust and reliable measurement, and associated best practice.

The 'Marketing of Measurement' project is currently working on some cross promotion events with the National Physical Laboratory (NPL) and the Manufacturer Measurement Network (MMN) on a 'Joy of Engineering' event aimed at school and university students to show the fun side of engineering. It is also planned that there will be a talk at the upcoming 2022 Water, Wastewater and Environmental Monitoring conference (12-13 October, Telford) where a presentation will be given on measurement uncertainty.

The 'Training' project has now been concluded with the creation of a new 'National Metrology Skills Alliance SIG'. All of the work to date has been migrated into this exciting new activity that is already making significant progress through the engagement of academia and wider industry.

The 'Technology Transfer' project has just been the subject of a special focus event to accelerate its delivery. A number of new pathways to promote how industry can better drive low TRL items through to higher TRLs and industrialisation have been developed and work is now underway to progress these.

With the conclusion of the 'Training' project the SIG has this month embarked on the scoping of a new project to explore 'Metrology As A Career'. There is much to do to get this project underway however if any members want to be involved then please make contact at measurementsig@instmc.org.

STANDARDS

The Standards SIG focuses on standardising existing and novel technology systems and elements used within the 'Measurement and Control' world. We achieve this with the support of active members who represent their organisations, InstMC and in an individual capacity at various national and international standards-making bodies e.g. BSI and IEC.

During the recent challenging times, a few of our Standards SIG members took on the mammoth task of revising a key standard in the measurement and control field - BS6739: Code of practice for instrumentation in process control systems: installation design and practice. Working closely with the BSI, they challenged the 'norm' of face-to-face meetings to review the document and instead used the advancing technology of Microsoft Teams, which enables the active members to work on a 'single' document irrespective of their locations. The use of such collaborative channels ensured everything was agreed upon prior to passing back to the BSI to continue with the formal formatting and issuing for a wider review of the 'new' document. I think it's not an underestimation of the task they achieved, during the worldwide restrictions in place, and it's also warming to know that the review team gained both personally, from increasing their knowledge and building a stronger professional network.

The SIG, Maurice, Ian (the review Chair) and Navdeep (new SIG Chair) express gratitude to all those who contributed!

SIG Standards have enjoyed a good tenure under the leadership of Dr Maurice Wilkins. Maurice led the set-up of the Sharepoint page and LinkedIn groups for better collaboration and engagement amongst members. Keeping open and healthy communication between the SIG and InstMC staff has always been on Maurice's agenda. Since May this year, Navdeep Mehay has taken the responsibility of leading this group. Navdeep comes from a C&I background within the engineering sectors including Nuclear Fusion Research, Automotive test & development centres and Power Stations in India and the UK. Moving forward, Navdeep plans to grow those collaboration platforms for enhanced group engagement, with the support and guidance of the steering committee and InstMC staff. SIG members generally meet three times a year and tend to schedule it around the BSI national committee GEL/65 meetings. The new InstMC website has made it easy for members to join their interested SIGs, which has resulted in the rise of this group's size to over 240 members. Find out more information about the ways to join the SIG and how you can get involved, on the InstMC website. https://www.instmc.org/sigs/standards.

JOIN AN INSTMC SIG

InstMC SIGs provide an opportunity for like-minded engineers to network, share ideas and expertise, collaborate, learn and keep updated on industry news and developments.

We currently have 8 Special Interest Groups covering the following technical topics within the measurement and control fields: **Cyber Security, Digital Transformation, Explosive Atmospheres, Flow Measurement, Functional Safety, Measurement, Standards** and the newly formed **National Metrology Skills Alliance**. Driven by groups of volunteers who work, or have expertise, within the relevant topic area, SIGs promote the sharing and advancement of knowledge through a range of activities. These include producing white papers and briefing notes, as well as hosting and attending conferences, seminars and exhibitions.

How to join

Members can join any SIG through the members only area of the InstMC website. Click on 'Member Login' on the homepage and head to the 'Members Area'. Click 'Manage My Profile' and scroll down the page to the Special Interest Group section. Tick the box next to any group you wish to join and 'Save'.

If you are interested in finding out more about a particular Special Interest Group visit https://www.instmc.org/Special-Interest-Groups or email the relevant contact below.

Cyber Security Cevn Vibert
cevn@vibertsolutions.com

Digital Transformation
Billy Milligan
William.Milligan@instmc.org

Explosive Atmospheres
Harvey Dearden
Harvey.Dearden@instmc.org

Flow Measurement
Katrina Davidson
FlowMeasurementSIG@instmc.org

Functional Safety
Harvey Dearden
Harvey.Dearden@instmc.org

Measurement Jeremy Stern
measurementsig@instmc.org

Standards Navdeep Mehay
navdeep.mehay@instmc.org

Hazards32

18–20 October 2022, Harrogate, UK

Join process safety and loss prevention professionals at *Hazards 32* for essential knowledge-sharing and networking.

This industry-focused event is the perfect place to advance your understanding of managing major hazards. Our programme is packed with examples of good practice and valuable lessons learned in process safety and hazard management that you can transfer to your own operations. We will also be exploring the emerging challenges and major hazard implications of new technologies and applications.

Register online today.

www.icheme.org/hazards32

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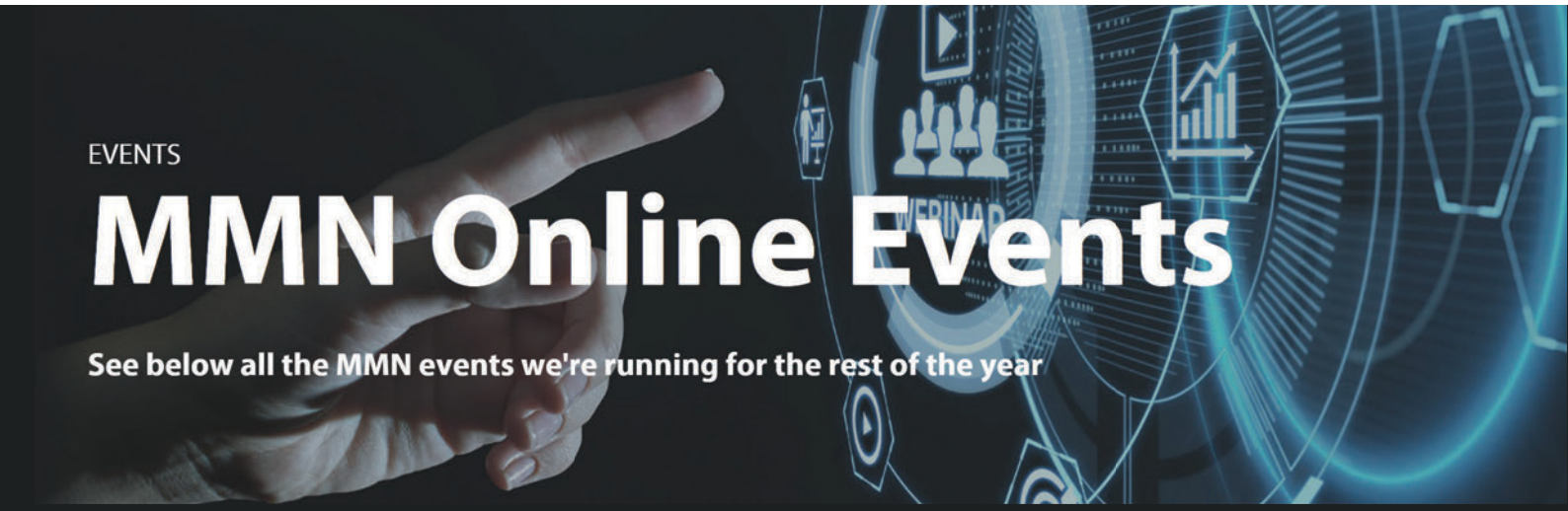
IChemE Safety Centre

IChemE ADVANCING CHEMICAL ENGINEERING WORLDWIDE



The Manufacturer Measurement Network helps SME manufacturers to be more productive, agile and quality orientated. Membership allows companies to keep abreast of emerging technologies and to interact with NPL staff and their manufacturing peers.

To find out more visit https://www.npl.co.uk/manufacturer-measurement-network

Vehicle Electrification
13th September 2022
15:30 - 16:30 BST

Industrial Digitisation
20th September 2022
17:00 - 18:30 BST

AMPI
11th October 2022
18:00 - 20:00 BST

Robotic Inspection
8th November 2022
17:00 - 18:30 GMT

Measurement Strategy
22nd November 2022
15:30 - 16:30 BST

All events are free to attend. For further information and to book your place, visit https://www.npl.co.uk/events/mmn-events

LOCAL SECTION NEWS

CUMBRIA

West Cumbria Local Section has recently expanded to encompass the whole Cumbria area and will now be known as Cumbria Local Section. The section has been running since the 1960s with close ties to Sellafield and local education during that time.

The group is looking to grow and is now actively seeking new members and volunteers. If you would like to get involved please contact the Chair, Ian Reynolds at ian.x.reynolds@sellafieldsites.com or Grant Hodgson, Vice Chair & Treasurer, at Grant.Hodgson@instmc.org. For more information on upcoming plans and activities visit Cumbria Local Section.

Courtney Goodwin 2020 Student Award Winner

YOKOGAWA Co-innovating tomorrow

Gen2 A City & Guilds Business

Student Awards

Congratulations to Courtney Goodwin who accepted the West Cumbria Local Section InstMC Student of the Year award over the summer. Courtney was selected in 2020, but due to the Covid pandemic, had her graduation postponed which also enabled West Cumbria to recently hand out the prize in person.

The award, sponsored by Yokogawa, was given to Courtney in recognition of her work on the Sellafield Degree Apprentice Scheme and her BEng with Gen2 and the University of Cumbria.

We would also like to offer congratulations to Christopher Milligan, 2021 Student Award winner, who has been working at Sellafield's Engineering Centre of Excellence.

L to R: David Jones, Cumbria Local Section Hon Sec, Christopher Milligan 2021 Student Award Winner, Mark Halliwell, Yokogawa

Awards Night

2022

Wednesday 19th October

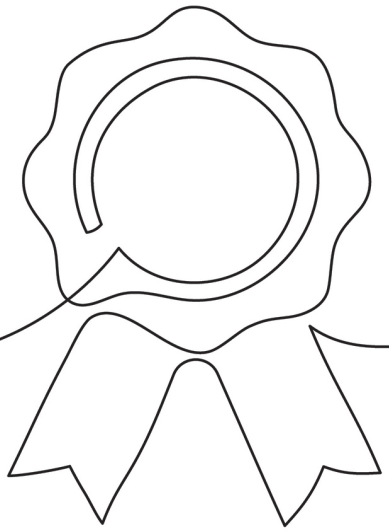
The InstMC Awards Night is an annual event where prestige awards are presented to individuals for their outstanding contribution and services to the Institute. Due to the Covid-19 pandemic we have been unable to host the event for the past two years so this year we will be honouring all our 2020, 2021 & 2022 winners.

6.00 pm - Registration
6.45 pm - Introduction & Welcome – Martin Belshaw
6.50 pm - Guest Lecture
7.15 pm - Presentation of Awards – Ken Grattan & Martin Belshaw
8.00 pm - Wine & Canapé Reception
9.00 pm - Evening Close

Prince Philip House, 3 Carlton House Terrace
London SW1Y 5DG

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

INSTMC 2022 AWARDS



Following two years of restrictions due to the Covid-19 pandemic, we are pleased to announce that the InstMC Awards Night will return this year. Join us on 19th October at Prince Philip House in London, to celebrate our 2020, 2021 and 2022 award winners. The event is free to attend, but please book your place as spaces are limited. Visit https://www.instmc.org/events for full details.

We are delighted to present to you, the recipients of the 2022 InstMC Awards.

Sir Harold Hartley Award

Winner: Professor David Richardson

For outstanding contribution to the technology of measurement and control

Professor David Richardson FRS, FREng, obtained his BSc and PhD in Fundamental Physics from Sussex University, UK in 1985 and 1989 respectively. He has been Deputy Director of the Optoelectronics Research Centre (ORC) with responsibility for optical fibre and laser related research since 2000 and has led various large collaborative optical communications research programmes within both the UK and Europe. Most recently the EPSRC Hyperhighway and Airguide Photonics Programmes and the EU PHASORS, MODEGAP and SAFARI projects.

Collaborating extensively with Industry, David has co-founded two spin out companies: SPI Lasers Ltd in 2000 and more recently Lumenisity Ltd in 2017, taking his research work from the laboratory to industry and commercial success in the UK.

David is internationally recognised for his work. He has published more than 1500 research papers, produced more than 30 patents and successfully supervised 70 PhD students to completion. He was elected Fellow of the Royal Academy of Engineering in 2009 and Fellow of the Royal Society in 2018. His work represents an outstanding contribution to the technology of measurement over several decades, in his field of optical fibre research for both communications and sensor systems and his leadership within the ORC at Southampton has made it world-class and internationally renowned.

Callendar Award

Winner: Professor Stephen O'Connor

For outstanding contribution to the art of instruments or measurement

Professor Stephen O'Connor receives this award for outstanding achievements in medical instrumentation development and as an expert in implantable devices, working within the NHS, industry and academia.

He started his career in medical engineering at the Medical College of St Bartholomew's Hospital where he designed and built novel equipment to study pulmonary function and breathing under anaesthesia, examining novel pharmacological agents and establishing a new clinical facility within the hospital. Two instruments were designed, developed and used clinically, one to identify that only upper airways are impacted by respiratory viral infection, and the other to assess respiratory depression during anaesthesia. His work identified drugs that could impact the patient experience and outcomes enormously.

Stephen left the NHS and started his career in instrument design in industry where initially he continued his respiratory expertise with Glaxo, initiating significant engineering

developments on the first multi-dose dry powder drug delivery system. At Smith Kline, as Head of Research Engineering, he was responsible for instrumentation development to support the worldwide research effort. He then moved into the implantable device arena, in charge of clinical trials for transvenous implantable defibrillators and the associated intra-cardiac leads. He initiated design changes from his clinical observations during implantation improving outcomes for patients over decades and majorly ensuring that these advances were commercialised. This system was the first transvenous device to be approved by the FDA with the lead, remaining the 'gold standard' today. His implantable instrumentation research moved onto the brain, where at Cyberonics, he ran clinical trials for epilepsy, designed and ran training programmes and introduced these devices into developing countries where epilepsy is more prevalent.

Stephen was awarded a Doctor of Science degree in 2018 for his outstanding contribution to engineering in medicine and Honorary Fellowship of the Royal College of Physicians in 2005, the highest honour that the College can bestow on a non-medically qualified person.

Finkelstein Award

Winner: Professor Eric Benoit

For notable contributions to measurement internationally

Professor Eric Benoit graduated with both a bachelor's and a master's degree in Physics from the Joseph Fourier University in Grenoble and received his doctorate in Instrumentation and Measurement, in 1988, from the same institution.

His main area of scientific research has been in measurement science, machine learning and distributed fusion systems. Building on his ongoing interest in information technology, he is seeking out new challenges related to the development of machine learning and fusion methods, with a focus on application fields which include human-machine interaction and the Internet of Things – his favourite challenges are those that are considered by others as 'impossible'. The Internet of Things area has provided him with a number of new projects in his favourite fields in measurement science, presently facing challenges with the measurement of weakly defined quantities in the human or biomedical spheres, such as emotion, systems complexity, human perceptions or market risks.

Eric has performed the role of Chair, IMEKO Technical Committee (TC)7 on Measurement Science, as well as editorial board engagement with the International Journal of Metrology and Measurement Systems and the International Journal Acta IMEKO. He reflects his expertise in the field in his teaching in his current post at LISTIC, the Polytech Annecy-Chambéry, in Annecy le Vieux in France.

Cornish Award (sponsored by WCSIM)

Winner: National Physical Laboratory (NPL) Thermometry Team

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

Through the work of the NPL Thermometry team, the UK has been recognised for its innovation in creating improvements in practical and traceable measurement, underpinning the realisation and dissemination of the International Temperature Scale of 1990 (ITS-90). The work that the group does, under the leadership of Professor Graham Machin FREng, includes high temperature fixed-points, primary thermometry (radiometry and acoustic thermometry), reliable traceable temperature measurements in hostile environments, especially space/aerospace and nuclear decommissioning, and metrology for wound management and prevention. The work of the group is targeted to help organisations better understand the impact of reliable temperature (and humidity) measurement on their processes, and to solve their challenging measurement problems.

The award recognises the diverse work done by the members of the group, including developing new techniques to measure thermodynamic temperature, which are incorporated into international agreements that are used to calibrate more practical secondary thermometers; acoustic thermometry which exploits the speed of sound in a gas being directly related to the average speed of molecular motion, in work which has contributed significantly to the re-definition of the Kelvin; and Johnson noise thermometry which exploits the fact that although the average voltage across a resistor is zero, the voltage fluctuates and the size of these fluctuations is directly proportional to absolute temperature.

Institute Award for Exceptional Early Career Engineers

Winner: Miss Annie KOU Wai Chu

Given to any individual, regardless of age, who is within approximately 10 years of starting work in Engineering, in the fields of Measurement, Instrumentation or Control, demonstrating an 'over and above' level of achievement for their level

Ms. Annie Kou joined CLP Power Hong Kong Limited in September 2011 as a graduate trainee. After the completion of 2-years' structural

training, she has had various job roles, such as Maintenance, Business Development and Project Engineer.

As a Maintenance Engineer at the power stations, she was responsible for the process control systems maintenance works, managing and coordinating major process, complex projects. She participated in the Castle Peak Power Station 'A' Boiler Control Retrofit Project and replaced the aged control systems, information systems and other miscellaneous C&I parts of the generating units (which were commissioned in 1980s) by a seamlessly integrated Distributed Control System (DCS). She performed the testing and commissioning (T&C) in which included both software and hardware tests to ensure the project material complied with technical specification. Upon the project completion, by means of automatic control, the generation unit availability and reliability, and the boiler thermal efficiency were significantly improved, reducing the forced outage costs, fuel consumption and emissions.

In 2019, she joined the Hongkong Electric Company Limited as Project Engineer and was responsible for the C&I portions on the three new gas-fired combined cycle turbine units (CCGT) in Lamma Power Station Extension. She carried out the detailed design, formulated the project schedule and work plan, and performed the site installation, testing and commissioning. She is currently working in the Lamma site office and conducting the installation and T&C of the DCS and instrumentations.

L B Lambert Award

Winner: Mr Andy Hudson

For meritorious service to the Institute particularly, but not exclusively, through involvement with Local Sections

Andrew Hudson has provided extraordinary support and commitment to the Wessex Section for sixteen years. He has been a dedicated committee member fulfilling roles such as the Companion Company Liaison Officer, Professional Development Officer and Technical Seminars Officer.

Notably, Andrew has arranged technical seminars across a variety of topics on a sustained frequency of four per year, taking responsibility for the entire seminar programme, including identifying presenting companies, quality speakers and reviewing their material. During COVID Andrew was undeterred and moved the technical seminar programme to a virtual offering. Attendance at the face-to-face seminars has grown under his leadership with a regular audience of greater than thirty from the Engineering community, the move to virtual has doubled the attendance.

L B Lambert Award

Winner: Mr Mike Verran

For meritorious service to the Institute particularly, but not exclusively, through involvement with Local Sections

This award is given to recognise a decade of service that Mike Verran has given to the Institute and most notably, his valuable input to the Professional Registration Committee (PRC).

Mike has completed many Professional Reviews over the years, along with acting as conduit between InstMC Head Office and the North Lincs Local Section. His wise counsel and professional conduct within PRC has been hugely appreciated.

Honorary Fellowship

Winner: Dr Graeme Philp

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

Dr Graeme Philp has provided long and distinguished service to the measurement and instrumentation community over a period of four decades, actively engaging with the Institute over much of that time. After gaining his PhD in the early days of fibre-optic sensors in the UK, graduating in 1985, Graeme worked for ABB until 1991 when he joined the intrinsic safety specialist, MTL Instruments, based in Luton, UK. He became Managing Director in 1992 and then Chief Executive in 1995, a post which he retained until MTL was acquired by the US multinational, Cooper Industries in 2008. Graeme's entrepreneurial flair was seen as by that time, MTL had annual sales of over £100M and sold its products in 70 countries around the world.

In December 2010 Graeme began a new phase in his career, when appointed Chief Executive of GAMBICA, the UK trade body representing the instrumentation, control, automation and laboratory technology sectors of UK industry. The activities of GAMBICA strongly complement those of the Institute and it has emerged as one of the most effective and respected sector trade associations in the UK, creating under Graeme's leadership over a period of nearly ten years, strong influence in international standards and the EU, invaluable in the post-Brexit world.

Graeme has been active in the Hertfordshire Local Section for many years, having given sterling service as its Chair. However, it is for his work as Honorary Secretary of the InstMC that has been outstanding. In particular, his industrial contacts from GAMBICA helped to provide strong support for the major IMEKO World Congress in 2018 (hosted in the UK for the first time in over 40 years) and a success of the industrial exhibition that accompanied it. His consistent support and wide experience helped guide the InstMC through moving to new headquarters and the successful sale of the Gower Street premises.

WWEM

WATER, WASTEWATER & ENVIRONMENTAL MONITORING

LIVE EVENT

12TH & 13TH OCTOBER 2022

TELFORD, UNITED KINGDOM

REGISTRATION NOW OPEN

WHAT IS WWEM?

WWEM The Water, Wastewater and Environmental Monitoring event is an in person event that focuses on Instrumentation and services for water and wastewater process monitoring. WWEM offers a technical program aimed at keeping you up to date with the latest trends, regulations, methods, techniques and technologies.

Furthermore, you can also network with all industry stakeholders including suppliers, regulators and end-users from industry that need to test, monitor and analyse water and wastewater.

WHAT ARE THE TOPICS?

Process Monitoring, Laboratory analysis, Current and Future regulation, MCerts, Gas detection, Field testing, Portable instruments, Operator Monitoring, Data acquisition, Odour monitoring and treatment, Big Data, Online monitoring, Flow/Level Measurement, Leak Detection, Pumping solutions, Control and Instrumentation.

WHO SHOULD ATTEND?

- Industry, Process operators, Environmental Managers, Control and Instrument users and Planners from across all industries who test, analyse, monitor or treat water and wastewater now or in the future.
- Policy makers and regulators from local authorities and Environment agencies
- Scientists and academics
- Solution providers and consultants

Supporting Trade Organisations

E: info@wwem.uk.com

www.wwem.uk.com

COMPANION COMPANY SCHEME (CCS) SHOWCASE

The InstMC Companion Company Scheme has been running since 1992, enabling companies to raise their profile amongst our membership of 3,000 professional engineers in the measurement, automation and control sectors.

There are opportunities to network with other businesses, InstMC accredited universities and with individual members, at local and regional level, through Local Sections and Special Interest Groups. We currently have 84 CCS members and are pleased to introduce some of them to you here.

Lunar Technology Ltd

Lunar Technology Ltd is a System Integrator in the area of Industrial Automation and Commercial Automation.

Our state-of-the-art professional services fundamentally build up on the leading-edge technologies inverted from top-class manufacturer / suppliers from Germany, US and France.

Lunar provides professional services on running a project from the start of scratch design, implementation, testing and commissioning which keep the project running on time, on budget and to the customer's satisfaction. Thereafter, we will not leave customers behind but also provide on-time maintenance services.

Our company staff is enriched with optimism and keeps generating innovative and creative ideas. Not only learning the latest technology for re-engineering tasks for customers, but also launching our new products under our brand name to improve human life and living standards.

Lastly, we always bear in mind hard work and to build peace and sustainability for a human society.

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Website: https://grouplunar.com/

Method Safety & Security Ltd

The Method Safety and Security group comprises of Method Functional Safety, Method Process Safety, Method Cyber Security and Method Compliance Assessment.

- Training: We provide practical, down-to-earth, sleeves-rolled-up training. Our trainers are true experts in their field, with years of experience of doing it for real across a range of companies and industries.
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The =Method team began working together in 2013. We are an independent, employee-owned business with a focus on the distinctive needs of the UK market Our focus is on service excellence with a practical delivery. We Do It Right.

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Valmet

On April 1, 2022 Neles merged with Valmet. Now operating as Valmet's Flow Control business line, we continue as a successful, global leader in flow control solutions and services.

Our customers operate across all industries, and with our market-leading expertise, products, and services we are committed in taking their businesses forward.

We deliver mission-critical flow control technologies and services for continuously evolving process industries, helping customers improve their performance and environmental efficiency, ensuring the safe flow of materials thus driving profitable growth and sustainable productivity.

Our valves and automation technologies are known for quality, reliability, and highest safety. They provide innovative, fundamentally simple construction, operation, and maintenance features helping optimize process performance at the lowest cost.

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ACCREDITATION CORNER ASK TREVOR

What is "traceability", why do I need it?

In order to tackle this question, we need to consider three terms encountered in measurement work.

To achieve a valid measurement result, you need Competence, Calibration and Traceability:

Competence

To be competent in measurement work one needs to have been trained, supervised, and deemed competent by practical demonstration. We use the term "demonstrable competence". The person deeming one competent has themselves to also hold that competency and to have seen valid work performed by the person they are approving as competent. That is often achieved by intercomparisons with others or other practical proficiency testing. This applies to the measurement work you undertake and to all the calibrations of equipment that enable you to do that.

Calibration

For your work to be competent you need to be assured that your measuring equipment is giving valid results by having it calibrated. Calibration is the act of comparing a measuring equipment with another equipment of known performance. That reference instrument is usually a "better" or more accurate and precise device. That calibration needs to be performed with competence.

Calibration is sometimes confused with adjustment. Calibration of a piece of equipment is achieved by noting its performance when compared with higher order equipment. This results in correction figures to apply when using your equipment and may, in some cases, lead to your equipment being adjusted to read correctly within a specification limit if you wish to avoid making corrections when using it. Therefore you choose a competent supplier to obtain your calibrations. Most users would not have the competence to establish the competence of their calibration supplier so would need to use an accredited or otherwise demonstrably competent supplier.

Metrological traceability

This is about the traceability of your measurement to connect with, ultimately, the national or international standard for the measurement parameter involved. This ensures that your measurements are compatible with other people's measurements and that everything fits together properly. Traceability of measurement is an important concept. Achieved properly it ensures that you may make valid measurements fit for your purpose, but there are pitfalls to overcome and common misunderstandings to avoid.

The official definition is to be found in the International Vocabulary of Metrology (VIM) that states

2.41 metrological traceability property of a measurement result whereby the result can be related to a reference through a documented unbroken chain of calibrations, each contributing to the measurement uncertainty

This means that you need to competently use suitable equipment that has been competently calibrated against higher order suitable equipment. The data from that calibration enables you to make valid traceable measurements.

> True traceability is only obtained with competence and so just having your equipment calibrated by someone who claims that their equipment is traceable to NIST, for example, is often not an indication of their competence to use it properly and obtain valid results.

Often there is more than one stage to this realisation. See Figure 1. The important point is that the chain of calibrations is competent and documented such that you may have confidence in the results of your work.

So, you obtain a calibration for your piece of equipment. That calibration needs to be competent and properly documented. A good

example would be to obtain a suitable certificate from a laboratory accredited for that work. It would be more problematic if you choose a supplier who asserts that they have traceable equipment themselves but who holds no third-party approval. That laboratory may be competent and may have properly traceable equipment, but one cannot know that for sure. The word traceable is often used not to describe the competent unbroken chain but just because a supplier uses a measuring instrument that has been calibrated.

> A valid measurement is made by demonstrably competent persons using traceable calibrated equipment.

The terms "traceable to NIST" or "traceable to NPL" are often seen. True traceability is only obtained with competence and so just having your equipment calibrated by someone who claims that their equipment is traceable to NIST, for example, is often not an indication of their competence to use it properly and obtain valid results.

To summarise the importance of the three terms we have considered in this issue: A valid measurement is made by demonstrably competent persons using traceable calibrated equipment. Of course other considerations also pertain, such as the suitability of the environment and adequate measurement uncertainty in the work – topics for another day.

A webinar was recently held by NPL with BMTA, containing contributions from NPL, Trescal and Trevor on the topic How to specify your calibration requirements" which may be viewed at https://www.bmta.co.uk/news-events/news/437-how-to-specify-your-calibration-requirements-npl-webinar.html

Trevor Thompson retired from The United Kingdom Accreditation Service after many years assessing and accrediting measurement laboratories. He was the British member for BSI on the ISO/CASCO working group for the writing of the standard ISO 17025:2017 and now operates independently. www.bestmeasurement.com

Ever wondered what the difference is between precision and accuracy? Assessing and auditing? Is calibration the same as testing? Why do the terms accreditation and certification often get muddled up?

Trevor is here to offer some expert advice! If you have a burning question on measurement, traceability and laboratory accreditation, particularly around ISO 17025, he will be happy to answer it.

Please email Trevor directly at questions@bestmeasurement.com and we will feature your question in a future edition of the magazine.

A Typical Traceability Pyramid

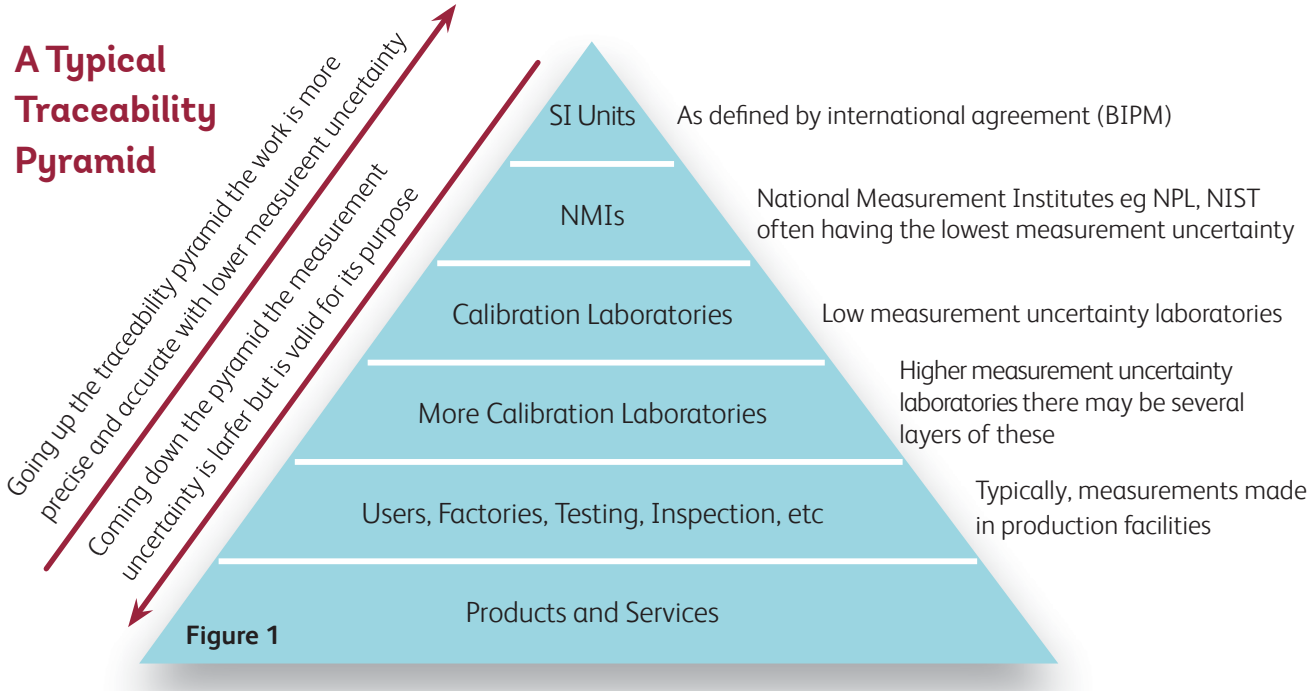

Figure 1

2022

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Inserts are accepted into Precision magazine and must go to the entire UK circulation.

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2519 UK Engineers / 500 Overseas Engineers
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The Institute of Measurement and Control is committed to promoting the professional excellence and standing of engineers and technologists at all levels in the automation, instrumentation, control and related industries.

Our aims are to serve the public by advancing the science and practice of measurement and control technologies and their various applications, to foster the exchange of views and the communication of knowledge and ideas in theseactivities, and to promote the professional development and qualification of our members.

In 2017 the InstMC launched Precision, a new coffee-table style quarterly magazine, presenting technical articles related to measurement, control and automation. The journal is circulated to our 3000+ members and shines a spotlight on current topics, developing technology, opinion pieces and member-related news. It is also aimed at anyone interested in the various uses of measurement and control.

Precision is a positioning and marketing tool for the InstMC and speaks to a wider audience on the use of measurement and control in the world today.

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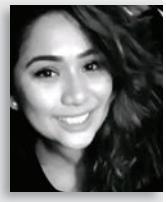

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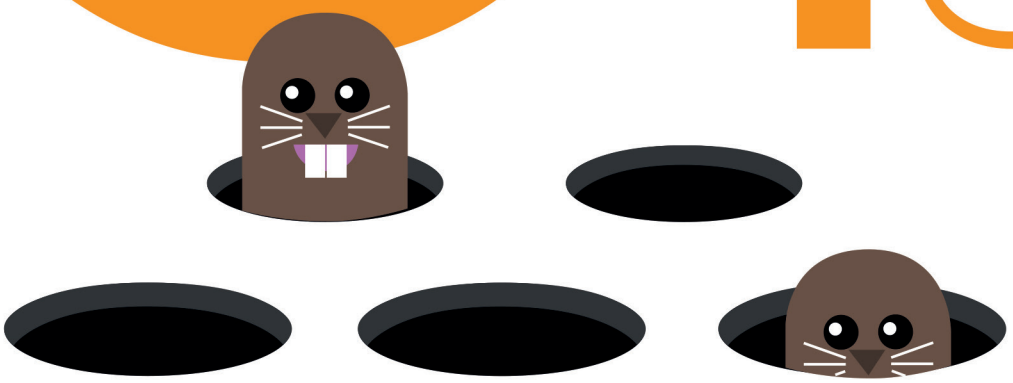

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