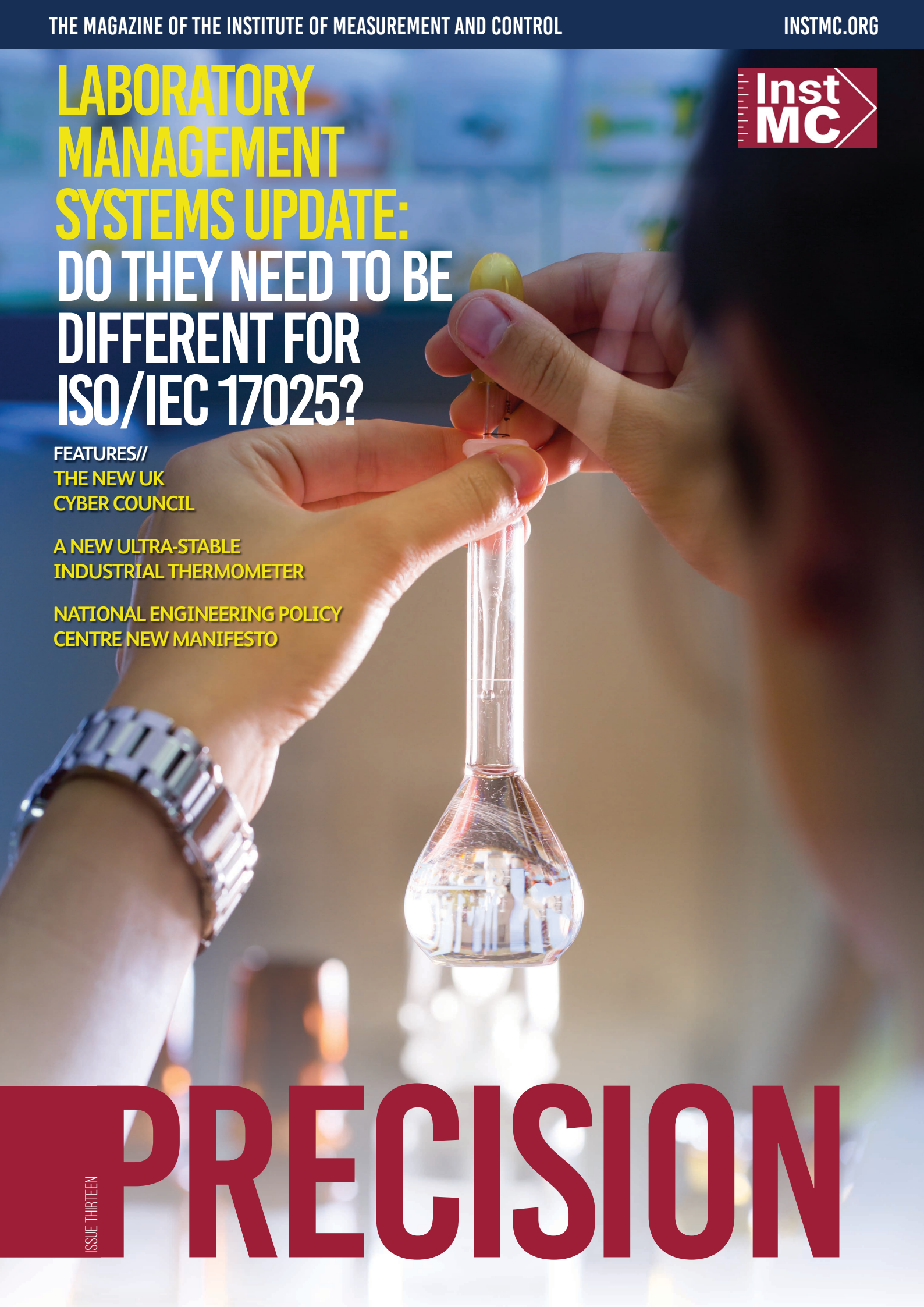
LABORATORY MANAGEMENT SYSTEMS UPDATE: DO THEY NEED TO BE DIFFERENT FOR ISO/IEC 17025?

FEATURES//

THE NEW UK CYBER COUNCIL

A NEW ULTRA-STABLE INDUSTRIAL THERMOMETER

NATIONAL ENGINEERING POLICY CENTRE NEW MANIFESTO



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THE NEW UK CYBER SECURITY COUNCIL

InstMC joins the new UK Cyber Security Council appointed by the DCMS.

Industrial Cyber Security SIG Chair, Cevn Vibert is representing InstMC on the Collaborative Alliance for Cybersecurity and working in the Alliance group. The Alliance brings stakeholders together in the interest of advancing a healthy cybersecurity workforce for the UK, from the development of professional recognition to the collaboration around acknowledged priorities to move this workforce forward.

The Alliance was formally established in July 2018 by independent, non-profit organisations, several of whom operate under a Royal Charter granted through the Privy Council, and some of whom are able to grant chartered status within their discipline. The Alliance harnesses a broad perspective on professional priorities drawn from its members' involvement in academia, advocacy, certification, and professional development. The Alliance has been working for several years towards the bid and this grant award. This UK Cyber Security Council formation is a significant but not exclusive part of the Alliance's aims.

On the 15th August 2019 the Collaborative Alliance for Cybersecurity confirmed its participation in the design and delivery of the new UK Cyber Security Council on behalf of the UKGov Department for Digital, Culture, Media & Sport (DCMS). The Alliance was selected following a competitive grant competition by DCMS.

The Alliance is a consortium of cyber security organisations that represent a substantial part of the cyber security community in the UK. Its members include:

- (ISC)²
- BCS, The Chartered Institute for IT
- Chartered Institute of Information Security (CIISEC)
- CIPD
- CompTIA
- Council of Professors and Heads of Computing (CPHC)
- CREST
- Chartered Society of Forensic Sciences (CSFS)
- Engineering Council
- Information Assurance Advisory Council (IAAC)
- The Institution of Analysts and Programmers (IAP)
- The Institution of Engineering and Technology (IET) [nominated Alliance Bid Lead]
- Institute of Measurement and Control (InstMC)
- ISACA
- Royal Academy of Engineering
- Security Institute
- techUK
- The Worshipful Company of Information Technologists (WCIT)

The Council will work in partnership with the National Cyber Security Centre (NCSC), be developed with broad representation, and be tasked to support the Government's National Cyber Security Skills Strategy by providing recognition across the practicing community, while enhancing standards and thought leadership for the future. The aim is to have the first programmes operational in 2021, with the development phase of the work serving to align relevant investments that are currently being made by Alliance members.

Cevn is honoured to be representing the InstMC in this Alliance. His work links well with co-chairing the new InstMC Industrial Cyber Security SIG and with the continued support from the Institute.

We welcome experienced and inexperienced members to join the InstMC Industrial Cyber Security SIG, introduce themselves and be a part of learning and helping in securing all our futures. If you're an Institute of Measurement & Control member you can join the Cyber SIG by ticking the Special Interest Group option on your InstMC profile.

See Industrial Cyber SIG news updates at www.instmc.org/Special-Interest-Groups/Cyber-Security and on social media.

Cevn Vibert CITP MIET MInstMC MBCS MISA MISSA MISACA aMIISP MIoD CSCCISP Global Director Vibert Solutions Ltd. Industrial Cyber Security Consultancy. Co-Chair InstMC Cyber SIG

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Do you have something to say? Would you like to share your thoughts and opinions with InstMC members?

We are keen to hear from potential contributors so please get in touch, sending your ideas to marketing@instmc.org

PRECISION

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A NEW ULTRA-STABLE INDUSTRIAL THERMOMETER

Scientist Jonathan Pearce from NPL and electronic engineers Paul Bramley and David Cruickshank from Metrosol Limited describe a joint project to develop a practical Johnson noise thermometer – a new type of thermometer which is completely immune to calibration drift.

Commonly used industrial thermometers such as thermocouples or resistance thermometers generally rely on the measurement of a temperature-dependent property that can be linked to a temperature scale by calibration. However, these suffer from the serious drawback that factors other than temperature (such as contamination or transmutation from ionising radiation) can affect the measured property, which leads to a drift in the calibration and hence an erroneous temperature indication. This has led to an interest in practical 'primary' thermometry, whereby one or more parameters are measured that can be directly related to temperature through a fundamental physical law, independent of any temperature scale or calibration. Such a thermometer is not subject to calibration drift.

One phenomenon that can be applied to this task is Johnson noise[1], which is the tiny voltage arising from the random thermal motion of charge carriers (in this case electrons). Because this thermal motion is strongly dependent on the temperature, the measurement of the Johnson noise voltage in a resistor can yield a measure of the temperature via Nyquist's equation[2]:

$$T = \frac{1}{4k}\left(\frac{V^2}{R}\frac{1}{\Delta f}\right)$$

where V is the root mean square Johnson noise voltage, k is the Boltzmann constant, T is the temperature, R is the resistance, and Δf is the bandwidth.

It is apparent from Nyquist's equation that the temperature can be determined without any calibration and that the parameters that change as the sensor materials degrade (due to contamination, ionising radiation, grain growth, etc.), namely the sensor resistance and the Johnson noise voltage, can all be measured continuously. This is the key to the thermometer: the temperature can be determined at

all times, independent of any calibration and independent of the condition of the sensor.

> …the temperature can be determined at all times, independent of any calibration and independent of the condition of the sensor.

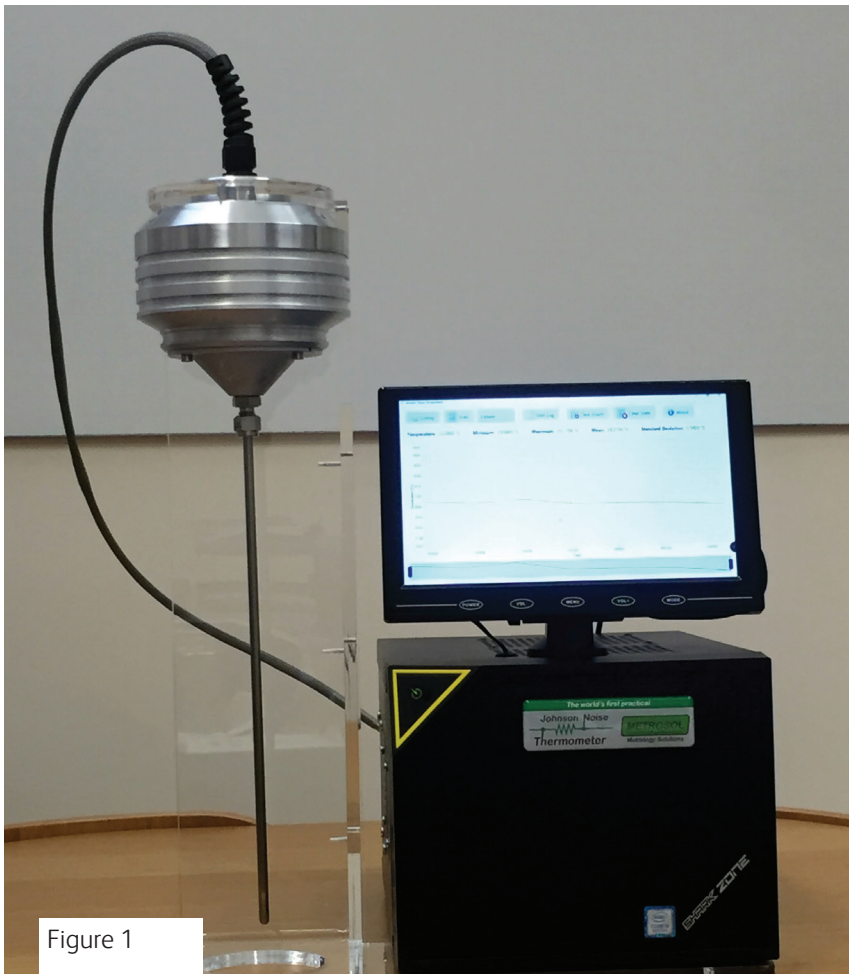

Figure 1

While most electronics design is concerned with removing noise, the goal of the NPL-Metrosol team has instead been to isolate it. Measuring the extremely small Johnson noise signals with adequate precision and sufficient immunity to external noise sources is at the limits of measurement. Over the years, many attempts have been made to produce working thermometers based on this principle; the main focus in recent years has been for measurement standards applications with uncertainties of the order of thousandths of a degree. Despite numerous efforts to develop Johnson noise thermometers for industrial applications where current technology does not provide adequate long-term stability (such as civil nuclear power generation), there are currently no such industrial thermometers.

Measuring the Johnson noise signal requires robust immunity to external electromagnetic interference, which is achievable by good design. A key challenge is the need for very high gain amplification of the small signal. Measurement in the presence of the electrical noise generated by the pre-amplifiers necessitates the use of correlation: the signal is measured on two different channels, and only the signal which is the same on both channels (the Johnson noise) is allowed through. However, with conventional designs this results in correlation times of hours or minutes depending on the required uncertainty. This is not compatible with the response of a few seconds required in industrial temperature measurements.

A second problem is the need to switch between the device under test and a reference signal. A reference signal is needed because the bandwidth term in Nyquist's equation cannot be determined adequately, and so the equation is used in ratio form at two different temperatures: the sensor temperature to be determined, and a known reference temperature. The Nyquist equation is then re-expressed as:

$$T = T_0 \left(\frac{V}{V_0} \right)^2 \frac{R_0}{R}$$

Where T_0, V_0 and R_0 are the reference temperature, Johnson noise voltage and resistance respectively.

In general it is inconvenient and sub-optimal to maintain a known reference temperature because it is impossible to match the frequency response of the two 'measurement arms' and this gives rise to significant measurement errors.

[1] J.B. Johnson, Thermal agitation of electricity in conductors. Nature 119, 50–51 (1927)

[2] H. Nyquist, Thermal agitation of electric charge in conductors. Phys. Rev. 32, 110–113 (1928)

Consequently, many approaches use a synthesised noise signal based on the noise associated with a Josephson junction array, which, although exquisitely accurate, requires complicated cryogenic apparatus.

Both these problems have been overcome in the current work by the use of a quasi-random synthetic reference signal which is generated a-priori with a signal generator (which is permissible because the target uncertainty is much less demanding than for the metrology applications of previous systems). This reference signal is then superimposed on the measurement signal so that they both experience the same frequency response as they pass through the connecting cables, amplifiers and correlator. The composite signal comprising the Johnson noise and calibration signal is then decomposed by digital signal processing. The ratio of the two signals can then be calculated in order to determine the temperature of the sensor resistor. This topology is very tolerant of a non-flat frequency response since the two signals experience the same frequency response. This has the important consequence that a much wider bandwidth than before (1 MHz or more) can be used, including frequencies where there is significant attenuation arising from the connecting cables; this is a much greater bandwidth than was available to prior systems, and means that the measuring times can be correspondingly shorter.

A prototype device was developed in 2016 and further funding has since been secured to develop the device further, improving its immunity to external electromagnetic interference and reducing its size. Significant progress has been made to date[3], and the current – second generation – device is shown in Figure 1. Importantly, when the device was tested for immunity to radiated electromagnetic interference, it passed even the most stringent 'heavy industrial immunity standard' (10 V m-1) that the testing lab could apply. This represents a breakthrough because most previous attempts at developing a practical thermometer suffered from severe extraneous electrical noise issues.

The new thermometer is currently capable of making measurements over a temperature range of -20 °C to 120 °C with an uncertainty of about 0.1 % within about 7 seconds, (0.3 °C at 20 °C). This uncertainty and response time is compatible with a large number of industrial applications. Some typical measurements in a stirred oil bath at 20.06 °C are shown in Figure 2. The temperature range is limited by the sensor materials, so extension to higher or lower temperatures merely requires the attachment of an appropriate probe. NPL and Metrosol intend to develop the technology further with the aim of producing commercial, drift-free thermometers based on Johnson noise over the next few years.

This project has received funding from the UK Department for Business, Energy & Industrial Strategy (BEIS) via Innovate UK, part of UK Research and Innovation (UKRI), and via the National Measurement System (NMS).

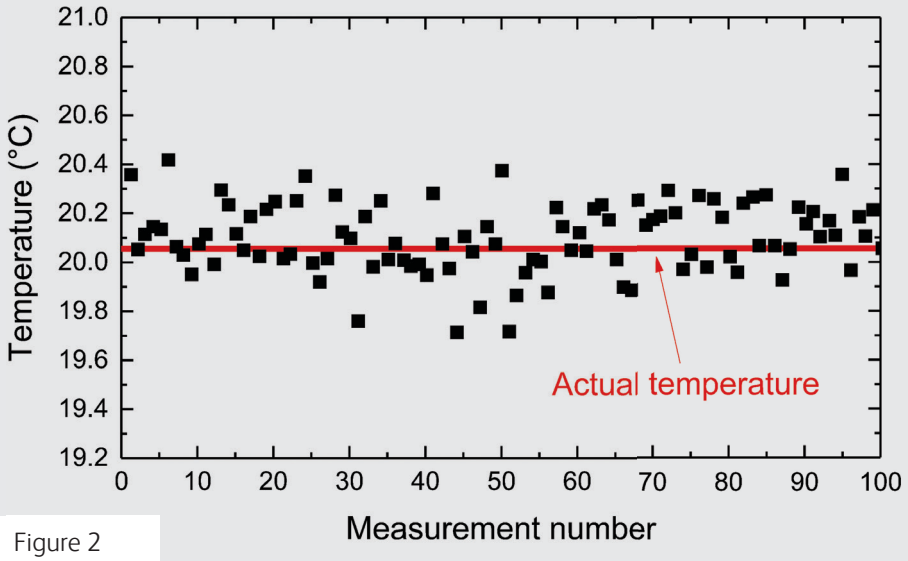

Figure 2

For more information on this project see the website at www.johnson-noise-thermometer.com/. Contacts are paul.bramley@metrosol.co.uk or jonathan.pearce@npl.co.uk. For further information on the work of NPL's temperature measurement team see www.npl.co.uk/temperature-humidity/.

Figure 1: Johnson's noise thermometer

Figure 2: 100 measurements of temperature in a stirred oil bath known to be at a temperature of 20.06 °C (± 0.01 °C) made over three days (mean temperature measured is 20.11 °C). Red line indicates the actual bath temperature.

[3] P. Bramley, D. Cruickshank, J.V. Pearce, The development of a practical, drift-free Johnson noise thermometer for industrial applications, Int. J. Thermophys. 38, 25 (2017)

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Location One

Date: Tuesday 15th October 2019
Location: The Jessop Suite,
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Location Two

Date: Thursday 17th October 2019
Location: HCF Catch, Redwood Park Estate
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(An awareness of Functional Safety principles will be assumed)

FUNCTIONAL SAFETY 2019

LABORATORY MANAGEMENT SYSTEMS UPDATE: DO THEY NEED TO BE DIFFERENT FOR ISO/IEC 17025?

Independent consultant Trevor Thompson, BSI's representative on the ISO Committee on Conformity Assessment (CASCO) looks at the changes to ISO/IEC 17025:2017

What is ISO/IEC 17025?

ISO/IEC 17025 has been the worldwide standard for assuring the competence of measurement and testing laboratories for many years. Laboratories meeting this standard have to demonstrate that they have the technical competence to perform defined tests or calibrations and that they have a laboratory management system capable of consistently delivering that competent work.

Originating in the 1960s, the Ministry of Defence requirements for subcontract "test houses" (DEF STAN 05-32) and calibration labs (DEF STAN 05-26) formed the basis of NATLAS N1 then NAMAS M10 before being merged with a European Norm EN 45001 and ISO Guide 25:1990. ISO 17025 now forms part of a family of conformity assessment standards used worldwide and having ISO 9001 compatible requirements.

At the end of 2017, a new version was introduced by ISO/CASCO and the three year transition period for Accreditation Bodies is now well underway. Very few technical changes are required for most laboratories but, at first glance, this version looks very different as it has been completely restructured, has fewer prescriptive requirements and features a risk and opportunity basis

Decision Rules OK

One of the features often causing queries is "Decision Rules". This is just a new term, for pass/fail criteria and how uncertainty of measurement is to be accounted for. In earlier versions of ISO/IEC 17025, there was the requirement to take uncertainty into account when determining a pass or fail against a requirement but no further information was provided. This resulted in an interpretative guidance document from International Laboratory Accreditation Cooperation (ILAC), the international organisation for accreditation bodies, that specified a way to do this. ISO/IEC 17025:2017 acknowledges that there are a plethora of methods that can be deployed, leaving the decision to the lab or the customer in many cases.

All that is required is for the decision rule to be known, agreed and described with the results. Laboratories shall use either a decision rule specified in the test/calibration method or standard, specified by law or regulation, specified by the customer or offered by the laboratory and agreed by the customer. This Decision Rule requirement was designed to better meet the needs of the market and provide visibility of the mechanism showing how a pass/fail result is determined.

Risk and Opportunity

The major change in the new version of ISO/IEC 17025 is the introduction of a "Risk and Opportunity" feature. It is a philosophy embedded throughout and has enabled the reduction in prescription that may be seen in this version. Applied well, it enables a laboratory to ensure that the depth and breadth of particular measures taken are no more or less than that necessary for efficient compliant and sensible application. It is important to read the introduction as well as the whole document in order to absorb the point. This version of the standard has fewer explicit requirements describing how something shall be done. In many cases, instead, it describes a necessary outcome leaving the lab to decide if or how that might be achieved and how much documentation or formality is required to suit the relevance and need in the particular laboratory.

Taking this approach and keeping it under constant review provides benefit for most laboratories, remembering that risk and opportunity are part of the same continuum. A given identified risk, in some cases, may be approached either by minimising the likelihood of something happening and/or alternatively perhaps, minimising the impact if it does happen.

Author

Trevor Thompson, for the United Kingdom Accreditation Service, UKAS, was the British member appointed by BSI to represent the UK on ISO/CASCO WG44 for the development of the new version. He is a metrologist, who started his career at the National Physical Laboratory applying electronics to classical measurement techniques before joining the first UK testing laboratory accreditation service (NATLAS) at its launch in 1981. Trevor now operates independently as bestmeasurement.com, offering metrology and accreditation consultancy for the UK, Europe and beyond.

1st "EMPRESS 2" Workshop

Enhanced temperature measurement techniques for improved process control 2

Tuesday 5 May 2020

Advanced Forming Research Centre (AFRC), UK
Organised by AFRC and NPL

EMPRESS 2 is a European project with the goal of enhancing process efficiency through improved temperature measurement. This workshop is an excellent opportunity to bring together scientists and engineers from academia, research institutes and industrial establishments to present and discuss both:

- The latest developments in traceable temperature measurement for process control
- End-users' requirements and challenges

WORKSHOP THEMES

Technologies

- Thermocouples
- Phosphor thermometry
- Surface temperature probes
- Combustion and flame thermometry
- Fibre-optic thermometry

Application areas

- Heat treatment
- Casting
- Forming
- Welding
- Forging
- Gas turbines
- Internal combustion engines

WORKSHOP HIGHLIGHTS

- Invited speakers will present reviews of the latest developments and state of the art
- Opportunities to contribute with oral presentations on process control challenges as well as technical solutions
- Networking opportunities

LOCATION AND VENUE

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Advanced Forming Research Centre (AFRC)
85 Inchinnan Dr
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Q&A

Geoff Jones

In the 'hot seat' this month is InstMC Board of Trustees member, Geoff Jones. Previously employed at Monsanto Chemicals and BASF IT Services, he is now retired.

What was the root of your interest in Engineering?

I was brought up in Chingford, North London. We moved there from Tottenham when I was three and times were frugal. It was the early 50s. You walked to school, had Utility furniture, valve radio; if something broke, you fixed it.

My father had just finished teacher training following a post-war insurance job in London, and taught wood and metal work in Secondary school. He had a motorised bicycle to get to work – a Cycle-Master I think, and this progressed through a series of larger motorcycles, all of which I helped keep on the road. I used to go into his classroom after hours and learnt wood turning and making mortice joints. In those days, owning a car was an expensive luxury, so a growing family meant a home-built sidecar was the order of the day.

I have always been interested in things practical. It must have started with Meccano and repairing bicycles. Once mobile, I used to cycle to a war surplus shop in Walthamstow to buy all sorts of radio, radar and telephone equipment. I remember building an oscilloscope from ex-WD parts.

A Christmas present of a chemistry set kindled an additional interest. I used to cycle to a chemist shop in Stoke Newington to buy all kinds of apparatus and chemicals. A home-made laboratory in my father's garage allowed experimentation that would certainly not happen today.

A Red-Rover bus pass allowed regular visits to the Science Museum, that really opened my mind,

I was fortunate to pass the 11-Plus and did well in maths and the sciences, but strangely, the topic of Engineering was never mentioned, not until I was looking for a university course that suited my interests. As it turned out, one of my uncles taught horology at Northampton College, London, which became The City university. They were on the lookout for students for the first intake of a thin sandwich course in Instrument & Control Engineering. This was a five-year course, and I chose Esso Petroleum to provide my industrial training during the half-years when not at university. This was amazing. The first half-year was spent in the apprentice training school, learning to weld, bend pipes, use a lathe, shaping machine, etc. Second and third years were spent out on the plant as an apprentice in electrical, mechanical and instrument trades. In the fourth and final years I was programming the new refinery computer control systems.

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

Interest in engineering starts with encouragement at home to have access to tools and the freedom to attempt to repair things, even if this is not successful in getting something to work again. Today unfortunately, Health & Safety often get in the way! Having kindled an interest, the most important action that the UK Government can take is to better fund ongoing technical education from the age of 16 up to

> Interest in engineering starts with encouragement at home to have access to tools and the freedom to attempt to repair things, even if this is not successful in getting something to work again.

degree level, to provide an alternative path from the purely academic. If this can be enhanced by industrial placements, employers will beat a path to your door on graduation. Having served as a Professional Registration Interviewer, I have always been impressed by applicants who have progressed via an apprenticeship, completing their degree as a part-time student.

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

The 2020 engineer needs to be a well-rounded individual, able to work in a multi-discipline environment. This requires project management skills, practical acumen, and the ability to know where to go to obtain the information to solve a problem. Plus the ability to work within a budget.

Regarding the Professional Institutions, these provide an important role in accrediting training, and so need to specialise in the various disciplines. Maybe not so many as now, but there is still a need for the InstMC as it provides the cross-discipline skillset, particularly in the fields of manufacturing, product and utilities automation, where there is a common thread of measurement & control.

What do you do in your free time to relax?

Now retired I currently spend most of my free time maintaining and renovating my house, which is a never-ending project, and a money-pit. I try to do as much as I can but am increasingly forced to buy-in expertise for jobs I am not qualified to do, or skilled in, or that are too physically demanding. Apart from this I enjoy the countryside and fresh air, having recently swopped the North York Moors for the High Weald to be closer to my new grandchildren. I am an avid supporter of the InstMC, a Council elected Trustee, and want to see us succeed in encouraging new talent to join the community.

Given one wish what would that be?

For every company that employs engineers to have a Chartered Engineer on the board.

> The 2020 engineer needs to be a well-rounded individual, able to work in a multi-discipline environment. This requires project management skills, a practical acumen, and the ability to know where to go to obtain the information to solve a problem. Plus the ability to work within a budget.

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Photo: *NPL wire bridge thermocouple calibration*

NATIONAL ENGINEERING POLICY CENTRE NEW MANIFESTO

Representing half a million UK engineers, the NEPC has published a new policy document calling on government help to invest in skills, innovation, clean energy technologies and digital and traditional infrastructure.

Backed by the UK's leading engineering organisations, Engineering priorities for our future economy and society highlights critical policy recommendations to enhance the UK's status as a world-leading innovation and engineering hub, ahead of the forthcoming spending review, the UK's exit from the EU and a possible general election.

This is the first joint publication by the National Engineering Policy Centre, an ambitious new partnership between 39 UK engineering organisations, led by the Royal Academy of Engineering. The National Engineering Policy Centre was established to give policymakers access to the best independent advice, skills and expertise of the engineering profession, which generates £420.5 billion of UK GVA and employs over 5.8 million people. It aims to apply engineers' problem-solving skills to some of the biggest problems the UK faces today.

This engineering manifesto includes 20 actions across five key policy areas:

- Skills: Implement the recommendations of the Perkins Review, which sets out actions to ensure an adequate supply of engineering talent for our nation, to secure the engineering skills needed for the future.
- Innovation: Increase Innovate UK's budget to boost support for business innovation and the 'D' of R&D to increase productivity.
- Digital: Deliver fast and resilient digital infrastructure, a thriving business environment, excellent digital skills and a diverse pipeline of workers to create a world-leading digital economy.
- Infrastructure: Deliver on the recommendations of the National Infrastructure Assessment or set out alternative plans to meet the UK's long-term infrastructure needs.
- Energy and climate change: Deliver on the UK's ambitious climate change goals by investing in demonstration and deployment of new low-carbon heat, charging of electric vehicles and carbon capture and storage technologies.

The National Engineering Policy Centre is an ambitious partnership led by the Royal Academy of Engineering, between UK engineering organisations representing over 450,000 engineers

View the first two pages of the report overleaf and read the full manifesto "Engineering priorities for our future economy and society" on the InstMC website. https://www.instmc.org/News.

NATIONAL ENGINEERING POLICY CENTRE

ROYAL ACADEMY OF ENGINEERING

Engineering priorities for our future economy and society

Skills

Implement the recommendations of the Perkins Review to secure the engineering skills needed for the future.

Innovation

Increase Innovate UK's budget to boost support for business innovation and the 'D' of R&D to increase productivity.

Digital

Deliver fast and resilient digital infrastructure, a thriving business environment, excellent digital skills and a diverse pipeline of workers to create a world-leading digital economy.

Infrastructure

Deliver on the recommendations of the National Infrastructure Assessment or set out alternative plans to meet the UK's long-term infrastructure needs.

Energy and climate change

Deliver on the UK's ambitious climate change goals by investing in demonstration and deployment of new low-carbon heat, charging of electric vehicles and carbon capture and storage technologies.

The UK faces a number of defining challenges to its prosperity, security and wellbeing. Navigating these challenges will require making trade-offs and dealing with uncertainties in the face of these escalating pressures with limited resources.

Engineers have the skills, insights and ingenuity to help tackle many of these challenges in ways that optimise efficiency, economy, safety and reliability. As engineers, we are problem-solvers and innovators, with a unique perspective on the world. From increasing productivity and renewing our infrastructure, to the skills gap and the threat of climate change, these challenges rightly lie at the heart of the UK's Industrial Strategy.

Most of these big challenges are long term in nature and require cross-government action. Engineering is central to delivering on them.

Here, we set out our priorities for upcoming policy and spending decisions in the UK. The actions we propose will enable the UK to make investment decisions that will create more jobs and prosperity, and meet the future needs of our society in a way that is faster, more efficient and sustainable. The engineering profession stands ready to support delivery of these goals and bring about the best outcome for the UK.

The National Engineering Policy Centre is an ambitious partnership, led by the Royal Academy of Engineering, between 39 different UK engineering organisations. Together, we represent[1]:

450,000 engineers

25% of the UK GVA, with **£420.5 billion** generated

19% of the UK workforce, with **5.8 million** jobs

27% of registered companies, with **721,940** companies

Skills

Implement the recommendations of the Perkins Review to secure the engineering skills necessary for the UK's future.[2]

Ensure the funding for further education colleges reflects the higher cost of providing engineering programmes, especially with the forthcoming T levels in engineering and manufacturing, as well as delivery of higher level technical skills.

Why? Further education is critical to the skills pipeline and its funding in 2019/20 is set to fall by 13% in real terms since 2010.[6]

Introduce a requirement for 40 hours of subject-specific continuing professional development (CPD) every year for teachers of mathematics, science, design and technology, and computing, with ringfenced funding.

Why? Subject-specific CPD keeps teachers updated in developments in their subjects and career options, yet one in three STEM teachers in secondary schools say they knew 'a little' or 'almost nothing' about engineering or nearly two in five lacked confidence in giving advice about engineering careers.[7]

Give employers greater flexibility on spending in the Apprenticeship Levy to include funds to support other forms of high-quality training provision.

Why? While the engineering community is supportive of the levy and recent softening of rules, a survey of business leaders revealed that 4 in 10 employers believe that apprentices are not the most appropriate use of their training budget[8], with evidence that only 8% of first-year levy contributions spent.[9]

Invest in understanding what works in interventions that promote the uptake of engineering education by students of all backgrounds through commissioning a longitudinal cohort study of young people, tracking their outcomes.

Why? Just 33% of young people aged 11 to 14 reported taking part in a STEM careers activity in the last year[10], although over 600 organisations operate in engineering engagement.[11] Evidence-based insight into effective outreach is needed to enable schools and the profession to use their resources most efficiently.

WHY?

The UK has a long-standing skills gap and a chronic failure to encourage enough young people to become engineers and skilled technicians.

124,000
engineers and technicians with core engineering skills are required per year in the UK.[3]

59,000
annual shortfall of engineering graduates and technicians to fill core engineering roles at level 3 and above.[4]

50%
of roles in the Shortage Occupation List are in engineering, with this pressure likely to increase following potential restrictions on EU citizens coming to the UK.[5]

ASK THE EXPERTS

Are "Digitalisation" and "Digital Transformation" the same thing, and if not, what's the difference and why does it matter?

Chris Hamlin, Director of Operational Certainty Consulting at Emerson Automation Solutions

Too many people use the terms "Digitalisation" and "Digital Transformation" interchangeably, fuelling the confusion that surrounds the concept of big-data, analytics, IIoT and Industrie 4.0.

Perhaps the source of the problem lies in the fact that both ideas find their origin in the same technological breakthrough - the ability to move almost unlimited amounts of data to almost anywhere on the planet in near real-time at almost zero marginal cost. Production floor data is no longer tied geographically and physically to the facility but can be analysed by practically anybody in the same building, at Head Office or in a hotel room on the other side of the world. Expertise can also be codified and deployed virtually to multiple locations simultaneously.

What differentiates Digitalisation from Digital Transformation is how this technical breakthrough is exploited and to what effect. Typically this is either to deliver operational efficiencies to existing work practices and business processes (Digitalisation), or to enable radical changes to the way that business is conducted (Digital Transformation). For example, a high street store might adopt computerised stock control to improve efficiency – that's Digitalisation – or it might use Digital Transformation to become an on-line retailer.

Do you have a question for the our experts? Please send them to publications@instmc.org

This isn't just an issue of semantics. It matters because, to be successful, the approaches taken need to be radically different. Applying the wrong approach to the wrong type of activity is usually catastrophic, undermining confidence in the technology and the credibility of the people involved. A recent report by McKinsey identified that 70% of digital projects fail.

Digitalisation is all about incremental gains. The primary activity is targeted technology adoption which can be delivered quickly, with minimal disruption to existing activity.

By contrast, Digital Transformation is all about radical change – doing things in fundamentally different ways. This might be shifting to remote operations, outsourcing core activities, moving from reactive to predictive management practices, or even changing underlying business models. As such, Digital Transformation projects are necessarily about the people in the organisation and the organisation's capacity and ability to change. Change management is the critical competency, and the technology adoption is nothing more than an enabler. Digitalisation is in no way inferior to Digital Transformation; just different.

An incremental improvement (Digitalisation) project can easily fall into the trap of implementing technology for the sake of having it, rather than identifying the right tools for the job, and consequently become a Digital Transformation project. A vague sense of the need for improvement gets coupled with the hype that surrounds analytics and big-data without any clear understanding about how the anticipated improvements will be delivered in practice. Too often the result is a technological white elephant with poor levels of adoption that change nothing.

By contrast, when a Digital Transformation project takes a conventional rather than a change management-based approach, we see the opposite effect. Most of the problems arise from a failure to understand the organisation's capacity to adapt to change and underestimating the impact on people and rate of adoption. These initiatives either overrun and underdeliver or are abandoned completely after consuming large amounts of time and money.

The solution is the same in both cases – fully understand the business drivers, strategy and anticipated performance benefits in detail before you engage on any type of digital project. It should be obvious whether it represents an incremental or a radical change for your organisation, and hence what the most appropriate approach should be.

The InstMC Digital Transformation SIG has been established to develop our understanding and define best practices in this space, and I would encourage anybody interested to get involved. To learn more, the InstMC is supporting the upcoming Advances 2019 conference in Manchester from 18-20 November where you will be able to explore these ideas in more detail and share experiences with colleagues and experts from around the world.

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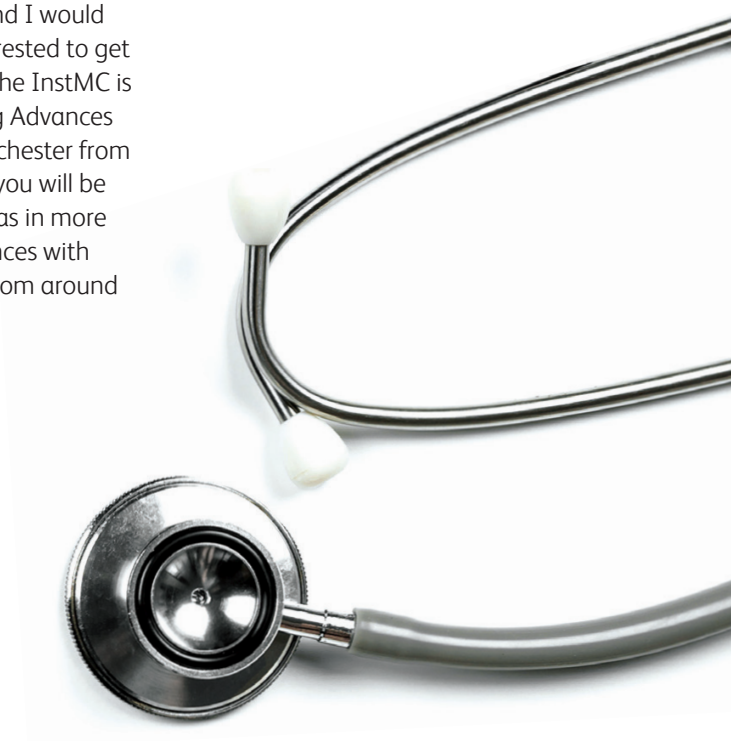

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Awards Night 2019

23 October 2019

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

Guest Lecture to be presented by Dr Ian Robinson who will be awarded with the ***Sir Harold Hartley Medal.***

Programme:

6.00 pm	-	Registration
6.45 pm	-	Introduction & Welcome
6.50 pm	-	Presentation of Awards
7.15 pm	-	Guest Lecture - Dr Ian Robinson
8.00 pm	-	Wine & Canapé Reception
9.00 pm	-	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

FS Engineer & Technician (TÜV Rheinland) Certificate Training 2019 & 2020

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Weekends: 9-10 + 16-17 November *2019* *(run over two weekends)*
Weekends: 8-9 + 15-16 February *2020* *(run over two weekends)*
2-5 March *2020*
1-4 June *2020*

Paris: **26-29 November *2019***
8-12 June *2020*

FS Engineer PH&RA:

Aberdeen: **18-22 May *2020***

FS Technician:

Aberdeen: **11-14 November *2019***
23-26 March *2020*

Introduction to Functional Safety:

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Aberdeen: **27 March *2020***

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