



WHAT IS 3DSL AND PHOTOGRAMMETRY?

CATCH: INDUSTRY-LED CONTROL & INSTRUMENTATION APPRENTICESHIPS AND TRAINING

HERBERT OSWALD WALKER REMEMBERED

CHATGPT ON CYBER SECURITY FOR CRITICAL CONTROL SYSTEMS

ULTRASONIC FLOWMETERS CLAMP DOWN ON STORM OVERFLOWS

JUNE 2023 ISSUE 28

PRECISION



InstMC Membership

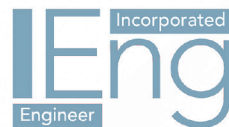
WHAT DO I GET?

Internationally recognised professional qualifications including:

- Career and Professional Development guidance and support including mentoring, accreditation of employers training and development programmes
- Free copy of our quarterly PRECISION magazine and The Wire monthly digital newsletter plus access to the members only section of our website and technical online library
- Opportunities to participate in the proceedings of an influential Institution through mentoring, accreditation, technical panels, seminars and conferences
- Recognition of your professional status through use of post-nominal letters, MInstMC (Corporate Member) and FInstMC (Fellow)
- Participation in a Local Section and Special Interest Groups to network, attend events and share expertise and knowledge
- Opportunity for qualified employees to apply for specialist engineer status; Registered Functional Safety Engineer (RFSE) and Registered Explosive Atmospheres Engineer (RExE)



CHARTERED ENGINEER



INCORPORATED ENGINEER



ENGINEERING TECHNICIAN

Scan QR Code to apply for membership



or visit:

<https://www.instmc.org/Membership-Registration/Individual-Membership>

For further details and application forms, please visit our website or contact the Director of Membership & Registration on +44 (0) 20 7387 4949 Ext 3 or email: membership@instmc.org

www.instmc.org



INSPIRING THE FUTURE IS LOOKING FOR INSTMC VOLUNTEERS

GIVE AN HOUR A YEAR TO HELP YOUNG PEOPLE DISCOVER THEIR FUTURE

Inspiring the Future connects volunteers from the world of work with primary schools, secondary schools and colleges to take part in a range of rewarding and interactive careers activities. Become a volunteer and help children and young people in your local community and beyond discover their future!

Young people, especially from disadvantaged backgrounds, often have a very limited understanding of the careers open to them. Research shows that speaking to people with different jobs is an effective way to bring learning to life for children and open their eyes to worlds they might never have imagined for themselves. It has a real and lasting impact, including:

- Broadening horizons and raising aspirations
- Challenging gender and social stereotypes
- Boosting children's motivation, attainment and future prospects.

Whether you're just starting out or long experienced, whatever your sector or speciality, you can excite young people about your role and show the value of a career in metrology.

How it works

- Sign up to access a dedicated online platform which uses innovative technology to connect schools and volunteers.
- Complete a profile which teachers then see to invite you to activities. Don't forget to add the Institute of Measurement and Control as a professional organisation!
- Give from just one hour a year. Taking part is always flexible, with

both local sessions in-person or virtual activities across the UK.

- Choose the activities which interest you. From classroom chats to speed networking, activities are interactive and focus on answering simple questions about what you do and how you got there.
- You will also have access to a wide range of training resources and ongoing support.

Not only is sharing your experience with children rewarding, it can have broader benefits for you too, including improved professional skills, enhanced wellbeing and greater work satisfaction.

Why not volunteer to make a difference today? Visit www.inspiringthefuture.org/volunteers/ for further information and to sign up. If you have any questions about the scheme, please contact enquiries@inspiringthefuture.org and they will be happy to help.

MAKE 2023 YOUR YEAR OF
inspiring
the
future

inspiringthefuture.org

CONTENTS

ARTICLES

INSPIRING THE FUTURE IS LOOKING FOR INSTMC VOLUNTEERS

Give an hour a year to help young people discover their future

3

WHAT IS 3DSL AND PHOTOGRAMMETRY?

6-7



CATCH: INDUSTRY-LED CONTROL & INSTRUMENTATION APPRENTICESHIPS AND TRAINING

8-11



Q&A

12-13

Oliver Grievson, Technical Lead at Z-Tech Control Systems and Chair of the Digital Water Program at the International Water Association, shares his thoughts on the future of engineering and valuing technical expertise.



HERBERT OSWALD WALKER REMEMBERED



Herbert Oswald Walker, a long-time member of the InstMC is remembered by his grandson.

14-15

CHATGPT ON CYBER SECURITY FOR CRITICAL CONTROL SYSTEMS



Cevn Vibert, Cyber Security SIG Chair, sits down for a one-to-one with ChatGPT on all things cyber security

16-19

ULTRASONIC FLOWMETERS CLAMP DOWN ON STORM OVERFLOWS 20-21

According to reports in the UK press last year, UK water companies released untreated sewage into our waterways more than a thousand times a day.



LOCAL NEWS SECTION

28-30

News from the North East and Ireland including the 2023 annual dinner and reunion.



TOMORROW'S ENGINEERS LIVE 2023



InstMC was pleased to attend 'Tomorrow's Engineers Live' on 13th March which returned for its second year.

24-25

SPOTLIGHT ON STAFF

31

Q&A with InstMC Staff Member **Jessica Currie**, Registration & Accreditation Officer



MEASUREMENT QUALITY MATTERS: ASK TREVOR

In this issue we revisit the important matter of how to make valid conformity (Pass/Fail) statements as a result of measurements.

32-33

FOCUS ON A SIG

26-27

News on Standards and TC65 Plenary Session



PRECISION

The magazine of the Institute of Measurement and Control
Published by: Institute of Measurement and Control
297 Euston Road, London NW1 3AD T: +44 (0) 20 7387 4949

www.instm.org

[www.twitter.com/instm](https://twitter.com/instm)

<https://www.linkedin.com/company/institute-of-measurement-and-control-the-/>

Chief Executive Steff Smith

E: steff.smith@instmc.org

Design, print & mail fulfilment

by HMCA Services Ltd

Tel: 01423 866985

E: enquiries@hmca.co.uk

Cover price, where sold, £15





BY KEVIN HAWLEY,
HEAD OF OPTICAL SYSTEMS,
ZEISS UK

WHAT IS 3DSL AND PHOTOGRAMMETRY?

In 2023 if we want to know what something is then we need to check Wikipedia, that will tell us “Photogrammetry is the science and technology of obtaining reliable information about physical objects and the environment through the process of recording, measuring and interpreting photographic images....”

Photogrammetry is not a new technique, it was first documented back in 1867 by the Prussian architect Albrecht Meydenbauer. One common application of photogrammetry that most people can relate to is aerial photographs for map making, from 2D images, and without computers, accurate 2D and 3D maps were created that we

have all taken advantage of.

So, fast forward to current times, with computers, the application of photogrammetry has changed significantly. For the purpose of this article, the application of different types of photogrammetry to support accurate dimensional measurements of objects up to 10m in size will be explained.

There are different types of photogrammetry, long range, close range, stereophotogrammetry and the list goes on... so let's address the two technologies in the title of the article, 3DSL and photogrammetry.

Let's consider 3DSL first, this is an acronym for “3D Structured

Light” and refers to a specific style 3D Scanning system. There have been other common references used for this style of system: Fringe Projection, White Light scanner and more recently Blue Light scanner.

The original high-end manufacturers of these systems include: Steinbichler, GOM Metrology and Breuckmann.

The Structured Light reference refers to the hardware that makes up the scanning sensor. For these ‘close range’ 3D scanning systems the main components are a single or stereo camera pair calibrated to a projector that emits a ‘fringe’ pattern, hence the Fringe projection name often used. Triangulation is used to digitize/scan the area



Photogrammetry for dimensional measurements uses the same basic principles as traditional cartography.



illuminated by the projector of the 3DSL scanner, the scanner or part can then be moved to increase the coverage of the object.

Since 3DSL scanners have a camera and lenses to focus on the projected pattern they can easily be reconfigured to change the “field of view”, this flexibility of the system helps cover various component sizes and data density requirements. Today software automatically aligns separate scans together through small reference markers applied to the object; it is also possible to simply align by geometry, however this can on occasion be less accurate.

These reference markers will be discussed further within the photogrammetry section.

Why have 3D scanning systems been widely adopted in the last few decades?

This has followed the development of more freeform designs for aesthetic reasons, organic designs for weight saving and a continual demand for faster inspection techniques.

According to an article published in Quality Digest, GOM 3D structured light scanning (3DSL) technology is highly versatile and can be used to measure a wide range of objects, including complex geometries, shiny surfaces, and transparent materials. This versatility makes it an ideal choice for manufacturers that need to measure a variety of parts and components as part of their production processes.

The majority of 3DSL scanners for dimensional measurements would have a field of view of 700mm cube or below and this is where the photogrammetry technology supports. It is generally recommended that an object up to 2.5 times the size of the field of view can be captured without any loss of accuracy by combining with photogrammetry. Therefore the maximum object size can be extended maintaining high accuracy up to or beyond 10m objects.

Photogrammetry for dimensional measurements uses the same basic principles as traditional cartography. Today, multiple 2D images from a Digital SLR camera are captured from around the object, modern wireless cameras and high performances computers bundle the images together as quickly as the operator can capture them, to produce a constellation of accurate 3D points.

This fast image alignment is achieved by using the accurately manufactured reference points applied to the object, coded points (basically working like small individual barcodes) enable image alignment and uncoded points placed to align the 3DSL scans or provide a location to measure to.



The last part of the puzzle is to introduce scale; cartographers would have taken this from a known length, for example measured the side of a building with a tape measure. Today carbon fibre scale bars measured in a traceable laboratory are captured next to the object and used to set the scale of the 3D constellation of points.

Photogrammetry is normally over constrained, this means that there are more images than required and the error of the measurement can be estimated to give a high level of confidence in the measurement.

So, back to the question what is 3DSL and photogrammetry?

3DSL is a type of photogrammetry that can be supported with (long range) photogrammetry.

They can be used independently, 3DSL for 3D scanning and photogrammetry for single point dimensional measurements however, to extend the size of object that 3DSL can scan, photogrammetry is the perfect tool.

There are measurement equipment manufacturers that develop both technologies and this then creates a system with a seamless connection between high detail 3D scanning and accurate large object capabilities.



CATCH

INDUSTRY-LED CONTROL & INSTRUMENTATION APPRENTICESHIPS AND TRAINING

BY JAMES MCINTOSH,
CHIEF OPERATING OFFICER,
CATCH UK

At CATCH, we have recognised the shortfall of Control & Instrumentation technicians in our industry which is

why we collaborate with our partners to offer contextualised training solutions in a live operational environment.

CATCH is an industry-led membership, skills & competency organisation operating predominantly in the Oil & Gas, Chemical & Petrochemical, Power, Energy and Process Manufacturing sectors. Our members include manufacturers such as Phillips 66, Prax Refining, Tronox, Croda, Uniper, Drax, VPI, Mitsubishi Chemicals, INEOS and Air



Products. We also have supply chain contractors as members including Wood, Worley, Jacobs and EFAB Industrial Solutions. Since creation in 1999, CATCH has worked closely with its member employers to understand, develop, design and deliver training solutions for their workforce. Based in North East Lincolnshire, at the heart of the Humber chemical cluster, CATCH is perfectly placed to assist companies to upskill their existing teams and develop apprentices to create our industries workforce for the future.

Upskilling Training

The upskilling training we offer is based around understanding employer requirements and can range from an 'Introduction to Instrumentation' course through to working with our partners to deliver product specific training. Our 'Introduction to Instrumentation' course was designed following a number of requests from members for electrical technicians that required some upskilling on control and instrumentation to enable them to add more value to their role. It involves some underpinning theory-based knowledge but focuses on practical hands-on experience utilising our extensive register of accuracy traceable modern test and calibration equipment. The course also includes a basic introduction to the main topics around pressure,

level flow & temperature, test equipment, loop testing, fault finding, control valves, actuators and safety instrumented systems. All of these things are then put to use in our workshops, VEGA L.A.B and process plant facility.

Training Facility

The core of the training is delivered at the National Centre for Process & Manufacturing (NCPM), the UK's leading fully operational tank farm and process plant training facility. The NCPM is a state-of-the-art facility offering "real world" experience, giving us the ability to train and develop technical skills in control room and field process operations, electrical, instrumentation and mechanical engineering in a full-emulated plant environment.

The NCPM has been delivered through a strategic partnership between CATCH and Reynolds Training Services. By bringing together the expertise of both training providers, we have created a fully integrated end-to-end live plant training and follow the manufacturing process from raw materials coming in, to finished product going out.

The NCPM has four main elements, each of which helps learners build knowledge, skills and experience in a live industry environment:

Tank Farm – Our impressive tank

farm reproduces the exchanges that happen in process and storage facilities worldwide. It allows us to store the liquids in a banded environment and begin the transfer to the process building. The tank farm has a range of industry standard equipment including Smart servos, radar gauge, multi stream controller, Coriolis mass flow meter and brodie digital control valve.

Control Room – At the heart of the operational control centre we have two distribution control systems which command and control the tank farm and process plant building, an Emerson Delta V and Honeywell Experion.

Process Building – The process building is connected to the tank farm by functioning pumps and pipelines which allows us to transfer liquids and use the reactors, heat exchangers and filtration system to "manufacture" a product and then send back to the tank farm.

Simulator – In the simulator suite we can observe and assess decisions made by learners as we test their responses to simulated emergency situations. It allows us to simulate critical operational scenarios utilising a multifunctional simulator in a control room environment. This heightens the pressure and realism within the potentially intense environment of the high hazard sector.

INSTRUMENTATION + INNOVATION



Make smarter decisions

Meet your decarbonisation challenges with more effective process monitoring.

As the world seeks to achieve net zero, carbon capture and the use of hydrogen are becoming more widespread.

Optimise your plant operations, mitigate safety risks, protect Equipment and ensure quality, with process-critical instrumentation and solutions from Endress+Hauser.

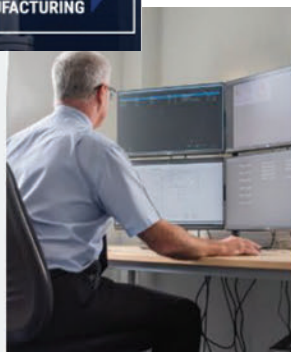
Discover more about
improving hydrogen
process performance
[smarter-decisions.co.uk](https://www.endress.com/smarter-decisions.co.uk)

Endress+Hauser 

People for Process Automation



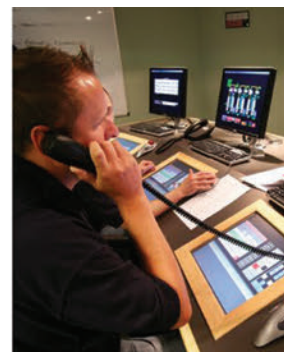
Tank Farm Our impressive Tank Farm reproduces the exchanges that happen in Process and Storage facilities worldwide.



Control Centre At the heart of the Operational Control Centre are our new Distribution Control Systems which command and control the Tank Farm.



Process Building Our Process Building is connected to the Tank Farm by functioning pumps and pipelines.



Simulator In the Simulator Suite we can observe and assess decisions made by learners as we test their responses to simulated emergency situations.

Apprenticeships

In addition to upskilling adults, in 2021, CATCH launched its own apprenticeship programme delivering Process Operations, Mechanical, Electrical and Control & Instrumentation apprenticeships.

Our apprentices spend their first year in our training centre before completing the remaining two years of their programme on their employers site. The learners are on the Maintenance, Operations and Engineering Technician (MOET) apprenticeship standard and complete a BTEC theory certificate in their first year in addition to an Instrumentation NVQ Level 3 once they are in a company.

The first year of training also includes four days a week of practical workshop, lab and plant-based training focusing on electrical, control and instrumentation tasks. They cover a specific control and instrument based technical certificate unit in the classroom that also has a range of instrumentation equipment used as “show and tell” exercises.

The range of practical workshop & plant-based tasks that our apprentices complete in year one includes:

- PID instrument identification and mark up
- Small Bore Tubing fixtures and fittings
- Re-range Tx using a Hart communicator

- Dead weight tester and comparator usage for gauge calculations
- Adjust a VEGAbar 38 Tx using VEGA PACTware and Bluetooth connectivity
- Strip Tx and manifold repair and reassemble
- VEGA radar setup
- Plant based calibration of instruments
- Actuator testing

The programme also includes modules on Industrial Process Management and Plant Process Control.

We feel it is also important to best equip our apprentices for the world of work and to that extent, provide them with a range of added value training courses and qualifications that are required in industry including confined spaces, fire extinguishers, emergency first aid, working at heights, IOSH working safely and safe systems of work. Personal development is also very important to us so all of our apprentices do Mental Health First Aid, gambling & gaming awareness, drugs & alcohol awareness and testing, driver safety, financial management and much more.

CATCH Chief Operating Officer, James McIntosh said “We are pleased to be playing our part in attempting to bridge the industry skills gap. Whilst we cannot do this simply on

our own, our strengths come from collaboration with industry employers and partners to enable people to train on equipment that is relevant to their role, in a safe environment. We are looking for more employers to work with us and visit our facilities to see how they can train their workforce and apprentices. We have a number of national contracts as the skills gap issue isn’t something that is Humber based, we are seeing the same all over the UK.”

Partnership Working

An example of the partnership working that CATCH offers is how we operate with VEGA. This partnership has developed significantly and in mid-2023 will see CATCH open the VEGA LAB, an additional training facility which gives learners the opportunity to use the latest VEGA equipment as part of their training experience. The NCPM also has a range of VEGA equipment in the process plant area which is used for live testing, calibration and maintenance.

Doug Anderson, CEO of VEGA (an InstMC Companion Company) said “At VEGA, we are committed to training and education for our customers, and our partnership with Catch goes back many years. Our latest VEGA Lab project is really exciting, providing equipment, training materials and support for a unique facility to train C&I engineers at all ages and levels.”

Q&A

Oliver Grievson

Oliver Grievson, Technical Lead at Z-Tech Control Systems and Chair of the Digital Water Program at the International Water Association, shares his thoughts on the future of engineering and valuing technical expertise.

What was the root of your interest in Engineering?

For me it was the fascination with the amazing engineering that we saw from the Victorian Era. We only have to look to John Snow and Sir Joseph Bazalgette to see some absolutely stunning engineering.

We look at the Thames Tideway which is currently being built using modern techniques and will be 15 miles long, and then look back and see what was built under London 150 years before, when 82 miles of sewer were built and if you have never seen the pumping stations at Abbey Mills and Crossness it is certainly something, as an engineer that you want to put on your 'bucket list'!

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

As we all know Engineering in Britain faces a massive shortfall of engineers and so over the next ten years we must reverse this or face the consequences. This is particularly acute in the Water Industry where the next ten years are going to be dominated by monitoring our environment in a way that the UK has never seen before. My wish is that this will result in a much greater use of Digital Transformation and Digital Tools to create smart water and wastewater catchments so that the environment can be managed in a much more efficient manner and the impact of human activities minimised. This is a blend of instrument, control and systems engineering and will help to address

everything from the problems of pollution, that are very public at the moment, to Net Zero....the next ten years may be optimistic but if we don't start now....

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

It is a tough question and in reality it is all about professional development and giving people a professional career path. A few years ago I went over to Holland to Leeuwarden which is locally called Water City where I was giving a presentation at a water conference. At a point during the day I was looking at the various things dotted around the exhibition and I saw that the Dutch had developed a career path for people who are interested in water all the way from primary education through to post-graduate and PhD study. There was a clear development path for the technical leaders of the future. It is no coincidence that the Dutch are one of the leading countries in the world in water & wastewater engineering.

For me it is also valuing our engineering professionals and their technical expertise. In the water industry it is all about the management path and we, as an industry, don't value the technical as much as we should. It's a balance that needs to be redressed and not just in engineering.

Is this for the Government to do? Maybe not, but they can certainly encourage the approach by supporting the professional institutions in a much more active way.

What do you do in your free time to relax?

Free time and relaxing isn't something that I have much time for but in the snippets of time that I do get I spend it with my family doing the mundane things in life like the gardening or just going for a walk. The peace of it all enables me to clear my head of the day to day stresses.

Given one wish what would that be?

For me it would be to give the field of engineering the ability to do what they know they need to do. We have in our profession a vast and powerful ability to fix most of the problems that we currently have from the Race to Net Zero, Climate Change and Pollution which are the issues that we often see in the news at the moment. We need to take the gloves off and stop holding the engineering profession back from we do best. The Victorian Era was a Golden Age of Engineering – let's try and repeat that as it is something that we desperately need right now.

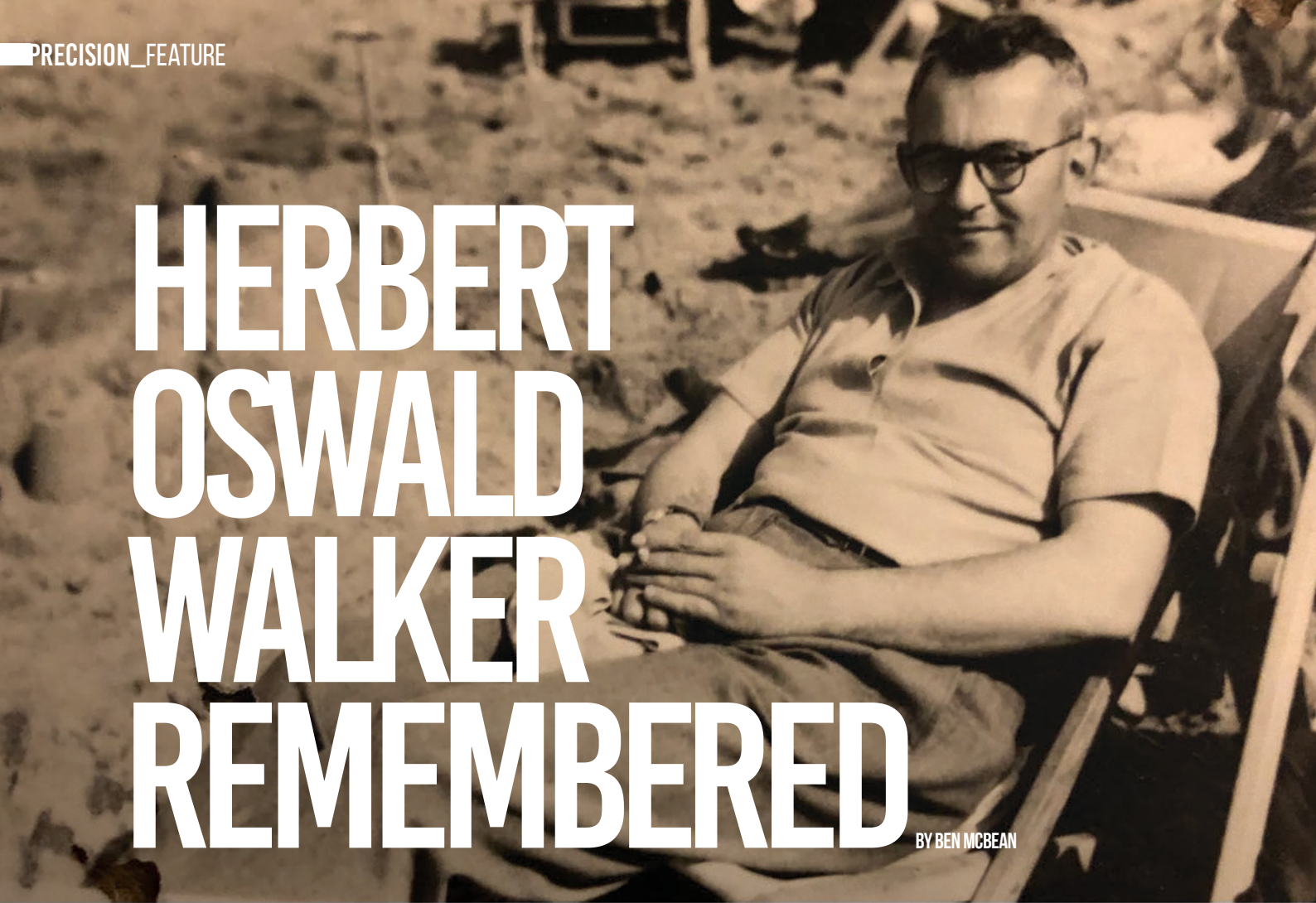


Abbey Mills Pumping Station



...the next ten years are going to be dominated by monitoring our environment in a way that the UK has never seen before.





HERBERT OSWALD WALKER REMEMBERED

BY BEN MCBEAN

I wish I knew more about my grandpa, Herbert Oswald Walker, a long-time member of the InstMC. He died in October 2003 at 89 years old, having recently moved from Blaby to Yarm-on-Tees. I didn't appreciate his life achievements, nor did I understand the adversity he faced.

My grandpa was the only child of Herbert Loftus Walker and Ethel Jane Webb. Hebert Loftus was "illegitimate" and had lost his mother at six months old due to typhoid and appears to have been raised by various uncles. My grandpa was born when his father was aged 43 and the groundsman of Doncaster Racecourse. His wife, Ethel was originally from Cambridge and had been a "turner downer". My mother and aunts remember Ethel, as being a horrible woman.

His childhood seemed particularly challenging, with no money, and I imagine little by way of nurturing. Despite this, it was his dream to become a pharmacist, but this was not allowed and he was unable to afford to go to University, so in 1929 he chose to study engineering at Doncaster Technical College.

His first job after college was with the Doncaster Omnibus Company, working in the Rolling Stock Engineer's Office. From there he

moved to Rolls Royce in Derby, I presume in a similar role. It must have been here where he gained his expertise in steam turbines and control systems which led to working on power stations in Brighton and Great Yarmouth.

He started working for Richardson Westgarth in Hartlepool, eventually becoming the Technical Director. The Company was at the forefront of the development of steam and diesel engines for ships throughout the nineteenth and early twentieth centuries. Here he developed marine control systems, in particular for the White Star Line and GEC, and in one case for the SS Atlantic Conveyor, subsequently torpedoed in the Falklands war. He had many experiences which he found thrilling, such as taking part in sea trials on tanker Texaco Maracaibo, through the Panama Canal and other sea trials around Australia in the 1960's.

He was extremely enthusiastic and keen to be involved in different

Industry Associations, such as the North East Institution of Engineers and Ship Builders and the Institute of Measurement and Control. By the time he retired he had numerous patents and had written many articles on instrument controls.

Recently, having been diagnosed as Autistic and ADHD, in my 40's, I have reflected a lot on why I am the way I am and in particular which traits I may have inherited from my parents or grandparents. I feel that my grandpa was socially awkward, found it difficult to show affection, was quite rigid in his thinking and had an extremely technical mind. He certainly displayed autistic traits, from which I may have benefited, especially in creative problem solving. An observation from Steve Silberman's book, Neurotribes, was that at M.I.T. Boston, they used to call autism "the engineers disease" due to the prevalence of autism in the children of talented engineers.

A 3006-91

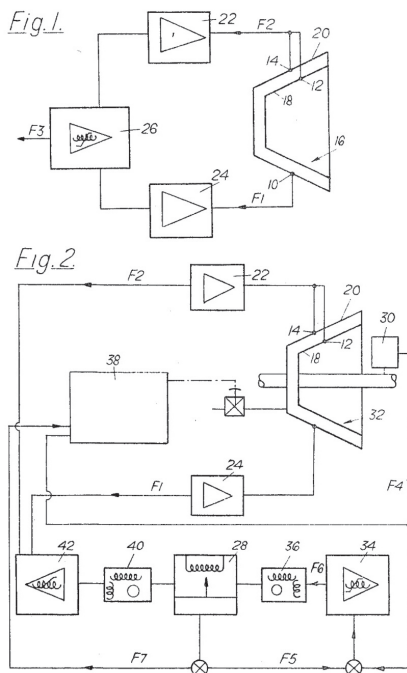
Computer Controlled Optimisation of Marine Steam Plant

By H O Walker MInstM.C.

Reprint of a paper presented at the Fourth International Convention Symposium in Italy

GEC-Elliott Process Automation Limited

Dec. 13, 1966 H. O. WALKER 3,291,146
 AUTOMATIC CONTROL SYSTEMS FOR STARTING-UP AND SHUTTING-DOWN TURBINES
 Filed Feb. 26, 1963 2 Sheets-Sheet 1



Inventor
 Herbert Oswald Walker
 By
 Fred L. Witherspoon, Jr. Attorney



An observation from Steve Silberman's book, Neurotribes, was that at M.I.T. Boston, they used to call autism "the engineers disease" due to the prevalence of autism in the children of talented engineers.



Cevn Vibert,
Cyber Security SIG
Chair, sits down
for a one-to-one
with ChatGPT on
all things cyber
security

CHATGPT ON CYBER SECURITY FOR CRITICAL CONTROL SYSTEMS

Dear ChatGPT... Please write me an article about cyber security for the InstMC magazine about resilience of critical control systems...

Cybersecurity has become an increasingly important issue in recent years, particularly when it comes to critical control systems. These systems are essential for the operation of many critical infrastructure sectors, including energy, transportation, and water

supply. Therefore, any disruption to these systems can have severe consequences, not just for the affected organization but for the entire community.

One of the key factors in ensuring the resilience of critical control systems is to have a robust cybersecurity framework in place. This means that organizations must be proactive in identifying and addressing potential vulnerabilities in their systems, as well as having

contingency plans in place to respond to any cyber incidents that do occur.

To achieve this, organizations must adopt a risk-based approach to cybersecurity, which involves identifying and prioritizing the risks that are most likely to impact their operations. This requires a thorough understanding of the threats facing their organization and the potential impact of a cyber incident. Once these risks have been identified,



organizations can then develop a cybersecurity strategy that is tailored to their specific needs.

Another important factor in ensuring the resilience of critical control systems is to have a comprehensive incident response plan in place. This plan should outline the steps that will be taken in the event of a cyber incident, including who will be responsible for responding to the incident, what actions will be taken to contain the incident, and how the organization will recover from the incident.

In addition to these measures, organizations can also take steps to increase the resilience of their critical control systems through the use of advanced technologies. For example, many organizations are now using artificial intelligence and machine learning to detect and respond to cyber threats in real-time. This allows them to identify potential threats before they can cause any damage and take immediate action to prevent them.

Finally, organizations must also ensure that their employees are trained and educated on cybersecurity best practices. This includes regular training on how to identify and respond to cyber threats, as well as ensuring that employees are aware of the potential risks associated with their use of technology.

In conclusion, ensuring the resilience of critical control systems is essential for the continued operation of many critical infrastructure sectors. By adopting a risk-based approach to cybersecurity, developing a comprehensive incident response plan, using advanced technologies, and providing regular employee training, organizations can better protect themselves from cyber threats and ensure the ongoing resilience of their critical control systems.

Please also include the threats of AI technologies...

While AI technologies can bring many benefits to organizations, they also pose a number of potential threats to cybersecurity. One of the

main concerns is the potential for AI algorithms to be used to bypass traditional security measures.

For example, hackers could use AI algorithms to identify vulnerabilities in a system, or to create more sophisticated phishing attacks that are better able to deceive users. They could also use AI to create malware that is more difficult to detect and remove.

Another concern is the potential for AI to be used to automate attacks, making it easier for hackers to launch coordinated and targeted attacks on multiple systems at once. This could include the use of AI-powered bots to conduct brute force attacks, or to perform reconnaissance on potential targets.

Another potential threat of AI is its ability to mimic human behaviour. Hackers could use this to create more convincing social engineering attacks that are better able to deceive users. They could also use AI to create deepfake videos or audio recordings that are indistinguishable from real ones, making it easier to spread disinformation or to manipulate individuals or organizations.

Finally, there is also a concern that AI algorithms themselves could be compromised or manipulated. This could occur through the insertion of malicious code, or the manipulation of data sets used to train the algorithm, leading to inaccurate or biased results.

In order to address these threats, organizations must take a proactive approach to cybersecurity that includes the integration of AI technologies into their overall security strategy. This includes the use of AI-powered security tools that can identify and respond to threats in real-time, as well as the development of AI-specific security policies and procedures.

Furthermore, organizations must ensure that their AI algorithms are properly secured and tested for vulnerabilities, and that they are trained on unbiased data sets. Additionally, organizations must

...it's worth noting that ChatGPT doesn't always provide factually correct answers...

prioritize the education and training of employees on the potential threats posed by AI technologies and how to mitigate them.

Overall, while AI technologies offer many benefits, organizations must remain vigilant in their cybersecurity efforts to ensure that these technologies are not used against them. By staying ahead of potential threats and incorporating AI into their overall security strategy, organizations can better protect themselves from cyberattacks and ensure the ongoing resilience of their critical control systems.

How can CNI best defend against these AI attacks on control systems?...

Defending against AI attacks on critical control systems requires a multi-layered approach that incorporates both traditional security measures and advanced AI-powered security solutions.

Here are some strategies that CNI can adopt to best defend against AI attacks on control systems:

Risk Assessment: CNI should regularly assess the risks to their control systems, identify potential AI threats and vulnerabilities, and

prioritize mitigation efforts based on the likelihood and impact of those risks.

Secure Design and Configuration: CNI should design and configure their control systems with security in mind. This includes limiting access to sensitive systems and data, implementing strong authentication and encryption, and monitoring for unauthorized access.

Network Segmentation: CNI should segment their control systems into separate, secure networks to limit the spread of any potential attacks.

Continuous Monitoring: CNI should continuously monitor their control systems for any unusual activity or anomalies that could indicate an attack is underway. This includes using AI-powered security solutions to detect and respond to threats in real-time.

Incident Response Plan: CNI should develop and regularly test an incident response plan that outlines the steps to be taken in the event of an AI attack on their control systems. This includes having a designated incident response team and processes in place for containment, investigation, and recovery.

Education and Training: CNI should prioritize the education and training of employees on the potential threats posed by AI attacks on control systems, including how to identify and respond to these threats.

AI-powered Security Solutions: CNI should deploy advanced AI-powered security solutions that can detect and respond to AI attacks on control systems in real-time. This includes using AI algorithms to detect anomalies and potential threats and deploying AI-powered security tools to automate the response to those threats.

Overall, defending against AI attacks on critical control systems requires a proactive and multi-layered approach that combines traditional security measures with advanced AI-powered solutions. By incorporating these strategies into their overall cybersecurity strategy, CNI can better protect themselves from AI attacks and ensure the ongoing resilience of their critical control systems.

ChatGPT Mar 23 Version. Free Research Preview. ChatGPT may produce inaccurate information about people, places, or facts.



What is ChatGPT?

A computer program that can understand human language and generate its own text in response. Similar to a robot that you can talk to, and it will talk back. When you give ChatGPT some text, whether in the form of a written or spoken question or statement, it will use the massive amount of data available on the internet to predict what should come next.

What can I use it for?

Pretty much anything content based:

- Writing a cv
- Summarising a book or film
- Writing and fixing code
- Providing answers to questions such as 'What is calibration?'
- Creating a poem or song around any subject you can think of
- Composing a letter or email at work

The more detail you provide in your prompts and questions, the more precise the answers will be, though it's worth noting that ChatGPT doesn't always provide factually correct answers and can also produce biased content.

Just for fun, we asked ChatGPT to write us a poem about being a control engineer. It took exactly 7 seconds to create.

I am a master of control,
A wielder of machines,
My world is one of data,
Of circuits and of screens.

I see beyond the surface,
To the heart of all machines,
The circuits and the wiring,
And every bolt and beam.

I am a control engineer,
A captain of the ship,
I guide the flow of power,
With an analytical grip.

I measure and I monitor,
I adjust and I refine,
I am a keeper of order,
In a world of constant design.

I solve problems as they arise,
With precision and with skill,
I am a master of the unseen,
Of every valve and drill.

The power of the world is mine,
Through knowledge and control,
I'm the one who keeps things moving,
With a steady hand and soul.

So here's to every control engineer,
Who keeps the world running right,
We are the guardians of the machines,
And the masters of the light.

Curious to know how ChatGPT can be useful to control and instrumentation engineers? We asked and here's the answer.

As an AI language model, I can provide assistance to engineers in a variety of ways. For example, I can help engineers to design and implement control systems by suggesting appropriate sensors, actuators, and control algorithms based on specific requirements. I can also provide troubleshooting assistance by analyzing system data and identifying potential issues.

One of the key advantages of using an AI language model like me is that I can process large amounts of data quickly and accurately. This can be particularly useful in industries where real-time data analysis is critical, such as in energy or healthcare applications.

However, it's important to note that AI language models like me are not a replacement for human engineers. While I can provide valuable insights and assistance, it's still essential for engineers to use their expertise and experience to make informed decisions and solve complex problems.

To start your own conversation on ChatGPT, visit <https://chatgpt.org/#what> and simply start typing! It's free, with no registration, and you can download your conversations as PDF documents or images.



ULTRASONIC FLOWMETERS CLAMP DOWN ON STORM OVERFLOWS

According to reports in the UK press last year, UK water companies released untreated sewage into our waterways more than a thousand times a day. Data from environmental charity, Surfers Against Sewage, reveals that there were a staggering 320 raw sewage warnings issued in the very first week of 2023 alone.

With increasing public concern about the unacceptable amount of sewage entering our rivers and seas, the UK government is now demanding every single water and sewerage company in England has a clear plan of action on every storm outflow, particularly those that are near to where people swim or in the vicinity of valuable habitats and wildlife.

A storm overflow occurs when the capacity of a wastewater system is exceeded due to heavy rainfall, with the excess water being discharged into local watercourses. This in turn can lead to pollution and environmental damage. With extreme weather events becoming more commonplace due to climate change, the problem is only set to increase.

How can technology help?

It's impossible to manage storm outflows if you don't measure the flow rate. With the high performance and reliability of a clamp-on ultrasonic flowmeter, it's possible to regain control of the situation. Providing real-time data on the flow

rate of storm outflows, this valuable information can be used to monitor the amount of water flowing out of a particular area during a storm event. This is essential for managing flood risk and ensuring the safety of local residents, infrastructure and wildlife.

How do ultrasonic clamp-on flow meters work?

Using ultrasonic soundwaves to measure the flow rate of a fluid, two transducers are safely and securely fixed to the outside of the pipe with a permanent clamp-fitting. One transducer emits ultrasonic signals into the fluid and the other one receives it. Traveling through the fluid at a known speed, the flow rate is calculated by measuring the difference in time that it takes for the signal to travel with the flow and against the flow. This results in a time difference (Δt) and is directly proportional to flow rate. It's also possible for the flowmeter to measure the speed of the fluid and the direction of flow.

A key advantage of clamp-on ultrasonic flow measurement is that

it is non-invasive. There is no need to cut or modify the pipe, eliminating unnecessary downtime – installation is simple and cost-effective. And because there is no contact with the fluid being measured, there is absolutely no risk of contamination.

Swifter penalties in the pipeline

At present, any water company that illegally pollutes waters can face enforcement action from the Environment Agency. But with the prosecution process often being lengthy, the government now wants to make it quicker and easier to issue penalties for environmental damage.

All options – including £250 million as an upper limit fine are being considered. There will be a public consultation in the spring to determine an appropriately high limit that sends a clear message as a serious deterrent.

“Through the largest infrastructure programme in water history, we will tackle the problem at source, with more investment on projects like the new Thames Tideway super sewer. I am making sure that regulators have the powers they need to take action when companies don’t follow the rules, including higher penalties that are quicker and easier to enforce.”
Thérèse Coffey, Environment Secretary

Non-invasive measurement allows cost-effective, real-time monitoring of storm outflows

Dynamic clamp-on flowmeter data monitoring provides a crucial early warning of overspill. This helps to prevent untimely discharges from storm water retention tanks, meaning the number of discharges into local watercourses is greatly reduced.

To find out more about the benefits of non-invasive ultrasonic flow measurement in the management of storm overflows, contact Andy Hammond -

www.flexim.co.uk

sales@flexim.co.uk

+44 (0)1606 781 420





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.



REFER A FRIEND

Refer people to InstMC membership and get rewarded with subscription discounts

Our members are our best advocates, and we need you to spread the word. Help us to grow InstMC membership and you will be rewarded with money off your subscription fees.

For each person you refer to membership (who then completes the application process and becomes

a paid member of the Institute), you will be rewarded with a 25% discount off your membership subscription dues for 2024.

You can refer up to three new members in 2023 and enjoy a maximum discount of 75% off 2024 membership subscription fees!

How the campaign works:

- If you would like to take part in the campaign, please email member.communication@instmc.org so we can register you to participate in the campaign.
- The Refer a Friend campaign is open until 31 October 2023.
- The Refer a Friend campaign

applies to individuals who join InstMC as new members. It does not apply to lapsed members who renew their membership.

- InstMC members can refer up to 3 referees (who become paid up members of InstMC) per year.
- Referees must join as a Member or Fellow.
- The Refer a Friend campaign is open to members who have paid their 2023 subscription fees.

For more information, email member.communication@instmc.org. Full T&Cs are available on request.



Tomorrow's Engineers Live

Inspiration, impact and collaboration



TOMORROW'S ENGINEERS LIVE 2023

InstMC was pleased to attend 'Tomorrow's Engineers Live' on 13th March which returned for its second year.

Hosted at IMECHE's headquarters, the event brought organisations together, from across engineering and STEM sectors. The aim of the day was for delegates to improve and build on their outreach activities through practical sessions, collaborative discussions and presentations from invited speakers. As the engineering industry faces crucial issues in diversity and recruitment, Tomorrow's Engineers Live aims to connect the community together to facilitate collaboration and collective action.

The opening plenary tackled 'Preparing for jobs that don't exist yet', with a panel of speakers from organisations such as Amazon Web, Siemens and Faethm by Pearson who discussed the skills needed for future jobs, as well as the new roles and professions already developing within sectors such as AI, mobile and online technology. We then heard from Sarah O'Connor, Big

Ideas Programme Manager at 'Solutions for the Planet', a social enterprise bringing businesses and young people together to share knowledge and skills to shape a more sustainable world. Her key message was "Sustainability shouldn't be chosen as an option in isolation – it needs to be embedded in the curriculum". Tom Woolley from SMS PLC talked about My Utility Genius, an energy platform software specialist, helping schools manage their energy – vital given that the Department of Education has reported that 39% of public sector building emissions come from education settings.

After a morning of breakout sessions, discussing a range of topics including T-Levels, how to involve SMEs in outreach and engaging

with underrepresented groups, we heard from a panel of students from The STEM Project. Founded by Laura Giddings, The STEM Project is an agency, consisting of a network of freelance STEM education consultants, educators, industry experts, speakers, presenters and youth directors – working to build strong STEM communities, bringing industry, government and education together on various projects to inspire the current and next generation into STEM roles.

With all the panel being of school and college age, we heard 'straight from the horse's mouth' the best way to engage with young people; 'Talk to us, not just on social media, make activities fun and show us how the things we learn are applied in real life.'



Sir Julian Young meets representatives from the STEM Project

The day closed with a speech from Sir Julian Young, Chair of Tomorrow’s Engineers Code and IET President, who talked about the Code and how fundamental it is to STEM learning. Launched in October 2020, the Tomorrow’s Engineers Code is a commitment to work toward common goals to increase the diversity and number of young people entering engineering careers. Over 100 organisations are signatories, including the Institute of Measurement and Control, who have made the four pledges about their approach to funding, designing, delivering and learning from engineering-inspiration activities.

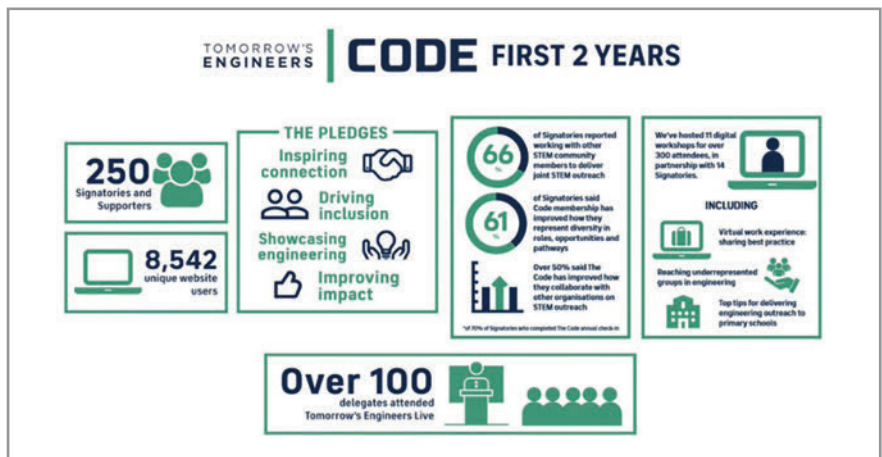
Feedback from the organisers confirmed that over 100 people attended Tomorrow’s Engineers Live, 63% of delegates said they would change aspects of their activities following the event and 86% said they are likely to pursue new collaborations with other organisations as a result of attending.

Find out more about the Tomorrow’s Engineers Code at <https://www.tomorrowsengineers.org.uk/tomorrow-s-engineers-code/>

“The day closed with a speech from Sir Julian Young, Chair of Tomorrow’s Engineers Code and IET President, who talked about the Code and how fundamental it is to STEM learning.”



Opening plenary panel of speakers



FOCUS ON A SIG

STANDARDS

Do you want to experience what it is like to be part of a standards-making committee without joining one? Become a member of the Standards SIG, where you will have the opportunity to network with standards makers and hear about their work and recent developments in the standards world. Furthermore, you will have access to our all-members' meetings with an opportunity to ask any questions. We meet three times a year with

a mix of hybrid and pure remote participation. We have started sharing new work programmes that may interest you in the future to become a part of. Our membership is a mix of Oil & Gas, Manufacturing, Professional bodies/Associations, Automotive, Pharmaceutical and Nuclear backgrounds. Join S-SIG with a single click under your profile section on the InstMC website.

As a standards-maker, I participate in various BSI and IEC meetings. British Standards Institute (BSI) is the UK's National Standards Body

and is a member of international organisations, e.g. ISO, CEN, CENELEC, ETSI and IEC. The IEC (International Electrotechnical Commission) is a global, not-for-profit membership organisation whose work underpins quality infrastructure and international trade in electrical and electronic goods. The IEC brings together more than 170 countries and provides a global, neutral and independent standardisation platform to 20,000 experts globally. Today, I will share my experience of a recent IEC meeting that I was part of.



TC65 PLENARY SESSION

IEC Technical Committee TC65 members prepare international standards for systems and elements used for industrial process measurement, control and automation. This is done by various subcommittees and working groups comprising volunteering members from the participating nations, who meet throughout the year online or in-person based on their work programme. Every 18 months, the Chairs and Convenors of these subcommittees and working groups get the opportunity to provide the status update of their work at a high-level week-long meeting known as TC65 Plenary. These plenaries have taken place around the globe e.g. Milwaukee (2017), Busan (2018), Delft (2020) and virtual (2021). This year, London was chosen to host the plenary and welcome their members. The meeting took place at 20 Cavendish Square with high engagement from in-person and remote participation. Along with the standards update, there is one day dedicated to the “Automation Forum” giving a chance for TC65 experts to learn about interesting projects in the host county around “Automation”.

Standards-SIG members, along with other bodies, were asked to put their names forward. Given my interest in future technologies, I volunteered to present on one of the given topics i.e. ‘UK’s Standardisation Needs, New Projects’. My presentation included my knowledge and research on this topic, the survey from S-SIG members and other experts in the automation field working on future and forward-looking projects. I, along with some other presenters, took the end user’s perspective in conjunction with the manufacturing one. I started by sharing the findings of a 2022 report published by Make UK, highlighting that the UK stands as the ninth largest manufacturing country in the world. Due to the



I believe that the UK is strengthening its ‘Knowledge Economy’...



heavy investment in the research programmes, I believe that the UK is strengthening its ‘Knowledge Economy’ and it will be one of its primary businesses. The major investment for the UK research goes into ‘Chemical and Pharmaceuticals’, ‘Transport’ and ‘Electronics, Electrical and Machinery combined’. The government’s investment in future technologies, i.e. Quantum and Nuclear Science, will accelerate the development at a higher rate than what we have seen. The technology is evolving faster than we can control and I believe having gained a robust understanding and created standards in parallel will ensure the end-users are getting the best out of this development.

I gathered a quick response from S-SIG members asking, ‘In which technical areas would you like new standards to be developed?’. Most of the members wanted to see standards within measurement in Oil & Gas field along with medical equipment. AI Machine Learning, Cyber Security and Industrial Communication were the second-highest topics which I covered in the ‘Developing Technologies’

discussion. Almost a quarter were interested in seeing standards being developed within the ‘Green Energy’ field; this ranges from EV to Hydrogen Power.

It is paramount for me to see that the work the organisations are doing is contributing towards a globally sustainable future. I shared my appreciation that the IEC is working with committees to help them better understand from the onset of the standardisation process how their work contributes to the SDGs. SDGs are the UN’s 17 Sustainable Development Goals to end extreme poverty, fight inequality, protect the planet and ensure prosperity for all. On another front, at London Declaration 2021, the UK has also committed that the global standards will support climate action and consider key climate science in every new standard and revision. Led by BSI, working with the International Organization for Standardization (ISO), the London Declaration is a commitment to ensure global standards will support climate action and advance international initiatives to achieve our global climate goals.

Listening to other presenters, I was amazed by the work being progressed in the wider automation field. An interesting takeaway for me was learning the term ‘Industry 3.99 era’ during a presentation on Smart Manufacturing, meaning (in my understanding) that even though technologies enabling Industry 4.0 are here, we haven’t reached the full potential of those as yet.

Overall, it was a wonderful learning and networking experience.

P.S. Did you know the definition of SMART in the IEC world?

‘Ability of a system or entity to interpret information, adapt to changes, and improve results’

[work by Joint Project Team JPT3 - IEV part on terminology relating to systems, smart and digital]

Navdeep Mehay CEng FInstMC
Standards SIG Chair

LOCAL SECTION NEWS

NORTH EAST 2023 Annual Dinner & Reunion

The 2023 InstMC North East Local Section & Teesside Instrument Engineers Annual Dinner and Reunion was held on 9th March at Leonardo's in Middlesbrough.

Attended by 158 members and guests, representing international, national and local companies and other organisations, the evening included addresses by Steff Smith, InstMC Chief Executive, John Noon, North East Chair and raconteur, Mick Monroe.

Following the formalities of the evening, members and guests, old and new, enjoyed the opportunity to mingle, converse and make new contacts in a relaxed atmosphere.

The generosity of the attendees raised £1,000 for the chosen charity, Teesside Hospice, a leading "end of life" care organisation which supports local families and individuals affected by terminal illness.

We now look forward to emulating this year's success in 2024.

Mike Vowell,
Hon Secretary, North East



Teesside Hospice Donation

On 6th April representatives of the North East Section presented Debbie Coulson, Director of Income Generation for Teesside Hospice, with the cheque for £1000 on behalf of Teesside Instrument Engineers. This was raised from members, guests and companies attending the NE Section & Teesside Instrument Engineers Annual Dinner and Reunion 2023.

Norman Harrison, NE Treasurer, John Hemy, Committee Member, John Noon, NE Chair and Mike Vowell NE Hon Sec (and ace cameraman!) were given a tour of the Hospice and its facilities by Debbie who explained that "for over 40 years the Hospice has been providing care across Teesside by supporting individuals and families who've been affected by a terminal illness.

Physical, mental and emotional support to help individuals and their families is provided by the clinical team, counsellors, volunteers and fundraisers to ensure that recipients of the care provided get to live well until the very end".

She also thanked the NE Section and those who supported the Dinner for the generous donation.

IRELAND

Robotic Knot in Pan Gallego

The Ireland Section are very grateful to Mr. Miguel Vilariño Orgeira for presenting an online (from Spain) Technical Event relating to the development process of a unique robot for bread making of a specific regional bread, Pan Gallego.

Pan Gallego is a traditional artisan bread from Galicia, in northwest Spain, recognised as a Protected Geographical Indication. Its distinct knot makes it instantly recognisable and requires incredible skill to create.

Miguel has successfully designed and developed from scratch, a bespoke robot to mimic the complex muscle motions of a human hand to create this iconic knot. The presentation

focused upon the key steps of the development process, with particular emphasis on the utilisation of the Agile Methodology (<https://interqualitybg.com/en/resources/scrum-and-agile-resources/agile-methodology>.)

Steps included:

1. Evaluation of current manual method.
2. Review and assessment of equipment and components on the market.
3. Trial and selection of potential materials and components.
4. Evaluate and select required sensors, actuators, controllers, and

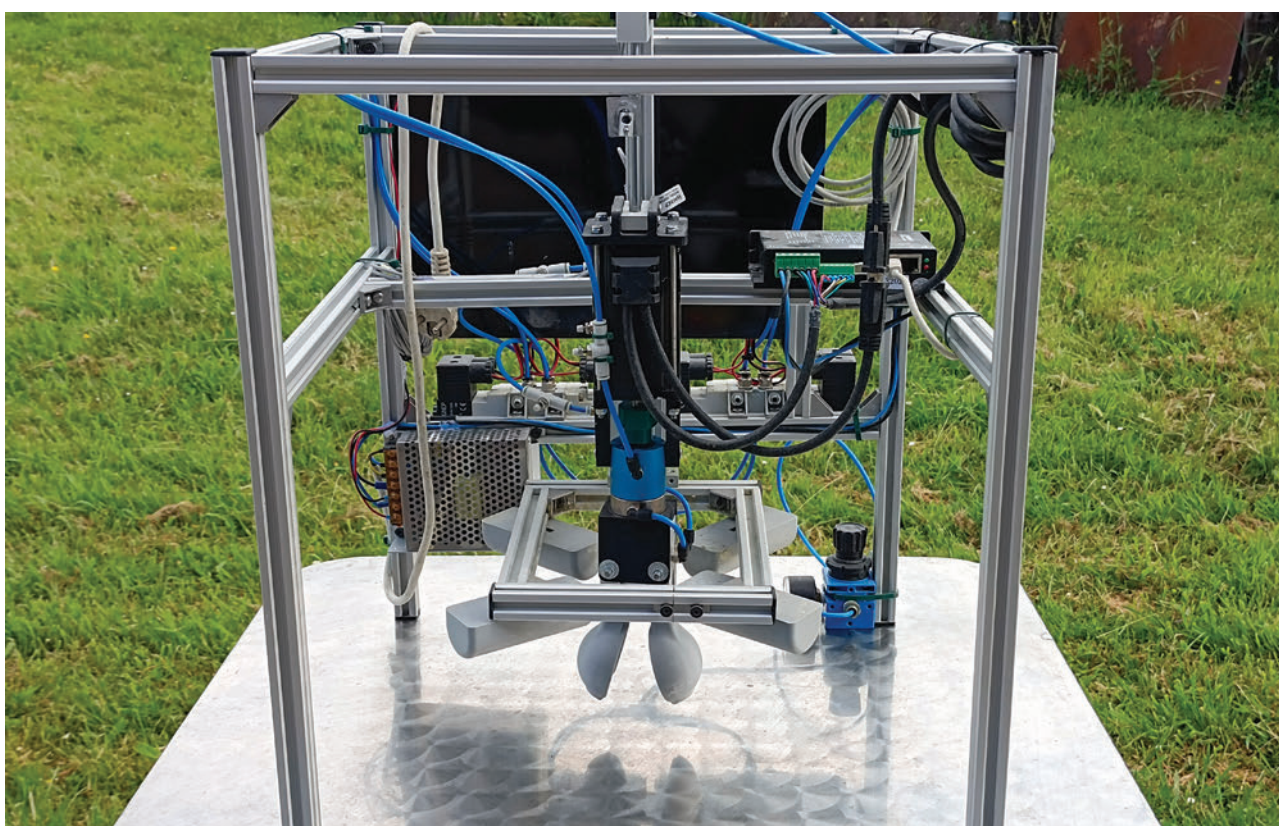
suitable communications protocols.

Each of the above steps had numerous iterations of testing, reevaluations, and adjustments, as per the methodology.

Several attendees were students seeking to gain knowledge in the sector of robotics, especially in the areas of design and development. Although most were from Ireland, we had one section member dialing-in from Azerbaijan!

Finally, we wish to thank Miguel for his time to present to the Ireland Local Section of the InstMC.

Aidan O'Connell, Chair
Ireland Section



LOCAL SECTION NEWS

WESSEX

INSTMC Attends AWE Professional Registration Showcase

AWE (Atomic Weapons Establishment) welcomed people from a wide range of professions to a Professional Registration Showcase at its Aldermaston site on 14th February. The showcase built on the success of a previous event for graduates, undergraduates and alumni, held at AWE in November and was opened up to everyone interested in the benefits of professional registration.

Hosted by AWE Heads of Profession, the event was also attended by representatives from key professional associations and institutes, from the Institute of Measurement and Control (InstMC); the British Computer Society (BCS); the

Institute of Mathematics and its Applications (IMA); the Institute of Materials, Minerals and Mining (IOM3); the Institute of Physics (IOP); the Institution of Chemical Engineers (IChemE); the Institution of Engineering Designers (IED); the Institution of Engineering and Technology (IET); the Institution of Mechanical Engineers (IMechE); the Royal Statistical Society (RSS) and the Society for Radiological Protection (SRP). Showcase visitors were able to gain in-depth information on membership, professional registration and support.

Christopher Smeeth IEng MInstMC MIET, AWE's Head of Profession for Control & Instrumentation (C&I)

said: "This was a great opportunity for colleagues to find out more about how professional registration could support ongoing their professional development journey. AWE and our Heads of Profession are keen to support people in progressing and obtaining professional registration, but it also gives people access to a network of support, mentoring and friendly advice and a clear path for progression. We were delighted that Alan Franks and Dave Horsham, both IEng MInstMC, representing the Wessex Local Section at the Institute of Measurement and Control, were able to join us and provide valuable insight and a wealth of knowledge."



© British Crown Owned Copyright / AWE

SPOTLIGHT ON STAFF:

Q&A with InstMC
Staff Member
Jessica Currie,
Registration &
Accreditation
Officer

How long have you been with InstMC?

I have been at the Institute for just over two months. Already, I feel as though I have absorbed so much new information and feel excited about the future of the Institute. It has been wonderful to get to speak to so many interesting people both in the office and across the globe.

What is your background?

I studied Art & Education, and I also had a brief career working for an Ancient Art Gallery. I have also worked for Westminster Adult Social Care and an Executive Search firm focused upon Corporate Finance. So, my experience in many ways is quite broad. I am passionate about learning, and the drive within us all that wants us to have adventures and to explore new things, to have an understanding of the world and what it means to be human. I am fascinated by the world of Engineering and specifically the intricacies surrounding Measurement & Control and the importance of this being regulated within our society.

What is your role at InstMC?

I am the new Registration & Accreditation Officer at the Institute. My role is varied in terms of having to understand Professional Registration and the Accreditation process and to ensure that it all runs smoothly. There are many individuals involved, from our volunteers to people working at

universities or within Industry, and part of my role is connecting the dots and making sure everyone knows what is happening and on the same page.

Can you describe a typical day in the office?

There has been no typical day on the job so far. Every day, I get to speak to a variety of different members and professionals. I always start my day with a coffee! I check our inboxes to see what queries from members or colleagues have come in and I look at my to-do lists and prioritise what needs to be done for the day!

What do you bring to the team?

I would describe myself as a people person. So, I try and get to know everyone well and build good relationships. I like to be organised and stay on top of things. So hopefully I bring all those things to the team.

What do you like best about working for the InstMC?

Working for a Professional Engineering Institute is brand new to me and I really like that it feels like I am learning a lot whilst working here. The team is brilliant and one of the best teams I have worked with. I also like that the role is so varied and covers so much. It keeps the day interesting!

What do you do to unwind, once your working day is over?

I practice yoga and really like to read or listen to audiobooks. I also journal frequently to try to order my own thoughts.



Can you tell us a fun fact about yourself?

I am a trained yoga teacher and I am currently studying to be a senior yoga teacher in my spare time. I really like the philosophy and the history of yoga. It originated in the Indus Valley around 5000 years ago, but some of the ancient texts almost sound like they could be some form of Science Fiction. It's really not about poses but a system for living.

MEASUREMENT QUALITY MATTERS: ASK TREVOR

In this issue we revisit the important matter of how to make valid conformity (Pass/Fail) statements as a result of measurements. This topic is often misunderstood, and some people confuse specifications with tolerances and measurement uncertainty.

Firstly, let's define those three terms, informally as

Specification – the specified parameters that shall be met by a product. Example – Height of a desk 760 mm. This specification is absolute, it does not depend or rely on your measurement ability.

Tolerance – allowable variation to a specification limit. A bigger tolerance often allows cheaper or quicker manufacturing techniques. In the height of a desk example this might be 760 mm +/- 30 mm which

may be expressed as height of table to be 730 mm minimum, 790 mm maximum.

Measurement Uncertainty (MU)

– this is an estimate or evaluation of the doubt you have about your measurement ability. Expressed in the parameter of the measurement or a percentage of that, it describes how confident you are about the measurement result being correct. If you can have confidence that your measurements are within 1 mm of the true value then your MU might be described as MU = 1 mm at 760 mm. This description of your ability also requires a confidence level to be stated with the MU. We shall not address that complication today, but it is usually expressed at $k=2$ which is approximately 95%. So, the measurement of the desk height might be stated as 760 mm with an MU of 1 mm at 95% confidence.

PASS/FAIL Statements -

What is the issue? We may be asked to say if the desk passes or fails the specification. Our result may depend on how well we can make the measurement. If the measured value is close to the specification limit then the size of our MU affects how confident we can be about our pass or fail statement. The real-world reality is that no-one wants to make a product much "better" than it needs to be to meet a specification because that costs more material or time. Furthermore, from a laboratory point of view, no-one wants to make a more expensive test or calibration measurement because that too requires more expensive equipment or more time to make the measurement. The customer

often wants the cheapest test or calibration. Broadly speaking, a Pass/Fail statement made when a measured value is within uncertainty of a Pass/Fail figure, then that statement cannot be considered reliable. Where this does not matter, where no safety issues or no high failure cost is involved then the customer may be happy. It is essential that the customer understands and accepts the risk involved.

To properly handle these factors, we need to develop a decision rule and agree that with the customer. This is now required by the latest version of the testing and calibration competence standard ISO/IEC 17025:2017 and is beginning to appear in specifications and requirements.

Decision Rule – a rule that describes how measurement uncertainty is accounted for in making statements of conformity.

This may be provided in a specification or standard, required by legislation, specified by the customer or by established practice in an industry. In all other cases, where a statement of conformity is made there must be an agreed decision rule that explains how MU is accounted for in making the pass/fail statement.

Common Decision Rules include:

Offsetting the pass/fail by the measurement uncertainty. This is called "Guardbanding" and gives a very safe conformity statement but may involve wastage by false rejection of some results.

Offering the pass/fail statement

together with a figure for likelihood of false accept or reject. Commonly provided as “Pass with n% PFA” where PFA (potential false accept) represents the likelihood of false acceptance. The fail equivalent is PFR.

“Simple Acceptance” is where the MU is not used in any calculation of pass/fail but the customer must then be made aware of the risk involved when the measurement uncertainty is too large to give a confident result. I would recommend using the PFA arrangement described above in that case but there are other ways of describing the risk, which could reach 50% in some cases.

Customers often do not understand measurement uncertainty (MU) and it is essential that they are given to understand sufficiently to make good use of the test or calibration results.

The components of MU include anything that when varied could alter a result. As shown in Fig 1 this typically involves environmental factors such as temperature, the calibration of measuring equipment, skill of staff, the method including number of repeated readings and sometimes more features.

Some uncertainty components give rise to random variations and the effect can be reduced by using an average of repeated measurements. Some are more systematic, maybe a constant bias of the result which would not vary when repeated. Fig 2 shows “precision” and “accuracy” as they might appear on a dartboard. The true value is the bullseye. Our results are shown by the red, green and blue darts on the board. The triangles represent the average of each set of three darts.

The red set show that all three darts land close to each other; they have good repeatability but bad (average) accuracy as that appears far away from the bullseye. The distance from their average to the bullseye represents a bias (systematic component).

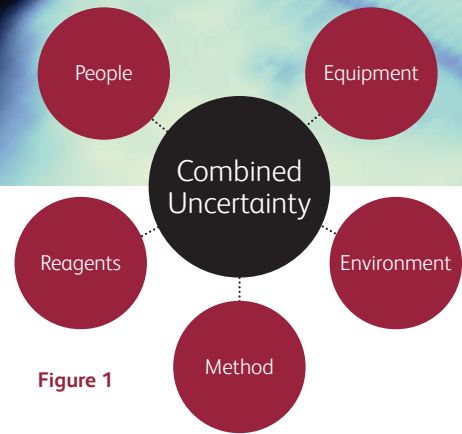


Figure 1

The green set have worse precision, but the average is closer to the bullseye. A smaller bias and repeated measurements which handle the random component giving a better accuracy.

The blue set show small bias and small scatter so these results have higher precision and higher average accuracy.

Enumeration of the bias needs external attention such as good traceable calibrations and participation in proficiency testing regimes or interlaboratory comparisons. These are topics for another time.

The ultimate reference about measurement uncertainty is the free “Guide to the expression of Uncertainty in Measurement” published by B.I.P.M. Simpler documents are available from NPL, ILAC and UKAS.

Trevor Thompson retired from the United Kingdom Accreditation Service and now offers training, mentoring and consultancy in metrology, accreditation and related ISO/IEC 17025 matters at www.bestmeasurement.com.

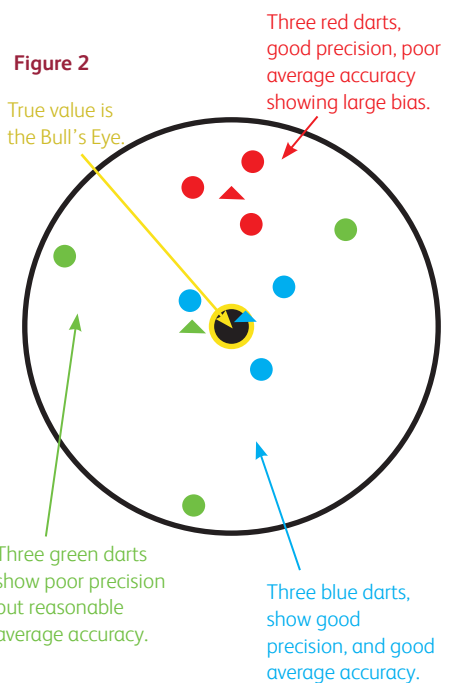


Figure 2

The distance from the triangles to the bull's eye shows the size of the bias or systematic component of the MU

2023

ADVERTISING RATES

Discounts can be given if 3 or more adverts are taken. POA.

Full Page	£1,400
Half Page	£845
IFC	£2,250
IBC	£2,250
OBC	£2,250

INSERTS

A4 & A5 Inserts **£845**

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

CIRCULATION BREAKDOWN:

2519 UK Engineers / 500 Overseas Engineers
70 Companion Company Members

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

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

Precision is a coffee-table style quarterly magazine, presenting technical articles related to measurement, control and automation. It is circulated to our 3000+ members and shines a spotlight on current topics, developing technology, opinion pieces and member-related news.

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

For further details, or to discuss your advertising requirements, please email jane.seery@instmc.org.



PRECISION MAGAZINE

OUR CORE TEAM

OFFICERS

President
Sheila Smith



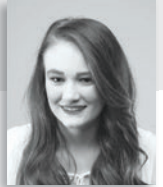
Honorary Secretary
Billy Milligan



Honorary Treasurer
Stewart Macfarlane



Business Executive
Sydney Reed
+44 (0)20 7387 4949
sydney.reed@instmc.org



Chief Executive
Steff Smith
+44 (0)20 7387 4949
steff.smith@instmc.org



Marketing Executive
Ernest Kyei
+44 (0)20 7387 4949 Ext 4
ernest.kyei@instmc.org



**Director of Membership
& Registration**
Leila Atherton
+44 (0)20 7387 4949 Ext 3
membership@instmc.org



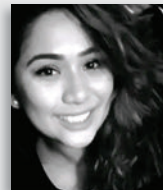
**Marketing &
Communications
Manager**
Jane Seery
+44 (0) 20 7387 4949
jane.seery@instmc.org



**Registration &
Accreditation Officer**
Jessica Currie
+44 (0)20 7387 4949
jessica.currie@instmc.org



Project Manager
Caroline Trabasas
+44 (0)20 7387 4949
caroline.trabasas@instmc.org





IChemE Approved **=Method** Training Courses

- TUV Certified 61511 Functional Safety Training Course —
- HazOp Training Course for Leaders —
- HazOp Training Course for Team Members —

www.methodfs.com/icheme

