



NATIONAL METROLOGY SKILLS ALLIANCE: SETTING THE STANDARD

ENHANCING ENGINEERING STUDENTS' EMPLOYABILITY: THE FINAL PIECE OF THE JIGSAW

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SEPTEMBER 2023 ISSUE 29

PRECISION



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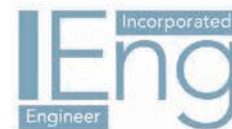
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MEET INSTMC HONORARY TREASURER STEWART MACFARLANE

Until 2000 I had never heard of the Institute of Measurement and Control. Whilst doing my degree, the Big Boys were all you heard about. From student membership, I never progressed beyond being an Associate.

Then I became the Scottish Nuclear representative on SIREP, The International Instrument Users' Association, now called Evaluation International. In the Spring of 2000, we had a board meeting at 87 Gower Street, where the EI Company Secretary, Dr Derek Cornish, was a past President of the Institute. By the time I left the building, I possessed an application form, which I duly completed. I was called for my PRI in the Autumn in 2000 and became MInstMC and CEng in early 2001. This became useful when I worked in Canada, as being UK CEng was recognised by my Canadian colleagues where being PEng is a requirement to practice as an Engineer. In late 2022, I applied to become a Fellow and that went through smoothly.

In 2004 I was asked to join the Safety Panel, now the Safety SIG. This led to representing the Safety Panel on the LSB (Learned Society Board). A few years later, I was asked if I would like to put myself forward as an elected member of Council. This led to becoming a member of the Accreditation Committee in 2016. In 2020, I became a (Council nominated) Trustee. I have Colin Howard to thank for encouraging me to become Hon Treasurer.

Picking up from my predecessors Colin Howard and Ian Craig, I am

charged with maintaining the financial stewardship of the Institute, ensuring it remains on a sustainable basis and that we look after our finances in a prudent manner. This means developing a medium to long term strategy for the finances with the Chief Executive and the other Trustees. We must always be cognisant of the Balance Sheet. As Colin Howard put forward at the time of the sale of Gower Street, we have moved from asset rich and cash poor to asset sustainable and cash generative. Throughout 2022, world and UK events made looking after the financial matters of the charity (which the InstMC is) a less than easy task, with inflation increasing and investments being affected.

Over the past 25 years I have been a Trustee of three charities, all music related, and was entrusted with looking after the finances for two of them. For one Choral Society, I helped achieve registration with the

newly formed Office of the Scottish Charity Regulator (OSCR) and moved them on to a more sustainable financial footing, when numbers had fallen, and subscriptions had not been increased for over 15 years.

So, what else do I get up to? As I have mentioned in the previous paragraph, I have an interest in music, currently singing in two local Choral Societies and RSCM Scottish Voices (a Scotland wide choir).

I have been employed in the Electricity Supply Industry in Scotland, mainly in the nuclear business, for the whole of my working life and had the opportunity of a secondment to Canada in 2002. I participated in two WANO (World Association of Nuclear Operators) missions. One to Canada in 2007 and the other to China in 2012.

For over 35 years, I have volunteered for the Ffestiniog and Welsh Highland Railway, and I am currently qualified as a Guard and Signaller.



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ASSESSOR FOR UKAS?**



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InstMC professional qualifications with a discipline focus.

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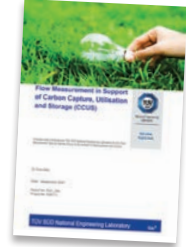
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FLOWING TOWARDS NET ZERO 27

When the UK Government's 2021 Net Zero Strategy¹ uses the term 'flow', it is almost always referring to financial flows, asserting the need to direct large-scale financial resources towards the green economy.



INSTMC CO-HOSTS CHAIN 23 22-23



InstMC was pleased to co-host and attend the recent CHAIN 23 event for young and early career engineers.

INSTMC 2023 AWARDS 28-31

We are pleased to announce that the 2023 InstMC Awards Night will take place on 26th October at Prince Philip House, SW1Y 5DG, headquarters of the Royal Academy of Engineering.



MEASUREMENT QUALITY MATTERS: ASK TREVOR

In this issue we take a look at making internal audits a useful and positive experience.

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NATIONAL METROLOGY SKILLS ALLIANCE: SETTING THE STANDARD



The National Metrology Skills Alliance (NMSA) was established in 2021 on the back of work started by the Midlands Centre for Data Driven Metrology (MCDDM), which had identified the need for a national framework outlining skills and knowledge in the field of Metrology.

From that work a cross-industry group was formed, with the primary aim to develop and promote a recognised standard for professional Metrologists.

Background

The NMSA was formalised as an official InstMC Special Interest Group (SIG) in 2022 with representatives from academia and Industry including MCDDM, Jaguar Land Rover, Coventry University, BAE Systems, AWE, Suriflo, Reliance Precision, Sellafeld, NPL, and Rolls Royce. Working Groups were set up to focus on drafting the core standard and the subject specific annexes covering topics including Core, Flow, Manufacturing, Control and Force.

The principal objective of the NMSA SIG is to produce and publish an industry accepted competency-based framework for metrologists and those working in metrology fields to include:

- A standardised framework that defines and provides structure to metrology skills across different levels and disciplines, for example beginner, practitioner, advanced - across areas such as flow and dimensional.
- Definitions of the competency requirements for different tasks and disciplines within the framework.
- Clear career development paths

for metrologists.

- A framework for a professional qualification
 - to demonstrate a recognised level of competency & professionalism,
 - to enable training providers to demonstrate consistent content of their products to the standard and
 - for organisations to have confidence when they recruit and train their staff.

New Core Standards

Throughout 2022, following regular SIG meetings and cross-industry collaboration, the core standard documents were created and put through the process of alpha testing.

The completed Core Standards and subject/sector-based annexes are split into three sections (see Fig. 1):

- NMSA 1 – Core Metrology Skills
- NMSA 2 – Subject/Industry Sector Skills
- NMSA 3 – Qualification Processes

NMSA 1 breaks down into four different categories, aimed at different skill levels (see Fig. 2):

- Foundation – For non-metrologists
- Level 1 – Practitioners, Technical/ Skilled
- Level 2 – Senior Technician/Team Leader/Skilled
- Level 3 – Approver, Managing/ Expert

The standards documents contain skills statements associated with various topics such as 'Environment' and 'Machine Equipment', breaking down the skills that should be demonstrated through the different

levels. Guidelines are also provided to help with interpretation.

How the standards can help

NMSA standards are structured to help both individuals and organisations.

Individuals could use the standards to look at their own skills in relation to their work objectives as part of their career development. Perhaps using it to create a gap analysis, identifying where skills need to be further developed.

Organisations could use the standards to monitor the skills of their teams. Many businesses have skills matrices that show how many people have the required skills, at different levels, to perform tasks. They could also use the information to create role profiles; either for existing staff or to help construct job adverts to recruit externally. Internal training can also be tailored according to the standards, in line with specific learning outcomes that are recognised by industry.

Feedback

Earlier this year, a call went out for volunteers to assist with beta testing the standards, prior to publication. The NMSA invited contribution from a range of companies, organisations and universities and were delighted with the high volume of responses. Support was voiced from industry, manufacturing, research centres, measurement OEMS and manufacturers as well as users, all expressing their willingness to be involved and how the standards could work for them.

Figure 1: NMSA 1, 2 & 3



NMSA 1:

- Overall NMSA Structure
- Metrology Skill Levels
- Generic metrology skill applicable to any discipline

NMSA 2:

- Metrology skills specific to a group a logical group of people in an industry sector, metrology discipline etc
- Opportunity for a wide range of standards for different groups

NMSA 3:

- Processes for individuals to demonstrate their competence and organisations to be assured people have the right skills

Figure 2: NMSA Skill Levels

Level	Appropriate for	Description
Foundation	Non-Metrologists	This Level is appropriate for an individual who is not a Metrologist but has to interact with measurement data in their role. It could be a scientist/engineer or manager who may be the “customer” of a measurement and make decisions based on information obtained from measurement data.
Level 1	Practitioners, Technician/Skilled	A Level 1 metrologist carries out measurements or related activity in accordance with a predetermined procedure under the supervision of a Level 2 or 3. This procedure will generally be limited to conducting a measurement, checking results for their validity and then reporting the results.
Level 2	Senior Technician/Team Leader/Skilled	A Level 2 metrologist will typically be carrying out measurements in an operational environment but may have additional responsibilities to support and coach Level 1 personnel as well as some limited decision-making responsibility with predetermined boundaries.
Level 3	Approver, Managing/Export	A Level 3 metrologist will usually be specifying measurement methods, processes and procedures. Will typically be involved in decision making in ambiguous situations. Will usually have some level of formal accountability in an organisation for metrology.



James Mansell, Rolls-Royce said

“It has been fantastic to see how many people are supportive of the NMSA work. Members of the SIG have worked really hard in getting this far, which is a testament to the value seen by the member organisations. As we have started to share more widely in our testing phase it has been great to see how many people see the value in what we are doing. Some areas of Rolls-Royce have already started using the beta test standard to do a first wave of skills assessments, helping our metrology people identify skills gaps and future development plans.”

InstMC and NMSA have also been working with the Metrology Trailblazer scheme, a government approved apprentice standard run by the National Physical Laboratory (NPL), which is currently reviewing the skills and competencies for the Levels 3 & 5 Metrology Apprenticeships. With representatives across all three groups, there are plans for further collaboration and hopes that these apprenticeships will also align with the NMSA metrology standards.

Future Plans

Following a successful testing phase, the Core, Manufacturing & Flow Standards are now close to publication and will be available, ready to use, later in the year through the InstMC website. Keep an eye on emails and newsletters from the InstMC, where we will be giving further details on format and cost.

There are also plans to host a launch event for the standards towards the end of the year and we will share more information once plans are underway.

A working group for ‘Qualifications’ is currently being set up and is open to volunteers who would like to take part and offer their expertise. This group will then begin working on the standard for the rest of the year, followed by testing and publishing in 2024/early 2025.

Get involved

Participation is actively welcomed! If you would like to get involved in any aspect of the NMSA, please email NMSA@instmc.org with your thoughts, questions or feedback. For all the latest information on the NMSA, visit https://www.instmc.org/signs/national_metrology_skills_alliance.



BY JOSHUA HAWORTH,
FINAL YEAR COMPUTER SCIENCE,
UNIVERSITY OF SHEFFIELD

ENHANCING ENGINEERING STUDENTS' EMPLOYABILITY: THE FINAL PIECE OF THE JIGSAW

In previous issues of Precision (*Issue 24*, June 2022 and *Issue 26*, December 2022) I detailed the opportunities afforded me by my Computer Science course, within the Faculty of Engineering at the University of Sheffield, to engage in tackling real-world problems to enhance my future employability. In these articles I have documented the progressive development of employability skills for engineers, firstly through a within-university cross-faculty project to design a biomimetic building, and secondly by working with a real-world client to tackle a genuine problem that they had and which required a software engineering solution.

These opportunities sowed the seeds for my opting to choose a 'Year in Industry' placement in my 3rd year of study, which eventually led to me working for 12 months in cybersecurity; a placement which I completed at the end of June, ahead of my return to Sheffield to begin my final year of undergraduate study.

The Placement

Following a two-stage selection process, I secured a placement in the Maritime Services sector. During the year I carried out cybersecurity assurance work and provided cybersecurity support across multiple

projects, providing an overarching focus on risk management and control.

One of the main focuses of my role involved assessing the cyber risk of different technologies being used to help minimise attack vectors against the product under development. The work ranged from assisting in picking out appropriate cybersecurity standards to assess the new system, carrying out a risk assessment on the products, and then helping to define security requirements based on mitigations of any risks found.

Some aspects of the day-to-day work

Throughout the placement I was involved in collaborating with

other engineers to help address appropriate security requirements, conducting risk assessments, and producing security operating manuals. The first step of the risk assessment required me to work through system design diagrams to identify any parts that might be vulnerable to cyber-attacks, whilst having discussions with the other engineers working on the project to try and identify any potential cyber-attack vectors. Following this, I was involved in pinpointing possible threat sources with the capability and motivation to carry out a cyber-attack, and determining if the threat source could also influence others. Typically, these threat sources can vary from organised crime to 'hacktivists' and advanced persistent threats (APTs), and the risk assessment included mapping motivations and identifying actors that might play a part in any attack.

From there, I could begin to draw up possible attack paths and the vectors that a threat actor may use to attempt to gain access to the system (both physically and digitally). This involved communicating with a security working group to ensure that my work aligned with the overall product.

Other aspects of my work involved creating the security operating procedures (SyOPs) and risk

management documents (RMADS) to assist with getting the product accredited, a large part of which required regularly communicating with integration, software, and system engineers to gain a greater understanding of all user processes. Once completed it was possible to write up any security procedures (e.g., adding new users or account policy and configuration) in line with already defined activities, introducing new measures to improve security, defining the different user profiles and the permissions each role will have on the system.

Work outside of my main role

The placement afforded me the opportunity to participate in various events that were not directly related to my day-to-day work. One such event was helping to organise a student 'hackathon' with the University of Southampton. The hackathon involved working with the external partnerships and programmes team, Southampton University Artificial Intelligence Society, and Cirium (an aviation data analytics company), to organise the event and determine the hackathon challenge. I also attended the hackathon itself to assist the participants, act as a judge on behalf of the company, and offer summer placements to members of high-

performing teams.

Challenges I faced on the placement

When I began my Year in Industry I did not have much prior experience or knowledge in cybersecurity or security assurance. To help overcome this, I spent a large amount of the first portion of my placement doing training courses, asking more experienced product security engineers about how different processes worked, and going through numerous standards and company policies. All of this greatly improved my knowledge of security processes and various accreditation methods, and contributed positively to the work that I was doing. The resulting improvement in my competence enabled me to work more independently and contribute more effectively to the various projects with which I was involved.

Links to my previous University studies

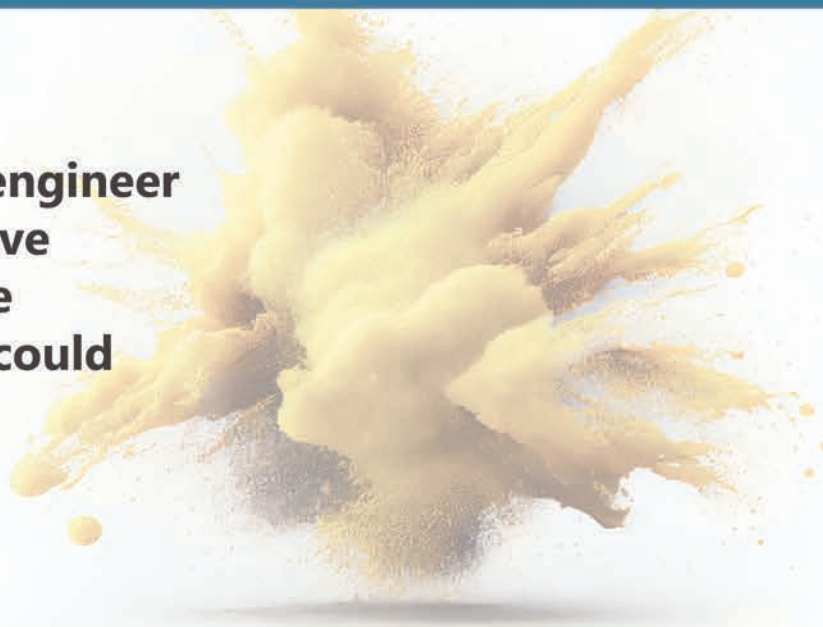
Although the work I did during my placement didn't directly link to the majority of the work on my course, some aspects of my prior learning were invaluable and enabled me to take on projects I wouldn't have been able to do otherwise. This was particularly the case when I was helping to create a new modelling profile and trying to decide which





REGISTERED EXPLOSIVE ATMOSPHERES ENGINEER (REXE)

If you are an experienced engineer working within the explosive atmospheres discipline, the InstMC RExE qualification could be the right choice for you



This professional level qualification is aimed at those individuals that can demonstrate competence & commitment with a professional level of engagement within the relevant field. They cannot be gained through attendance on a short course. Registration as IEng/CEng with the Engineering Council UK is a pre-requisite in demonstration of professional standing. It is also a requirement that you are, or become, a member of the Institute of Measurement and Control.



modelling framework to use for it. My previous knowledge of UML (Unified Modelling Language) helped considerably when designing which type of stereotypes were needed, as well as the relationships between different classes. This also proved helpful when I had to create the diagrams to model the various threats and attack paths for the risk assessment so that controls could be put in place to minimise/mitigate these risks. In addition, my experience with using UML to carry out system design greatly assisted me in understanding previously built models, so that I could analyse the diagrams for any systems of interest in the product and look for possible security vulnerabilities at the design stage of the product life-cycle.

Also invaluable was the general networking knowledge picked up from using various technologies during the first two years of my course. In addition to learning about how different networks function, this particularly helped when researching communication technologies and analysing a variety of VPNs and their suitability for a product.

The previously documented university work on the 'Engineering - You're Hired' project (Precision, Issue 24) and the 'Software Hut' module (Precision, Issue 26) stood me in good stead for working effectively in a multi-disciplinary team of engineers and working to meet the cyber security needs of both internal and external clients.

What I Have Learnt from My Placement

Overall, the majority of the work that I undertook throughout my placement has helped to considerably improve both my technical and professional skills, which will help me going forward into my final undergraduate year of university and in my future working life. These include, but are not limited to, contributing to the design and development of products, reviewing engineering documents/diagrams, and helping to break down and

allocate various security engineering tasks within a team.



Overall, the work that I have carried out during my twelve-month placement has significantly helped to improve both my understanding of how to apply what I have learned at university to real-world problems, and given me more of an idea of how different aspects of that learning can contribute effectively to industry.



One skill I believe I improved in the most is my ability to express different engineering ideas and principles at a level to match an audience's understanding. This was particularly noticeable when I had to research security solutions for various problems that I then had to present to project teams in a way everyone would understand, despite their varying levels of pre-existing knowledge. My research skills also improved considerably during my placement, not least since my work involved

me getting to grips with existing corporate policies, industry standards, and analysing Security White Papers, all of which required considerable research.

In Conclusion

Overall, the work that I have carried out during my twelve-month placement has significantly helped to improve both my understanding of how to apply what I have learned at university to real-world problems, and given me more of an idea of how different aspects of that learning can contribute effectively to industry. Working in a professional environment on projects that relied on my ability to assimilate new knowledge quickly, and then apply this to improve the security of the product, has significantly honed my skill set. I have also gained self-confidence by presenting my work to more senior engineers and others within the business. Going forward with my degree I will be able to use the skills and knowledge gained through my placement to improve the quality of my work and my understanding of topic areas within computer science generally, and cyber security in particular. For any InstMC student members who are considering a Year in Industry as part of their undergraduate course, I would definitely encourage you to do so. For me, it was an invaluable natural progression from the experiences I had previously had in university, and an effective bridge to my future employment.

References

Haworth, J. (2022) Tackling Real World Problems to Enhance Engineering Students' Employability. Precision, June 2022, Issue 24, 16-17. The Institute of Measurement and Control.

Q&A

Raffaella Ocone

In the hot seat this issue is **Raffaella Ocone**, Professor of Chemical Engineering at Heriot-Watt University, who shares her thoughts on where the future of engineering is heading and how it should adapt in an ethical and social context.

What was the root of your interest in Engineering?

Engineering is a creative subject which produces practical solutions; since I was a child, I have always been interested in understanding how things work. I greatly enjoyed chemistry, maths and physics at school, and I was interested in seeing them 'in action' and using them in a creative way. I had the fortune to see the purpose of chemistry and physics and their practical applications.

My dad was my inspiration; although not trained as an engineer, he was always finding a solution to fix or re-invent things around the house including our toys (latterly he substituted toys with my beloved shoes!). If he had had the opportunity to go to university, he would have studied engineering, I am sure. I soon understood, through his skills, that as an engineer I could make a difference to people's lives and make them happy!

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

Britain has a shortage of engineering skills and I really hope that more can be done to attract the next generation of engineers and scientists. Since I studied engineering, the discipline has evolved getting out of its traditional boundaries and becoming more trans- and multi-disciplinary; new branches have emerged, such as bioengineering (which did not exist when I started).

Britain will need engineers working in traditional engineering jobs as well as in new ones. Digitalisation and sustainability will remain at the core of the way we live and prosper, and engineers will have a central role in assuring the transition to renewable energy systems. Automation and robotics, infrastructures, biotechnologies and bioengineering are examples of engineering sectors where Britain will need to grow and train skills. The "new" engineer must be able to appreciate the social context where their technical outputs will be employed; engineering must be inclusive.

Engineers will need to be appreciative of inputs from other disciplines and will need to be able to communicate complex ideas to diverse audiences. Engineers will need to be aware of the ethical dilemmas that they will face in their professional life; responsible development of emerging technologies will be the core of the profession. My vision is that engineering will leave the rigid boundaries where it traditionally belonged.

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

The shortage of UK engineers can be attributed to several factors, one being the lack of young students pursuing STEM subjects from an early age. However, there are other areas that would need to be addressed to ensure that engineering could be seen as an appetible and attractive profession. In the UK, engineering does not have the same status of other professions such as medicine, for instance, and more should be done to raise the professional standing of engineering.

When I started, engineering was seen as a male profession; after more than three decades, although the numbers of women studying engineering and entering the profession has risen, we are still far from observing healthy numbers; the pace of change is far too slow. Unfortunately, some engineering sectors are still lacking diversity and the government should effectively and tangibly promote and encourage inclusion and participation of women and underrepresented groups by providing initiatives to address existing barriers. The rapidly evolving discipline would need support for continuous professional development, enabling up-skilling and re-skilling of the workforce to stay up to date with the latest technologies and practices. Updating engineering curricula and offering relevant apprenticeships would make engineering more attractive to a wider population: it is all about widening participation, working on the international arena attracting, nurturing and retaining talent.

What do you do in your free time to relax?

I have always been an avid reader; I love crime stories particularly the Nordic ones. I love complex and intricate plots and I like to challenge myself by guessing where the story will lead. The best stories are the ones based on the complexity of

the human psychology and where a good description of the setting and places is given. To some extent, a good crime story is as a mathematical puzzle, where all the details must fall into their places. I like to read stories from international authors set in various geographical areas: it is a way to understand realities that I do not know; often a book inspires me to research more about places and people. My rule is to read the books in the original language they were written - if I speak the language, of course! If I do not speak the language, I always get the Italian translation, if available.

I love listening to classic music

and I like to concentrate on the "conversation" among the various instruments.

I am a keen walker and I try to exercise every day; the best however, are my hiking breaks in the Italian Alps in summer.

Given one wish what would that be?

The greatest fortune that I have had in my life is a job that I love and makes me happy. I wish that many young people, from various backgrounds, could realise how exciting working in engineering is. This wish would automatically bring diversity in engineering making it more attractive and equitable.



it is all about widening participation, working on the international arena attracting, nurturing and retaining talent.





SHOULD YOU CONSIDER BECOMING AN INDEPENDENT TECHNICAL ASSESSOR FOR UKAS?

The United Kingdom Accreditation Service (UKAS) relies heavily on its network of Independent Technical Assessors to conduct robust assessments in various technical areas. Becoming a Technical Assessor for UKAS provides a unique and rewarding opportunity to enhance your skills and career.

UKAS and conformity assessment

UKAS is government appointed (though does remain independent of government) and is the sole National Accreditation Body playing a crucial role in ensuring the quality and safety of products and services. UKAS provides accreditation to organisations conducting conformity assessment activities (such as certification, inspection, testing, calibration, validation & verification), by conducting assessments against agreed standards for safety, reliability and quality. By providing independent verification of products and services, conformity assessment underpins confidence in the products and services we rely upon. UKAS accreditation is widely recognised both in the UK and internationally, and helps to promote trust, reliability, and efficiency in the marketplace.

The role of Independent Technical Assessors

Independent Technical Assessors play a crucial role in UKAS's

assessment process. They provide the necessary expertise to deliver reliable assessments across a wide range of technical areas. Technical Assessors are responsible for evaluating the technical competence and capability of organisations, ensuring the validity of technical operations, appropriateness of equipment, and competence of staff.

To become a Technical Assessor, candidates must possess a strong comprehensive working knowledge of the processes or techniques they are assessing, as well as the relevant business systems and principles of quality assurance and quality management. Additionally, they should have excellent interpersonal skills, be well-organised, and have the ability to communicate effectively at all levels.

Advantages of becoming a Technical Assessor

Becoming a Technical Assessor for UKAS offers several advantages. Firstly, it provides the opportunity to expand skills and knowledge in



your respective field. Working with a wide range of organisations and specialists allows Technical Assessors to participate in pioneering activities that drive quality and innovation within their industry.

As any of our Technical Assessors will tell you, no one day is ever the same as another. Being a Technical Assessor enables you to develop your specialised knowledge by collaborating with experts, thought leaders, and innovators in their field. This exposure to diverse perspectives and approaches helps broaden thinking, increase experience, and drive continuous professional development.

As Technical Assessors are offered work with UKAS on a third-party sub-contract basis, these advantages are gained alongside your current role, and will bring these benefits into the business you currently work for.

Full training is provided in the relevant accreditation standards and, once trained and authorised as competent, UKAS will pay an agreed rate for work undertaken.

Requirements for the role

Rigorous technical or clinical knowledge is the key requirement for being a Technical Assessor at UKAS and it is essential that all Technical Assessors maintain a strong knowledge of:

- The processes or techniques they are assessing;
- The business systems and processes relevant to the organisation under assessment;
- Underlying principles of quality assurance and quality management.

Additionally, Technical Assessors must be organised and well-presented with excellent interpersonal skills. They must be able to report accurately and concisely both verbally and in writing, providing empathetic feedback where appropriate.

The application process

If you believe you have the relevant skills and expertise to become a Technical Assessor for UKAS, the application process is straightforward. You can send your CV to ost@ukas.com, expressing your interest in the role. UKAS will review your application and consider your suitability for becoming an Independent Technical Assessor.

Upon acceptance, UKAS provides full training in the relevant accreditation standards to ensure assessors are equipped with the necessary knowledge and tools to carry out their assessments effectively. Assessors are compensated on a third-party sub-contract basis, and payment is based on a daily fee that includes preparation, post-visit activities, and on-site assessments.

Conclusion

Becoming an Independent Technical Assessor for UKAS is a highly rewarding opportunity to expand your skills, enhance your career, and contribute to maintaining the highest standards of technical competence in various industries. The role offers exposure to diverse organisations and specialists, fostering continuous professional development and innovation.

If you have the relevant expertise and are committed to quality and improvement, consider applying to become a Technical Assessor for UKAS and play a vital role in ensuring technical excellence and continual improvement within your specialist field. An up-to-date list of Independent Technical Assessor vacancies is always available on the UKAS [website](#).

Being a Technical Assessor enables you to develop your specialised knowledge by collaborating with experts, thought leaders, and innovators in their field.

REGISTERED FUNCTIONAL SAFETY ENGINEER (RFSE) & REGISTERED EXPLOSIVE ATMOSPHERES ENGINEER (REXE)

INSTMC PROFESSIONAL QUALIFICATIONS WITH A DISCIPLINE FOCUS

If you are an experienced engineer working within the functional safety or explosive atmospheres disciplines, the InstMC professional qualifications, RFSE & REXE, can help advance your career and professional development.

The qualifications are awarded through professional peer review, following demonstration of competence, commitment and ongoing engagement at a professional level in the field of functional safety or 'Ex' matters. It is in this respect that they differ from the many short course qualifications which are available. They are positioned at a level corresponding with registered professional engineer (IEng/CEng) awarded by the Engineering Council in the UK.

Registration as IEng/CEng (or their equivalent outside the UK) is a prerequisite for application,

in demonstration of professional standing. Applicants must also be, or become, a member of the InstMC.

Engineering Council Registration at IEng/CEng level provides demonstration of professional competence in accordance with UK-SPEC. This in turn is held to demonstrate underpinning knowledge and understanding (UK&U) and a commitment to Continuing Professional Development (CPD). These are considered essential to the ability to properly assimilate learning through experience, self-directed study, and consultation with peers, which is the key to both the development and maintenance of competence in functional safety. This is unlikely to be achieved simply through attendance on an intensive course. Any non-registered engineer wishing to apply for RFSE would need to satisfy these same criteria and

is therefore advised to first seek registration as IEng/CEng.

Beyond registration, candidates are required to demonstrate 'extensive, diverse and direct experience', together with 'ongoing engagement at a professional level'.

The assessment is of whether the candidate is in a position to execute a professional role, i.e., that the candidate has a foundation of understanding and awareness within the relevant discipline, together with the wherewithal to investigate and consult appropriately in order to come to an intelligent, informed view of requirements or options. The distinction is drawn between professional engineering concerns and craft skills, where proficiency with hand or machine tools is required. The qualification is not held to substantiate competence in any associated craft skills.



It is this wherewithal that is the hallmark of the registered engineer. The award of the associated title is held to be a continual reminder to the holder of their obligations to:

- maintain their competence & commitment,
- employ due diligence in the exercising of their duties,
- undertake appropriate research, together with validation of their findings through consultation with their peers.

Those engineers awarded the RFSE/RExE qualification are required to submit CPD records to the InstMC every 3 years, together with an affirmation of ongoing competence & commitment.

Successful applicants, who may use the title 'Registered Functional Safety Engineer' or 'Registered Explosive Atmospheres Engineer', must agree to their identification on a public register maintained by the InstMC. This allows interested parties to validate claims of qualification as RFSE/RExE.

For further details and an application form, visit https://www.instmc.org/careers_learning/professional_registration/rfse_rexe_qualifications.aspx

Register of Functional Safety Engineers

Surname	Given Names	EngC Reg no.	RFSE Reg no.	Date of Registration
Walton	Mark	561902	23/002	13/06/2023
Izzeldin Hussein	Abdelaziz	695819	23/001	05/03/2023
Gowen	Myles	693060	22/001	12/09/2022
Samuel	George	676182	21/001	19/04/2021
Rafferty	Ronald	441128	21/002	14/09/2021
Dolan	Ian	661135	20/001	22/01/2020
Easton	Colin	364463	19/001	24/06/2019
Wilkinson	Nathan	656962	19/002	25/06/2019
Pyke	Gregory John	650519	19/003	17/07/2019
Tack	Jason	634361	19/004	02/12/2019
Wood	Jeffrey	371036	18/001	31/01/2018
Holden	Samuel John	620981	18/002	19/07/2018
O'Murchu	Padraig	391846	17/001	10/01/2017
Blackmore	Lawrence	312527	17/002	16/02/2017
Derbyshire	Andrew	589348	17/003	17/02/2017
Southan	Christopher	399831	17/004	31/08/2017
Wheeler	Christopher	565789	17/005	21/09/2017
Reeve	Pau	561859	17/007	20/12/2017
Green	David	553776	16/002	18/05/2016
Dearden	Harvey T.	331365	16/003	14/06/2016
Ransome	David	555021	16/004	21/09/2016
Kriescher	Steven	440028	16/006	21/12/2016

Register of Explosive Atmosphere Engineers

Surame	Given Names	EngC Reg No. (or=)	REXE Reg No.	Date of Registration
Wilkinson	Nathan	656962	21/001	06/09/2021
Dearden	Harvey	331365	19/002	30/10/2019
Tack	Jason	634361	19/003	27/11/2019

Registered Functional Safety Engineer (RFSE) : A Case Study

I have worked in the field of Instrumentation and Control for over 35 years, with my career starting as an Instrument Mechanic apprentice at BP Oil in the late 80s. Ten years later, having completed an honours degree in Electronic and Instrumentation Systems, I was promoted to the role of Instrument Engineer and in 2002 became a Chartered Engineer.

My interest in functional safety began shortly after the release of the first edition of IEC 61511, and since then I have specialised in functional safety in the Oil and Gas industry. In 2014 I completed an MSc in Safety, Risk and Reliability Engineering

and in 2016 became a Registered Functional Safety Engineer (RFSE) with the InstMC.

Why RFSE?... what appealed to me most about the RFSE qualification is that it is distinct, and not obtainable by just attending a short course, but instead assessment is based on the individual's competence and commitment to functional safety (FS). The assessment is carried out by a panel of experienced reviewers from the FS Special Interest Group. It doesn't end there, as maintaining the RFSE qualification requires ongoing commitment to FS and evidence of such included in one's CPD record, which is reviewed

periodically. In my opinion this assessment criteria sets the RFSE qualification apart from any other as it is a thorough review of an engineer's FS competence.


As well as a certificate of qualification, there is opportunity to be listed on the prestigious RFSE public register on the InstMC website, and the use of the post-nominals RFSE.

I would encourage functional safety professionals to pursue this unique qualification as a means of demonstrating competence and commitment to functional safety.

Steve Kriescher CEng FInstMC RFSE



REGISTERED FUNCTIONAL SAFETY ENGINEER (RFSE)

SAFETY

If you are an experienced engineer working within the functional safety discipline, the InstMC RFSE qualification could be the right choice for you

This professional level qualification is aimed at those individuals that can demonstrate competence & commitment with a professional level of engagement within the relevant field. They cannot be gained through attendance on a short course. Registration as IEng/CEng with the Engineering Council UK is a pre-requisite in demonstration of professional standing. It is also a requirement that you are, or become, a member of the Institute of Measurement and Control.





INSTMC WOMEN'S NETWORK

Are you interested in joining the InstMC Women's Network?

We are delighted to announce, following much positive feedback, that we are setting up a Women's Network for InstMC members.

The aim of the group is to raise the profile of women engineers through discussion and engagement across a range of topics and activities such as leadership, professional development, mentoring, outreach, advocacy, support, technical knowledge, diversity, public speaking and much more!

We are looking to host an online meeting in October and would love to hear your thoughts and ideas.

Keep an eye on InstMC communications where we will let you know the date of the meeting and how you can join.

We hope to see as many of you as possible!



COMPANION COMPANY SCHEME

**Raise your profile amongst our membership
of 3000+ professional engineers**

Since our Companion Company Scheme (CCS) was launched in 1992, hundreds of large, medium and small enterprises have become members, enjoying a range of benefits. We offer opportunities to network with other businesses, InstMC accredited universities and with individual members at local and regional level through our Local Sections and Special Interest Groups. Company membership is open to universities, research and development organisations and companies with an involvement in measurement, control and automation.

Benefits include

- Opportunity to promote networking events and services to the wider membership
- Introduction to all the InstMC Local Sections with the potential to give technical presentations and sponsor events
- Participate in Special Interest Groups to develop company knowledge
- Opportunity for qualified employees to apply for specialist engineer status; RFSE (Registered Functional Safety Engineer) and RExE (Registered Explosives Atmosphere Engineer)
- 15% discount on advertising across InstMC publications and platforms
- Appear in the regular Precision magazine feature 'CCS Showcase' to highlight your company
- Use of InstMC logo on your website, stationery and marketing materials
- Receive a copy of the Institute's quarterly magazine, Precision
- Discount on cost of training approval and endorsement

About the InstMC

The Institute of Measurement and Control (InstMC) is a Professional Engineering Institute (PEI) and international network of engineers and scientists working within the measurement, automation and control fields. Founded in 1944, the InstMC is recognised by Royal Charter as a learned society and is licensed by the Engineering Council to assess individuals for professional registration.



CLAMP-ON ULTRASONIC FLOWMETERS DELIVER CONCRETE FLOW MEASUREMENT SOLUTION

Perceived by many water companies to be an incredibly challenging, if not insurmountable measuring task, clamp-on ultrasonic flow measurement is offering a straightforward, non-invasive and robust solution to the problem of flow measurement through concrete pipes.

A task that would normally require expensive and substantial works, monitoring flow in Prestressed Concrete Cylinder Pipes (PCCP), or 'Bonna' pipes, consisting of a concrete core, a thin steel cylinder, high tensile prestressing steel wires and a mortar outside coating, is made possible and cost effective with powerful clamp-on ultrasonic flowmeters that can penetrate the walls of even the most difficult pipes of complex, multi-layer construction.

These low-frequency and high-amplitude transducers are capable of sending and receiving signals through the many layers of PCCP pipes, maintaining ample signal quality for exact and reliable flow measurements. Ultrasound signals are sent at 1000 times per second and evaluated by a highly sophisticated digital signal processor that calculates time difference based on cross correlation. This ensures exceptional noise suppression and delivers highly accurate data, even on challenging pipes.

FLEXIM recently completed a successful flow measurement task on concrete reinforced PCCP pipe, for a UK water company that supplies 4.6 million households and businesses. The application was Demand Side Response (DSR), with measurement on a 42" pipe, with a bi-directional flowmeter used. Typical maximum flow = 82Ml/d, minimum flow = 10Ml/d.



Accurate measurement of raw sewage through large concrete pipes

Able to offer non-invasive solutions around the globe, FLEXIM also carried out successful flow monitoring for a major water treatment plant operator in the US. Struggling with the failure of several insertion flowmeters and looking for a more economical alternative, they decided to investigate the idea of clamp-on ultrasonic metering, as they were already familiar with this non-invasive technology and had used it on various pipe materials in the past. However, they needed proof that it would work on concrete.

Full bore and insertion magnetic point velocity flowmeters were once the only option for measuring flow through concrete pipes. Replacing old insertion meters is expensive and resource-intensive, involving service interruptions and possible harm to the pipe's structural stability during installation. And because insertion meters are exposed to the flow of material in the pipe, there is considerable cost embedded in their design. They also require significant maintenance.

A key advantage of clamp-on ultrasonic technology, is that it can be tested for suitability before permanent installation. So following tests of multiple locations and pipe materials, including HDPE, Ductile Iron, and Precast Steel Reinforced Concrete Pipe (PCCP) with a 7-inch wall thickness, results were so accurate, that every time an insertion meter fails on concrete pipes, the operator now simply replaces it with a FLEXIM clamp-on ultrasonic flowmeter.

Waterproof, accurate and reliable clamp-on measurement solution

Undeniably precast concrete pipe presents a major challenge for any flow measurement technology. But thanks to powerful clamp-on transducers and sophisticated evaluation technology, ultrasonic flowmeters from FLEXIM are able to deliver accurate and drift-free flow measurement data. All with an IP68 waterproof protection rating.

To find out more, contact Andy Hammond - www.flexim.co.uk | sales@flexim.co.uk | +44 (0)1606 781 420

INSTMC CO-HOSTS CHAIN 23

InstMC was pleased to co-host and attend the recent CHAIN 23 event for young and early career engineers. CHAIN is an inter-institution initiative that aims to bring young engineering professionals together, from college students and apprentices to the newly chartered, to share knowledge and experience and to promote the work of PEIs and how they might benefit from joining.

We were delighted to partner with the Institution of Mechanical Engineers (IMECHE), Institution of Engineering Technology (IET), Institution of Civil Engineers (ICE)

and the Institution of Structural Engineers (ISE) to co-host this year's event with the theme 'Engineering Through Adversity'.

Held at IMECHE's headquarters on 13th July, the event was a hybrid mix of online and in-person attendance, with each institute providing a speaker. We were very pleased to have Navdeep Mehay, Standards SIG Chair, as our representative speaker, who gave an inspirational talk about his work at the UK Atomic Energy Authority (UKAEA) and how they have responded to adverse situations such as the microchip shortage and adapting to new workflows during the Covid pandemic.

The event opened with an address from new IMECHE President, Giles Hartill, who stressed the importance of attending events and sharing knowledge with others based on your own experience....not just what you learn through education. We also heard from James Dornor,

who talked about his career in F1 motor racing and the importance of making motor sports more accessible in less affluent areas which he helps achieve through his involvement in the organisation 'Driven by Us'. Nana Anderson, a Mechanical & Design Engineer at Atkins highlighted how 'getting involved' was the key to building resilience, and Macarena Martín, a Civil Engineer at J Murphy and Sons recounted the multiple issues they faced when the Covid pandemic hit during the North Bristol Relief Sewer project and how they adapted to ensure completion of the work.

This was a great opportunity to collaborate with other Professional Engineering Institutions and their members, sharing collective knowledge and inspiring the next generation of young engineers.

To find out more about CHAIN, visit <https://www.imeche.org/get-involved/young-members-network/chain>



CHAIN23 Organising Team & Attendees



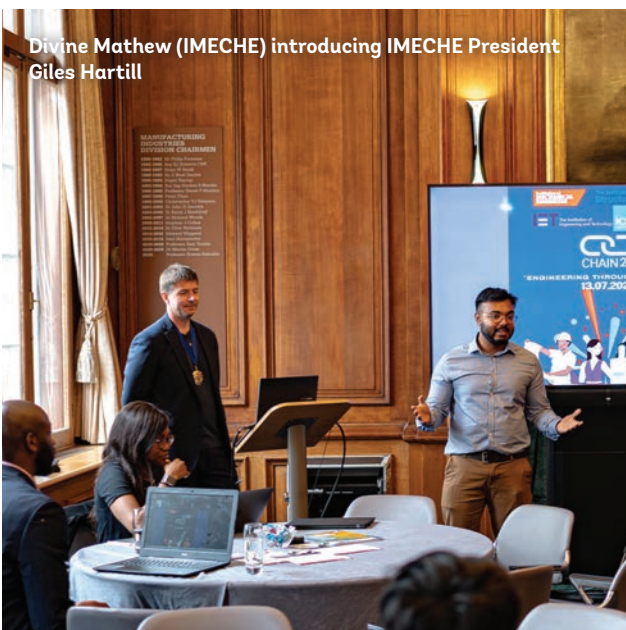
L to R: Isabelle Sambles (Chair) with Speakers James Dornor, Macarena Martin and Navdeep Mehay



Nick Valentine, CHAIN co-founder



Navdeep Mehay, InstMC Standards SIG Chair



Divine Mathew (IMECHE) introducing IMECHE President Giles Hartill



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 70 active CCS members and are pleased to introduce some of them to you here.

Beamex

BEAMEX is a leading worldwide provider of calibration solutions with the sole purpose to create 'a better way to calibrate' for the global Process Industry. Beamex



offers a comprehensive range of products and services, from portable calibrators, to workstations, calibration accessories, calibration software, industry-specific solutions and professional services. Through Beamex's subsidiaries, branch offices and an extensive network of independent distributors, their products and services are available in more than 80 countries. Beamex has more than 12,000 customers worldwide.

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www.beamex.com

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BEKA associates, celebrating their 40th anniversary, are an



independent British manufacturing company dedicated to display instrumentation for hazardous areas. "Intrinsically Safe Since 1983"

BEKA's new Pageant display, a zone 1 combined operator panel, HMI and PLC complements the extensive and popular range of 4-20mA

loop powered indicators, totalisers, counters, timers/clocks, batch controllers, field-bus indicators, data displays, sounders, beacons and panel lamps, all which have a 3-year warranty.

Home for BEKA is Hitchin in Hertfordshire but the destinations for products are global. UK customers dominate but a world-wide network of partners support customers in oil and gas, chemical, pharmaceutical and waste water sectors. International certification... IECEx, ATEX, FM and ETL for USA and Canada, CCC for China and PESO/CCOE for India ensure local compliance.

Tel: +44 (0) 1462 438301
Website: www.beka.co.uk



DP Flow Ltd

DP-Flow Ltd are the UK distributors for Asystem. Asystem specialises in predictive maintenance enhanced by an AI-driven monitoring solution, preventing unexpected production stoppages due to equipment failure. The solution uses wireless beacons combining acoustic, vibration and temperature to continuously monitor the health of machines and provide real-time insights into the condition of equipment.

Artificial intelligence driven software analyses data, detects potential equipment failures and provides diagnostic advice. By identifying the early signs of equipment degradation, Asystem's solution from DP-Flow Ltd allows businesses to take proactive measures before equipment breakdown occurs,

therefor avoiding lost productivity and revenue. Asystem is recognised for its ease of installation, open architecture, and the AsystemAdvisor software that's adapted to every employee profile from management to expert users.

By using Asystem's AI-driven intelligent monitoring solution, businesses optimise equipment maintenance, reduce environmental impact, and enhance operational performance.

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www.dp-flow.co.uk

Flexim UK

Setting standards for more than 30 years, FLEXIM is the technological leader in non-invasive ultrasonic flow measurement. A commitment to research and development means our clamp-on ultrasonic measurement systems are capable of measuring anything that flows, from liquids to gases, and even steam.



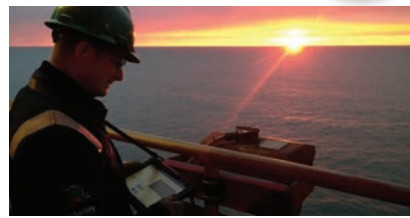
Clamp-on ultrasonic transducers are attached to the outside of the pipe, meaning there is no interruption to operation, and no risk of leakage. All our products meet the highest industrial production, safety and environmental standards, and our technology is SIL certified.

FLEXIM's ultrasonic clamp-on technology is also proving invaluable in the field of process analytics, such as for non-invasive concentration measurement. Our unique optical PLOX R process refractometer has established itself as a worldwide leader in industrial applications.

Our goal is to be a reliable partner at all times, offering the best possible support and service whenever it's needed.

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Kelton



Kelton is the energy industry's consultancy partner.

Our priority is to maximise the value and efficiency of our clients' energy assets – from concept to operation and beyond. We do this by working closely with our clients to truly understand their operations, and their needs. Only then can we provide the right engineering solution to optimise their energy operations, today; or deliver the best-practice guidance and consultancy services to support their journey towards a smarter, more efficient, and greener tomorrow.

It's our people that make the difference – delivering world-leading solutions with the flexibility, integrity and customer service you expect from a family-owned business. That's why Kelton is the trusted consultancy partner for some of the biggest names in the energy industry.

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Severn Glocon UK Valves Ltd



Severn Glocon Valves is a globally acclaimed leader in engineering bespoke flow control solutions for diverse industries. With an unrivalled reputation spanning decades, we have consistently delivered cutting-edge valve technology, setting new standards in efficiency and reliability.

At the heart of Severn Glocon Valves lies an unwavering commitment to innovation. The team of seasoned

engineers collaborates with clients to craft tailor-made solutions that optimize operations, reduce downtime, and enhance safety. From oil and gas to power generation, our valves have earned accolades for withstanding the most demanding environments with unmatched precision.

Customers benefit from a comprehensive range of products, including Control, Choke and Butterfly valves, each designed to maximize performance and minimize environmental impact.

Embracing advanced digital solutions, Severn Glocon Valves further empowers businesses with real-time data monitoring and predictive maintenance capabilities.

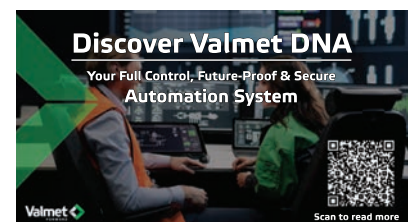
Choose Severn Glocon Valves for exceptional expertise, cutting-edge technology, and a track record of elevating industries worldwide.

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Valmet Ltd

Valmet is a leading global developer and supplier of process technologies, automation and services for the pulp, paper and energy industries. With our automation systems and flow control solutions we serve an even wider base of process industries. Automation Systems business line delivers automation solutions ranging from single measurements to mill- or plant-wide process automation systems. They are designed to maximise the profitability and sustainability of customers' businesses by improving production performance, quality management, raw material and energy efficiency, and cost-effectiveness.

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Awards Night

2023

Thursday 26th October

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

The Guest Lecture will be presented by Professor Martin Dawson

- 6.00 pm - Registration
- 6.45 pm - Introduction & Welcome - InstMC President Sheila Smith
- 6.50 pm - Guest Lecture - Professor Martin Dawson
- 7.15 pm - Presentation of Awards - Ken Grattan & Sheila Smith
- 7.45 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

FOCUS ON A SIG

BY DR MANUS HENRY, DEPT OF ENGINEERING SCIENCE,
UNIVERSITY OF OXFORD & FLOW MEASUREMENT SIG

FLOWING TOWARDS NET ZERO

When the UK Government's 2021 Net Zero Strategy¹ uses the term 'flow', it is almost always referring to financial flows, asserting the need to direct large-scale financial resources towards the green economy. Two exceptions are a proposal for "the development of data systems to connect energy, waste, and water flows from industrial sites"², and the following comment about innovation³:

"However, innovation does not flow neatly in one direction from one phase to the next; it is unpredictable and serendipitous, involving constant cycles of learning, testing, refining, and discovery."

Similarly, in a recent interview⁴, Tony Blair stated, "The number one issue today ... is how do you finance the energy transition? ... Secondly, how do you accelerate the technology?"

The InstMC's [Flow Measurement Special Interest Group \(SIG\)](#) concerns itself with two of these aspects of Net Zero flow – technology and innovation for physical flow measurement of liquids and gases. In parallel with the financial channels coursing through the economy lies a vast network of material streams of every type - water, gas, raw materials, products, effluents, emissions – all of which must be monitored, controlled and audited via measurement and control systems. Indeed, the value of the material in these streams is often directly determined via a flow measurement. Constant innovation is required to address the ever-evolving requirements for these flows, not only by taking advantage of the latest research and technological breakthroughs, but also by the continuous development of the associated industrial

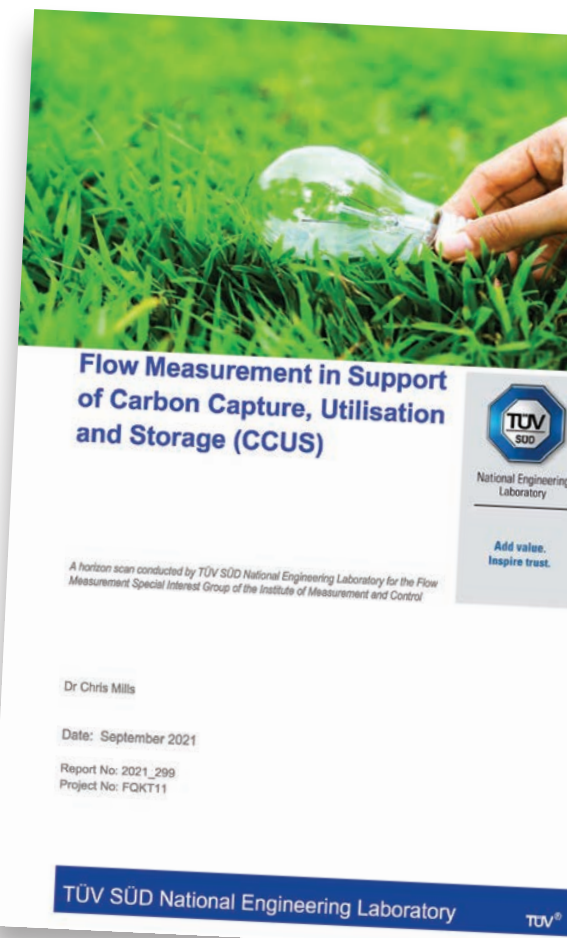
standards and training programmes.

Net Zero is undoubtedly the most demanding challenge to the practice of flow measurement (and many other fields) in living memory. A large-scale expansion of metering systems will be required to trace the path of greenhouse gases through the material economy – industrial, commercial and domestic – while novel measurement techniques are required to manage the new gases (particularly Hydrogen and Carbon Dioxide) to be introduced into old and new pipe networks on a national scale.

The Flow SIG, working in close partnership with TÜV SÜD National Engineering Laboratory, the UK's Designated Institute for Flow Metrology, commissioned a series of horizon scans examining the implications of Net Zero for current flow measurement practice. These include reports on Hydrogen⁵ and Carbon Capture, Utilisation and Storage⁶. While highlighting some of the measurement technology challenges to be addressed, such as the varying phase properties of CO₂ with different levels of impurities, the reports also identify obstacles to the "constant cycles of learning, testing, refining, and discovery" needed for innovation to flow.

For example, internationally there are very few calibration labs capable of providing CO₂ and H₂ under the operating conditions required to test, evaluate and certify the innovative metering technologies which will audit the net zero material economy. Without such facilities, innovators, investors and licencing authorities will be unable to make informed decisions. The sums of money needed to provide these laboratory facilities are a figurative drop in

the ocean of green investments envisaged by policymakers. It is to be hoped that here in the UK we will invest in the metrological incubators needed to support the delivery of that much mooted, and much needed, innovation.



[1] HM Government, "Net Zero Strategy: Build Back Greener", October 2021.

[2] op. cit., p130.

[3] op. cit., p208.

[4] Daily Telegraph, 27 July 2023.

[5] Flow Measurement Requirements for Low Carbon Fuels (Hydrogen), InstMC, Nov 2020.

[6] Flow Measurement in Support of Carbon Capture, Utilization and Storage (CCUS), InstMC, Sep 2021.

INSTMC 2023 AWARDS

We are pleased to announce that the 2023 InstMC Awards Night will take place on 26th October at Prince Philip House, SW1Y 5DG, headquarters of the Royal Academy of Engineering. 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 2023 InstMC Awards:

Sir Harold Hartley Award

Winner: Professor Martin Dawson

For outstanding contribution to the technology of measurement and control

Professor Martin Dawson FRSE FRS is recognised for outstanding contribution to the technology of measurement and control at the Fraunhofer Centre for Applied Photonics at the University of Strathclyde, over more than thirty years.

He is Distinguished Professor and Director of Research at the University of Strathclyde's Institute of Photonics, which he helped establish twenty-seven years ago after returning from several years of post-doctoral research in the United States, following his Bachelors and PhD degrees at Imperial College, London. He is also, since 2012, the inaugural Head and Scientific Director of the UK's first Fraunhofer centre, the Fraunhofer Centre for Applied Photonics. Together, these organisations employ over 100 staff and PhD/EngD students and have to date funded collaborations with over 150 companies. Professor Dawson has contributed extensively to research in optoelectronics and photonics, including micro-LED display technology and optically pumped and ultrafast lasers.

Fraunhofer is the largest



applications-orientated research organisation in Europe and it has pioneered a very distinctive and highly successful approach to accelerating technological innovation. Ten years ago, Professor Dawson led the opportunity to create the first Fraunhofer research centre in the UK, based on a vision of the development and application of laser-based instrumentation. His work has shown important technological capabilities resulting from the Centre's research, including remote chemical and environmental sensing and quantum technologies, and how Fraunhofer really operates in practice, as an independent research and technology organisation interfacing between university and industry.

He holds fellowships of the Royal Society, the Royal Society of

Edinburgh, the IEEE, Optica/OSA and the Institute of Physics and he has received several awards for his work, including the Gabor Medal and Prize of the Institute of Physics, the Aron Kressel Award of the IEEE Photonics Society, the Nick Holonyak Jr Award of Optica/OSA and the Global Solid State Lighting Award of Outstanding Achievement from the International Solid State Lighting Alliance (ISA).

Callendar Award

Winner: Professor John Barbur

For outstanding contribution to the art of instruments or measurement

Professor John Barbur has made an outstanding contribution to the field of instrumentation, and the measurements that can be made with it, through his role in the design and implementation of innovative instrumentation and measurement techniques developed for colour vision testing in safety critical occupations, thereby improving safety for us all.

This is exemplified in a three-year project led by Professor Barbur entitled 'Analysis of European colour vision certification requirements for Air Traffic Control (ATC) officers' which led to a change in policy by the CAA (UK) with the adoption of a special grade for operators. In 2019, the European Aviation and Space Agency (EASA) decided to adopt the Colour Assessment and Diagnosis

(CAD) test and use a stricter grade for Air Traffic Controllers (ATC). Since then, all EASA member states require ATC operators to have normal trichromatic colour vision. The CAD test has become the default standard for ATCs and so the colour vision instrumentation developed by him at City, University of London has had a measurable impact on all EU air travel, with the strict grade colour vision requirements applying to all 17,000 ATC officers, improving the safety for 1,106M air passengers per year currently.

Professor Barbur's research has led to a report on colour vision assessment commissioned by the UK Maritime and Coastguard Agency (MCA) which again has had a significant impact both in the UK and abroad. MCA is responsible for legislation and guidance on maritime matters and provides safety certification to seafarers. The British Army, Royal Air Force, and Royal Navy have also adopted these colour-grading scales with an efficient protocol based on initial screening using the rapid CVS test, followed by the CAD test for those service applicants who fail the screening test.

In addition to the impact on policy and practice, the CAD test instrumentation has been made available commercially through City Occupational Ltd (COL) – a spin-out company of City, University of London, established in August 2013 to develop, manufacture

and distribute the technology for use in further visually demanding occupations, research, and primary healthcare.

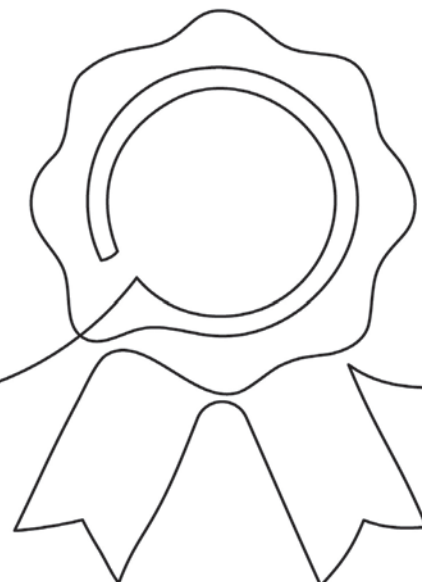
Finkelstein Award

Winner: Professor Richard Brown

For notable contributions to measurement internationally

Professor Richard Brown has made numerous globally recognised contributions to the development and improvement of the International System of Units (SI) over many years, but in particular he single-handedly led the recent expansion to the range of SI prefixes, which was approved by the 27th General Conference of Weights and Measures (CGPM, the authoritative body of the Metre Convention and the SI) in November 2022. The four new globally agreed prefixes are ronna (R) for 10²⁷, quetta (Q) for 10³⁰, ronto (r) for 10⁻²⁷, quecto (q) for 10⁻³⁰.

Richard conceived, developed, and drove forward the proposal to expand the range of SI prefixes in response to the needs of data science to describe the ever-growing global datasphere. The extension to sub-multiples also benefits the particle physics, quantum science and astronomy communities. His work involved substantial international thought leadership in identifying, scoping and defining the problem, and then producing



a well-thought out and workable solution that achieved consensus in the international community via the International Committee for Weights and Measures (CIPM) and the CIPM's Consultative Committee for Units (CCU). This proposal was unanimously approved by Member States of the Metre Convention as Resolution 3 of the 27th CGPM in November 2022, at which point SI grew by four prefixes and as a result has increased the number of SI units available to use by 20%! To benchmark the magnitude of this achievement it is the first time there has been a change to the range of SI prefixes in over thirty years, and only the fourth time such a change had occurred since the SI was formalised in 1960. Richard has also contributed substantially to thinking about what, if anything, should come after this extension – be that double prefixes, or even non-binary prefixes.

The impact and importance of this story was clear from the huge quantity of press coverage that it achieved – more even than the revision of the SI in 2019 – featuring in almost all major print and web-based news outlets. Highlights of this coverage include being featured on an edition of the BBC More or Less programme and in articles in Nature and New Scientist.

Cornish Award (sponsored by WCSIM)

Winner: Dr Gregor Brown

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

Dr Gregor Brown began his career with the TÜV National Engineering Laboratory (NEL) before Cameron (SLB) and currently Sensia, dedicating thirty years towards the advancement of ultrasonic flow measurement science and technology. Throughout his career, he has applied rigorous experimentation, modelling and

analysis, and engineering across a diverse range of applications such as single-phase liquid and gaseous hydrocarbons, wet gas and multiphase fluids. His expertise spans a range of technologies including traditional differential pressure meters, mass flow meters, industry-leading custody transfer ultrasonics flow meters and leak detection systems. Dr Brown is a widely recognised subject matter expert who has been actively contributing to the international measurement technical community, with 20+ publications in journals and conferences such as the North Sea Flow Measurement workshops, Southeast Asia Hydrocarbon Flow Measurement workshops, and Australian Petroleum Production and Exploration Association conferences.

Dr Brown is a prolific innovator and listed on many granted patents in various jurisdictions around the world. He is the inventor of the Self Verifying Ultrasonic Flow Meter (SVM) technology for single phase gas or liquid measurement, enabling customers to dynamically verify meter performance through a quantitative evaluation from first principles. There are various approaches to verify ultrasonic meters, however each requires either significant infrastructure, HSE considerations or potential commercial exposure. A truly differentiating technology, the SVM employs 16 measurement paths which deliver unrivalled self-verification capabilities, and an overall uncertainty output (U SVM) which can be broken down into 3 major components for further analysis and root cause determination:

- the axial velocity measurement verification per chord (U Chordal);
- the fifth chordal measurement plane to facilitate 8-path vs 10-path verification flow measurement (U Integration);
- the vertical reflective path for detection of gas at the top of the pipe in a liquid meter or liquid in a gas meter (U Area).

The SVM technology is a unique

design which allows significant reductions in measurement verification infrastructure, emissions footprint, pollution through contaminated products, and HSE risk by avoiding the requirement to depressurise and expose personnel to hydrocarbon pipelines when frequently removing and recalibrating meters.

Oxburgh Award

Winner: Mr Oliver Grievson

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

Mr Oliver Grievson has worked in the Water Industry for the past twenty-five years and is currently Technical Lead at Z-Tech Control Systems. He is also Chair of the International Water Association's Digital Water Programme, Deputy Chair of the CIWEM Professional Standards Committee and Deputy Chair of the US education charity Wastewater Education 501(c)3.

For the past eleven years Oliver has shown outstanding leadership in the monitoring of flows at wastewater treatment works under the Environment Agency Monitoring Certification Scheme (MCERTS). He began this role at Anglian Water in 2012 when the company was in a very poor position and facing legal action for their performance in wastewater monitoring. Oliver put together a remediation programme and brought Anglian Water to an industry leading position within twelve months, delivering over 90 projects in that time. Over the following six years Oliver secured funding and delivered over 500 instrumentation projects to bring the regulated instrumentation asset base up to an acceptable monitoring standard, taking data quality from 30% to over 99.9%. This data was then used to rectify flow performance problems at treatment works and thus improving the environment.

Whilst at Anglian Water, he worked with the rest of the water industry (the other nine water & sewerage companies) to bring together best practice and share key learning points to not only improve his own company but all of the others. This included research with the water companies and supply chain to look at issues such as electro-magnetic flow meter cleaning programmes and area-velocity flow meter best practices.

On leaving Anglian Water in 2018 he joined Z-Tech Control Systems acting as an instrumentation consultant for the water industry working as a technical expert in legal cases as well as advising water companies on a wide range of issues from difficult flow meter installations to complex monitoring schemes in wastewater. He recently worked with DEFRA and the industry on bringing together the plan for Section 82 of the Environment Act involving river monitoring upstream and downstream of sewage overflows which will see over 30,000 installations installed nationally across the country.

Oliver is a Chartered Engineer, European Engineer, Chartered Scientist, Chartered Environmentalist, Chartered Water & Environmental Manager as well as being a Fellow of the InstMC, IET, CIWEM, IES, and a Fellow of the International Water Association. Oliver is also currently writing the BS CEN standard for ICA in wastewater treatment.

L B Lambert Award

Winner: Mr Martin Bragg

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

Mr Martin Bragg receives the Lambert Award for his meritorious service to the Digital Transformation SIG.

Martin has been heavily involved

with the DT SIG since its inception and has provided content for a number of the upcoming publications with all content being to a very high standard. He also provides leadership and guidance when required but prefers to stay out of the limelight! His knowledge and contribution to the SIG are highly valued.

L B Lambert Award

Winner: Dr Shu Lun MAK

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

Dr Shu-lun MAK, FInstMC, FIMechE, CEng, receives the Lambert Award for his leadership of various task forces and valuable contribution to the InstMC Hong Kong Section.

During his Vice Chairmanship of the section, there has been a substantial increase in members. Dr MAK is OC chairman of a Paper award, jointly organised with the Hong Kong Institution of Engineers – Control, Automation and Instrumentation Division.

He has served as an assessor to accredit the training programme of Petronas in Malaysia, conducting more than twelve professional assessment interviews in the past 5 years.

Honorary Fellowship

Winner: Professor Philip Thomas

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

Professor Philip Thomas is a Past President of the Institute of Measurement & Control and currently Master of the Worshipful Company of Scientific Instrument Makers.

Philip graduated from the University of Reading with a BSc (Cybernetics and Instrument Physics) and a DSc in control, dynamic simulation, instrumentation, NDT, nuclear

decommissioning and risk from City, University of London.

Philip began his professional life as an instrumentation and control engineer working in the chemical and then nuclear industries. He worked for ICI plc as a control engineer then as a Group Manager at the United Kingdom Atomic Energy Authority. He took up a full-time chair in Engineering Development at City, University of London in 2000. He had been Professor of Risk Management in the Faculty of Engineering at the University of Bristol since 2015.

He researches the Judgement- or J-value method for assessing risk measures, particularly in the nuclear industry, where he has been active in the South West Nuclear Hub. The J-value provides an objective tool that assesses the cost-effectiveness of safety schemes for a wide range of industries. It is a new approach, based on established economic theory, that balances safety expenditure against the extension of life-expectancy brought about by the safety scheme. He has applied the J-value to the current coronavirus pandemic, where he has warned that prolonged lockdowns may cost more life than they can save.

MEASUREMENT QUALITY MATTERS: ASK TREVOR

In this issue we take a look at making internal audits a useful and positive experience.

Firstly, what is internal audit and why do it?

Measurement laboratories within organisations operating any modern management system will “suffer” some form of internal audit as part of the process for an organisation to check its own compliance with requirements.

An internal audit is an attempt by an organisation to examine its own compliance with a set of requirements. These days those requirements will be in, or referenced from, a documented management “quality” system of some kind. ISO/IEC 17025:2017 is the standard often used in measurement laboratories but other modern standards effectively have very similar requirements.

Let’s consider the basic premise involved by these standards:

- Technical Competence - do we have the relevant skills?
- A management system to ensure consistency - is it in place and working?
- Are we actually getting valid results in practice, as shown by external comparison?

If you can, with evidence, answer

positively to these questions then this is most encouraging and you should be getting valid results in your work. The role of internal audit in laboratories is to examine this, gather evidence of compliance, and draw conclusions about your laboratory. A positive outcome motivates staff and gives the laboratory’s confidence a real boost.

Scoping and planning the audits

Over a period of time, to put it simply, you should aim that you examine all of the people doing all of the things in all of the places they happen. This will involve a complex comprehensive plan for big labs with many different tests or calibrations undertaken by a large number of staff in several locations. It is usually the “quality manager”, (howsoever named) who plans the audits. It is usual, but not mandatory, to have an annual cycle for the audits, but a bigger lab may have cycles within cycles to ensure complete coverage of all people and places over an extended time.

Who can do audits?

The principle that no-one may audit their own work means that the quality manager cannot audit the efficacy of the audit programme he or she has written. Likewise, the writer of management system features as described in the management system cannot audit their policy for correctness in reflecting requirements but can audit other people following those features. Technicians cannot audit that they have done a job correctly, but can and should audit other people doing the same type of

job. Peer audit is fine. Often, when examining an activity, one finds that there are two aspects to that activity - Firstly, is it correctly described to reflect a requirement (i.e. clause of a standard), and secondly, is it being performed correctly in practice?



Measurement laboratories within organisations operating any modern management system will “suffer” some form of internal audit as part of the process for an organisation to check its own compliance with requirements.





What shall we do?

Examine the quality manual or equivalent set of policies to ensure they reflect the requirements of the management system standard i.e. ISO 17025:2017. If the lab actually did what it says here, would it be compliant? This can be a desk exercise conducted anywhere by someone who did not write it. Ensure any technical requirements from specifications are correctly reflected in documented procedures if necessary. This examination requires technical competence in the subject.

Ensure the technical requirements in the manual or in the test specification are actually being performed correctly. This entails going to the places where things happen and may include a mixture of vertical (a test or cal job) and horizontal (a topic) audits of past work and practical witness of staff performing the tests. All staff doing all things over time. Don't watch the same person doing the same thing each time!

Proficiency Testing Comparisons

Modern management system standards require participation in

external quality assurance measures to see if the results from the lab are actually right in practice by comparison with other laboratories. This is proficiency testing or interlaboratory comparisons. These schemes may be self-arranged or be a commercially provided activity. An internal audit should ensure these are being planned, undertaken and notice or action taken as a result. Ideally, all of the people who have been involved over a period of time should take part.

Auditing

It is important that the auditing be conducted sensitively and meaningfully. It is important that auditees feel comfortable and understand that the auditor is there to confirm compliance rather than to dig for non-compliance.

“Show me”, is far better than “Tell me” and “I am here for you to show me how well you do this” rather than “I am here to see what is wrong!” Interpersonal skills are important, not only in conducting the audit but also in the presentation of the outcomes afterwards. If readers request, we shall consider this and

cover audit planning in more detail in a future issue.

Trevor Thompson has assessed and accredited many laboratories for the United Kingdom Accreditation Service during a long career and is now semi-retired offering help to laboratories including with internal audits, assessment preparation and training at bestmeasurement.com.

Please send any questions or suggestions for future articles to questions@bestmeasurement.com.

2023

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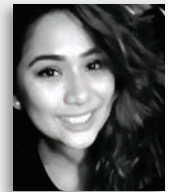
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