

Landwards ^{@IAgrE}

The professional journal for the Institution of Agricultural Engineers

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In this issue...

- **People** – 2024 Award winners
- **Book Review** – A change of culture
- **People** – Meet the president
- **Technical** – Alternative fuels



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Contents:

4 Agricultural engineering news and views

Perspectives from the people and profession

8 From the CEO's desk

The latest Institution activity

10 The President's musings

Change and opportunity

12 Biosystems engineering

A review of some of the latest papers

16 EurAgEng

An overdue award, and the AgEng24 conference

18 People – the IAgRE Awards

This year's winners

24 Technical

Alternative fuels

28 Technical

On-farm AD needs to catch up

30 People

Meet the new President

32 People

Award winning international engineer

34 Book Review

The SafeLearner

36 Now and then

Comparing engineering to 35 years ago

38 The Douglas Bomford Trust

Travel awards and scholarships

40 New technology

The state of the art

44 Membership matters

The latest branch and membership activity



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New President Mark Moore talks to Landwards about his Agricultural Engineering journey from page 30

Editors Welcome



Since we put the last edition to bed, we have reviewed the results of the Landwards survey, thanks to all involved, and I trust that this edition reflects the feedback received.

First up, it was a pleasure to attend this year's Awards ceremony at New Holland in Basildon at the end of April. Not only to congratulate the many, worthy winners, (more of that from p18) but also to catch up with colleagues and friends for the first time in a while.

Whilst in Basildon, IAGrE CEO Charlie Nicklin and I took the opportunity to have a look around Case New Hollands R & D work focussed on alternative fuels, fascinating stuff from p24.

Given the positive feedback from the

Landwards survey around finding out more about other engineers, we interview incoming IAGrE President Mark Moore on p30, and dig a little deeper with one of the Award winners from p32.

Regarding Diversity and Inclusion, we have a great book review looking at culture in engineering from p34. Interestingly Now and Then from p44 compares and contrasts attitudes and facts from 1990 with today. Read together, the editor found these articles challenging.

Enjoy this edition.

Andy Newbold Hon FIAgrE

Editor

andy@farm-smart.co.uk

Reminder: Associate Members can upgrade free to Member grade

If you are an existing Associate Member you have the option to upgrade to Member grade providing you have completed 5 or more years in a relevant career.

However, if you prefer, you can remain as an Associate Member for as long as you wish.

For more information please see

<https://iagre.org/upload/1621421462.pdf>

or contact Alison at

membership@iagre.org

Agri-Tech Engineering 2024 new residential course for 15 year olds

The Smallpeice Trust has launched a residential course for budding young engineers

Starting with the question, "Are you ready to dive headfirst into the world of cutting-edge farming technology?" Get ready to equip yourself with practical skills that will set you apart, unleash your creativity, and make a real difference in the future of agriculture on the Agri-Tech 2024 residential course.

Delegates are invited on an exciting journey supported by the NFU Mutual Charitable Trust and the Douglas Bomford Trust. This unique course will cover the possibilities of sustainable farming practices while ensuring long-term food security for the UK. Delegates will dive into an immersive experience using robots, unleashing their creative programming and practical skills as real-world challenges aimed at feeding the world efficiently while minimising environmental impact are tackled.

Agri-Tech 2024 is for Year 10 students in England and Wales, S4

students in Scotland, and Year 11 students in Northern Ireland and runs from 30 July to 1st August at Harper Adams University.

This event includes the following:

- Programme a robot for navigation in a field
- Design and build a seed planter
- Through experimentation and/or mathematically determine the optimum seed spacing to allow plants to thrive
- Attach the seed planter unit to a robot
- Test drive the robot and seed planter to endure correct operation
- See <https://www.smallpeicetrust.org.uk/events> for more information.





Letter to the editor

I was rather “taken aback” by the centre spread of the spring 2024 edition of Landwards in which someone had very kindly featured my receiving of the Award of Merit from EurAgEng in November 2023 for Innovation into Practice. Being notified of the award in October of that year was a considerable surprise and I was very honoured and grateful to receive it. The journey to Hanover by train was an interesting experience, while making a short speech of acceptance and thanking those who had helped me considerably along the way was rather daunting in front of an audience of around 1000! I don’t feel that my job of spreading the word or good news about CTF is finished however! In the early 1980s, while at Silsoe Research Institute, I was tasked with setting up a field experiment to explore the impact of field machinery compaction on arable crop production systems. During the next 10 or so years I had two revelations.

Tread lightly

The first revelation was the fact that if we didn’t put any wheels on the cropped area, those intractable soils that I had become so familiar with in the preceding 10 years, became “a pussy cat”! Those preceding years were spent trying to improve the economy of cultivations for cereals,

a project led by David Patterson involving three field experiments on contrasting soils over a period of 6 years – quite a landmark piece of research (Patterson et al., 1980). So, I was well versed in how difficult it could be to create good seedbeds on heavy clay soils. As the soil compaction experiment progressed, and as an engineering institute, our thoughts turned to “if not driving on soils leads to such a revolutionary improvement, how do we achieve this in the most efficient manner?” Cue, gantry tractor systems – not new, an idea developed and used in the UK in the 1850s but what seemed to us, with modern hydraulic drives and electronic control systems, the ideal candidate for research and development. So started a long, challenging but highly innovative project helped by many clever colleagues at the Institute.

Low input high output

The second revelation was when I went into the field with the first working version of a 12 m wide gantry. With just 66 hp the machine could pull a full width light cultivator. My overriding impression was “this is magic”, a 12 m wide bed of soil which was nowhere compromised by wheels! I had become so used to standing on the back of a seed drill (yes, we had to do that in those

days!) checking that seed was flowing and that it was being covered adequately with soil. The latter was the nub of it – if you managed to get the seed covered where the tractor wheels had run, then it was too deep elsewhere and vice versa. This problem hasn’t gone away today, we just have more sophisticated ways of dealing with it but it remains an issue even with conventional controlled traffic systems. This of course is where gantry systems come in, their tracked area for a given width is only about half of that with tractor systems, so the traffic lanes can be left uncropped and uncultivated.

So, my unfinished job is to spread the good news about gantries and encourage their adoption. They won’t be a complete panacea for every job and circumstance but their advantages across a wide range of production systems and in a world where we are seeking greater precision and a lower impact on the environment, cannot I believe be surpassed.

Have I got time I wonder – only this limited asset in our lives will tell!

Kind regards

Tim

Tim Chamen, CEng, CEnv, PhD

European market for arable farming and crop protection equipment decreasing in 2023

- According to preliminary information collected by CEMA, the European Agricultural Machinery Association, the market volume for arable farming and crop protection equipment is expected to amount to EUR 4.70 billion in 2023

This marks a decrease of about 3% when compared to the previous year (2022), with -5% for the seeding, fertilizing, crop protection equipment segment, and -2% for soil working equipment.

The current and expected market situation was discussed at the CEMA annual meeting of the three CEMA European Product Groups – for Soil Working Equipment, for Seed Drills and Fertilizer Spreaders, and for Crop Protection – which took place in Hasbergen at Amazonen-Werke H. Dreyer.

The agricultural machinery industry as a whole experienced a steady growth from 2021 to 2023, but a decline is expected in 2024 for up to -10% of the market volume. A strong

downward trend has already been observed since the fourth quarter of last year.

A number of challenges are becoming apparent on the industry's demand side, in addition to the still-noticeable effects of the Covid-19 crisis. The new EU CAP policy, the farmers' protests, volatile markets and high interest rates are factors having a negative impact on farmers' willingness to invest. Further adjustments will depend on developments in the end customer markets.

The strong participation to this year's meeting of the CEMA Product Groups confirmed the good cooperation and steady growth of the network. A total of 47 company representatives took part in the meeting. The groups also welcomed two new participating companies: DCM Spreaders, and Unia. Furthermore, companies Einböck and Pöttinger could expand their participation by joining an additional Product Group.

During this year's meeting, Mr Dirk

Hollinderbäumer (LEMKEN GmbH & Co. KG) was re-elected as chairman of the European Product Group for Soil Working Equipment. The other two groups elected new chairmen: Mr Christian Gall (Amazonen-Werke H. Dreyer SE & Co. KG) is the new chairman of the European Product Group for Seed Drills and Fertilizer Spreaders, and Mr Dirk-Jan Stapel (Kverneland Group Nieuw-Vennep BV) is the new chairman of the European Product Group for Sprayers.

The CEMA Product Groups are composed of leading European manufacturers of equipment for arable farming, for harvesting forage and hay, as well as tractors and combine harvesters. The main focus is placed on a joint assessment of the market based on dedicated statistics. Currently, around 30 companies from more than 10 European countries are members of the CEMA product groups in the field of arable farming. The prerequisite for participation is membership in a national industry association belonging to the umbrella organisation CEMA.



Engineers share responsibility for decisions regarding AI systems

- The EU states have adopted stricter rules for artificial intelligence (AI) in the European Union. VDI expert Dieter Westerkamp emphasizes the importance of the final decision and responsibility being with humans. This is essential, above all, for the ethical principles of the engineering profession.



The EU has finally passed the AI Act. This is the first time that EU states have laid down rules for the use of artificial intelligence. It is the first law of its kind in the world and can set a global standard for the regulation of AI. A central point of the law stipulates that AI systems are as transparent, comprehensible and non-discriminatory as possible.

An important aspect here is that the AI systems are monitored by people - not technical systems. This means that the final decision and responsibility remains in human hands. This point is clearly supported by the VDI. In its "Ethical Principles of the Engineering Profession" from 2021, the VDI states: "Engineers are aware that when delegating operational and strategic support and decision-making services to autonomous AI-based systems, responsibility must ultimately remain with humans." This is not just about artificial intelligence itself. "We have to look at the overall systems in which AI is used," says Dieter Westerkamp, Head of Technology and Society at the Association of German Engineers. "We have therefore formulated in our ethical principles that engineers ensure that decisions made by AI systems are always comprehensible and plausible. They also share responsibility for the systemic effects - not only of the developed subsystem itself, but also for its effects in an overall system or network."

The VDI took the emergence of widespread AI use and autonomous systems as an opportunity to revise and supplement its ethical principles.

Reversing the small but worrying spike in women aged 35 to 44 leaving engineering

New workforce data released by EngineeringUK reveals the proportion of women working in engineering and technology roles has declined in the past year from 16.5% to 15.7%.

Furthermore, the latest Engineering Council registration statistics shows the average age at which women leave their Professional Register is 43, compared with 60 for men.

Taken together, these statistics highlight a particular challenge for the engineering profession. The Engineering Council shares EngineeringUK's hope that this data will serve as a wake-up call to engineering and technology companies to improve recruitment and retention practice.

While the overall proportion of women working in engineering and technology roles has declined over the past year, the proportion of women joining the Register continues to increase year on year. Likewise, the proportion of all engineers joining the Register between the ages of 30 and 49 continues to increase while the proportion joining aged 50-64 continues to decline.

Paul Bailey, Engineering Council CEO, said: "The Engineering Council fully supports EngineeringUK's call to address the spike in women leaving the profession. With decisive action across recruitment and retention, we can see more women joining the engineering workforce, and, crucially, more women staying there and becoming professionally recognised."



Read the full report here:

<https://www.engineeringuk.com/media/bryloncz/women-in-engineering-2024-update-engineeringuk-may-2024.pdf>

From the CEO's desk

Charlie Nicklin CEng
FIAGR



In the spring edition of Landwards I started by commenting on a long drive back from Chelmsford, funnily enough I'll be starting this one with the same, however the weather was much better this time!

"Why Chelmsford again?" you may ask, well this time I was returning from our 2024 Awards. CNH's Basildon tractor plant was the venue and our guests were treated to a fantastic day in some lovely Essex sunshine. The annual awards is my favourite event, it's great to learn more about the careers and activities of our members and celebrate their wide ranging personal achievements.

Whilst at the lectern I remarked about the subject diversity we have in our student awards, ranging from researching Beta Glucan rich hydrocolloids to designing a hydraulic slurry chute! I was certainly taken back by the emotion the event brings out, with a number of awardees very close to tears. CNH treated us to a fabulous lunch in their customer centre and we then had a number of product and technology presentations, plus a factory tour. Luckily for me, the day before I was treated to a tour around the R&D areas, which of course you wouldn't see on a normal tour. Although a familiar sight for me, I think it's great that there is design, test and development activity going on, not just for Basildon, but also the other manufacturing plants in the CNH organisation. Unlike many think, Basildon still does product engineering, maybe not on the same scale as they used to, but they always need good engineers. As expected from a global machinery maker, the execution was professional from start to finish. The awards are covered in more detail from page 18. My personal congratulations to all award winners and thanks to Case New Holland for hosting the event, and of course the attendees who I'm sure enjoyed the day.

This period in the year also plays host to our official AGM, which we now do online to make it much more accessible for our members. Before the formal proceedings our outgoing President Steve Constable provided us with a summary for the year. I'd like to take this opportunity to personally thank Steve for his time as our President and I hope he found it fulfilling. On the same theme I would like to welcome Dr Mark Moore as the new IAGR president and Kit Franklin as President-Elect, and I really look forward to working closely with both going forwards.

Landwards survey

You may have seen my feedback on the Landwards survey in the eNews back in April, but for those that didn't I'll give a summary. First of all, thank you so much to those of you that took the time to respond, and I'm pleased to say many of you did!

Landwards is your journal, so we want to ensure it remains relevant for our sector and its diversity. We had a

detailed review of the results with our editorial team and we also explored the subject at our Advisory Council meeting back in March. We are really pleased that 80% of you rated the journal as Excellent/Good and none of you thought it poor! The People/Practice/Technical sections are very well liked, but it's clear that People stories do shine through, whether its careers, innovations, projects, etc. so get in touch if you fancy hitting the keyboard with your story. There is also an interest in articles on professional registration, how the process works and hearing from people who've been through it. We also like the idea of "then & now" features, looking back at the archives or historic innovations and how they've changed to modern day, for example 1960's autonomous tractor developments and where we are today. We've certainly got some great ideas to ensure both the journal and the wider content remains interesting, and we'll be putting actions and different themes in place going forwards.

Audit preparation

From an operational perspective we have been preparing for audits of our membership process, which is planned for June. These audits are there to ensure we continue to work with the utmost professionalism in membership and registration activities, and of course to seek continuous improvement. Annual license reviews have also been completed for both the Engineering Council and the Society for the Environment, which allows us to feedback our thoughts on both bodies' activities, as well as reporting our own. And finally, thank you to those that have paid their subscriptions to date. It's worth noting you pay £10 less using annual direct debit (£5 for Technician grade) and it also reduces a significant amount of administration for us for annual subscriptions.

Please contact Jo at:
finance@iagr.org
for further details.

Charlie Nicklin CEng FIAGR
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President's Musings

Mark Moore

Change presents many opportunities

Welcome to my first musings as President. Firstly, I would like to recognise the outgoing President Steve Constable who has worked diligently for the Institution since Spring 2022. With the support of Charlie, the secretariat, and the team I think we can all agree the Institution is in a good place.

I would like to offer our thanks from the entire membership to Steve and the team for their leadership and hard work to deliver the range of activities we all enjoy from being a member of the IAgRE. The challenge is to keep the momentum going so members continue to grow their knowledge and experience given the enormous amount of change that is taking place in the world especially around food security, climate change and farm incomes.

A year of change

Globally, more than 2 billion people head to the polls in 2024 in more than 60 countries, such as United States, UK, Mexico, India, Indonesia, and the European Union. Many commentators have dubbed this a super election year as 2024 is the biggest election year in history. Agriculture and food security is a key battleground as manifestos are published and different political parties try to persuade voters. Food and farming are central to humanity and organisations such as the UK's National Farmers Union (NFU) and the EU's farmers union, Copa-Cogeca, are both presenting their "asks" to policy makers in the lead up to elections.



What is clear is there is a tremendous amount of change happening within agriculture which is driven by a need to maintain a balance between food security, climate change, and farm incomes. This is not easy to maintain, as has been demonstrated in recent months by the farmer protests in cities like London and Brussels. The EU's Farm to Fork strategy is a key component of the Green Deal, which aims to make the EU's climate, energy, transport and taxation policies fit for reducing net greenhouse gas emissions by at least 55% by 2030, compared to 1990 levels. Farmers

have resisted Farm to Fork policies and the increased regulations and cheap food imports has taken things to breaking point as farmers incomes are threatened. Similarly, the uptake for the UK's Sustainable Farming Incentive policy has been slow due to low payments and lack of detail on how to implement the various actions.

But the dynamics of agriculture are good – we need nutritious food to survive – so we need farmers! There is a general acceptance amongst farmers and policymakers that things must change if we are going to tackle climate change and



have a sustainable food production system that continues to feed a growing world population. The NFU manifesto advocates sustainable policies by incentivising a reduction in greenhouse gas emissions, improving energy efficiency, and reducing the impact of inputs and fuel. Copa-Cogeca also endorse climate friendly policies that support farm incomes and food security.

Looking to agricultural engineers

Many farmers are increasingly looking towards the agricultural engineer community for solutions

to help the implementation of sustainable food production systems. Agricultural policy also references innovation encouraging farmers to adopt technology like precision farming. The EU's Farm to Fork advocates farmers use technological, digital and space-based solutions to deliver better climate and environmental results and optimise the use of inputs such as pesticides and fertilisers. The UK's SFI has just introduced a similar range of actions that are aimed at incentivising farmers to adopt technology such as variable rate fertiliser systems. Ursula von der Leyen, President

of the EU Commission, has just launched an open dialogue on the future of agriculture and agricultural engineers are contributing to this discussion.

Agricultural engineers have an essential role to play in ensuring the balance between food security, climate change and profitable farming. With the desire to move to digitisation there is a wide range of different knowledge and skills required to enable sustainable farming practices. Agricultural engineering is not just about traditional mechanical engineering. We need engineers with skills in electronics, communications, software development, and systems and applications engineering. This broad range of disciplines coupled with the important contributions we provide to feeding a growing population gives agricultural engineering a greater purpose and makes our sector very attractive as a career option. Initiatives, such as "We Are Land Based" which the IAgRE supports, are an important part of attracting young people to become agricultural engineers.

Systems integrators

Agricultural engineers are also good systems integrators because our diverse range of disciplines means we "touch" nearly every part of the food production system. The IAgRE is well placed to foster discussion through networks and meetings. It is recognised that to deliver sustainable food production systems we need to talk to each other, which is why the EU has started the dialogue on the future of agriculture. Enabling open discussions and an expansion of knowledge is one of the key activities of the IAgRE. I would encourage you all to engage as we have a crucial role to play in ensuring future food security in a world where farmers will have to adopt new technology and farming practices to mitigate climate change and promote biodiversity. Let's work together to make it happen.

Dr Mark Moore FIAgRE

Biosystems Engineering

Biosystems Engineering, owned by the IAgRE, and the official scientific journal of EurAgEng, is published monthly with occasional special issues.

Head to <https://www.sciencedirect.com/journal/biosystems-engineering> to view the full article list of the latest edition and to

find out more about depth and breadth of articles accepted for publication.

Reduced subscriptions are available to IAgRE members. Go to <https://iagre.org/biosystemsinformation> for details of the preferential rates for both paper and electronic versions.

Biosystems Engineering

Volume 238, February 2024, Pages 115-127

Intensity-modulated optical fibre strain sensor for continuous measurements of below-the-surface food deformation during drying

Hamed Jafarishad, Mucheng Li, Yao Shen, Pawan Singh Takhar, Yuxiang Liu
Department of Mechanical Engineering, Worcester Polytechnic Ins., Worcester, MA, USA. Department of Food Science and Human Nutrition, University of Illinois at Urbana-Champaign, Champaign, IL, USA

Highlights

- An optical fibre strain sensor for continuous measurements of food deformation.
- The first strain sensor that enables continuous subsurface measurements.
- Up to -20% normal strains measured during the drying of fresh banana slices.
- Shell-hardening effects revealed by the fibre sensor measurements.

Measurements of food deformation during drying processes are important for food quality control but remain challenging. A mm-scale optical fibre strain sensor is presented in this paper to help address this challenge. One of the key design features of this optical fibre sensor is the soft buffer

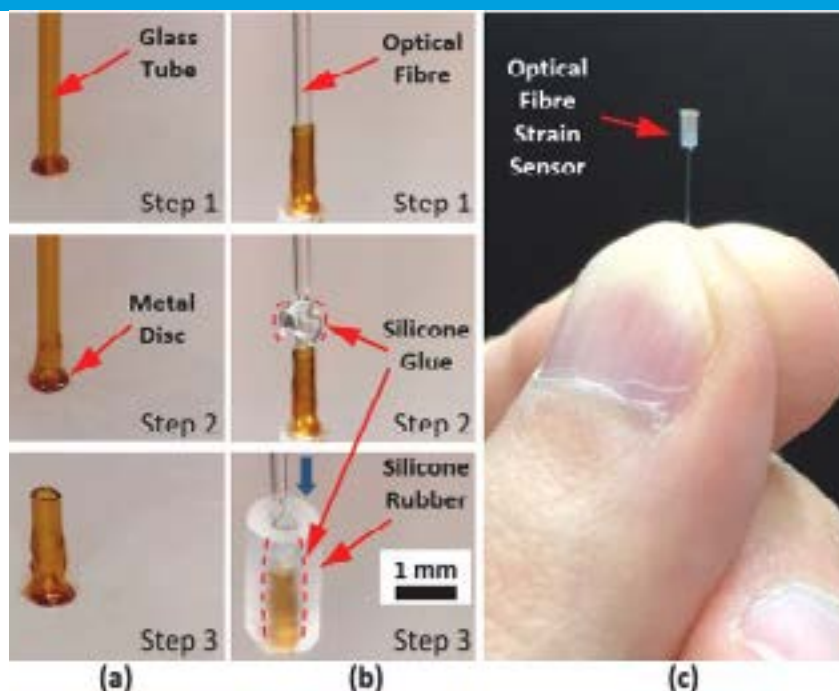


fig 2 - Images of the latter stages of the sensor fabrication steps and the finished product.

sleeve on the sensor outer surface, which enabled a large measurable deformation range while minimising the sensor's influence on the deformation of the target food. The buffer sleeve was fabricated by a moulding process, which resulted in highly repeatable sensor performances. The rest of the fabrication and assembly processes were straightforward without requiring any specialist facilities. The sensor can be

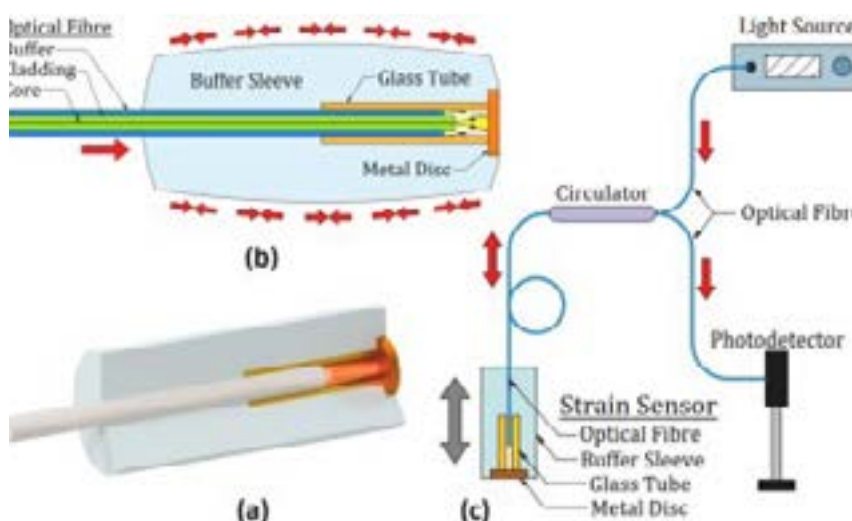


Fig 1 - The conceptual design of a sub-surface optical fibre strain sensor for foodstuffs, (a) the 3D model and (b) a 2D schematic of the optical fibre strain sensor and (c) the entire sensor set up.

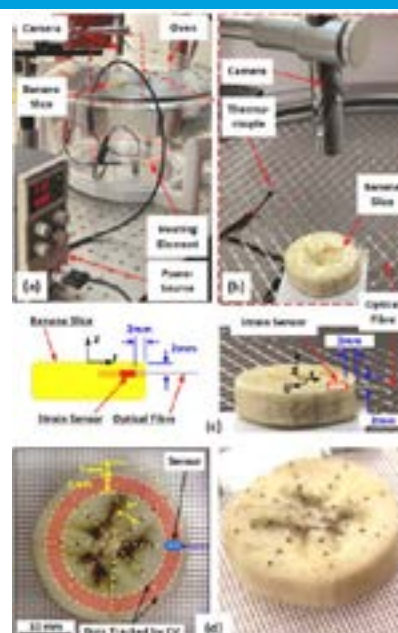
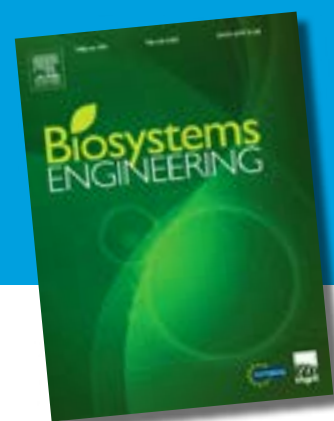


fig 3 - Images of the laboratory set up to continuously measure the deformation forces within slices of banana over a 4-hr period (a) Drying setup, (b) Close-up, (c) (top) Schematic and (bottom) photo of a banana slice with the sensor embedded, and (d) Sample preparation with ink dots marked on the banana slice top surface.

Over the past three months (February 2024 – April 2024), Biosystems Engineering published 47 articles, which included one review article. The following three articles, one from each volume, have been chosen to illustrate the diversity of work in the journal.



embedded inside food samples without the need for any adhesive, because the soft sensor surface and the existing starch in the food matrix helps to prevent the sensor moving inside the foodstuff. The sensor can be embedded in soft foods to provide continuous and distributed measurements of food deformation below the surface during drying processes.

To demonstrate its application in foods, multiple sensors were embedded inside fresh banana slices during a 4-hr long air-drying process. The sensor measurements covered the full range of the banana normal strain from 0 to 20% and revealed the shell-hardening characteristics by providing both the spatial and time dependences of deformation within the slices. The sensor measurements were verified by measuring the banana surface deformation using computer vision. This is the first sensor in the literature that can measure the real-time sub-surface deformation of soft food samples during drying. The presented fibre optical strain sensor has a high potential to contribute to improving both fundamental understanding and process monitoring of food drying processes.

that synergises mobile robotics and mechanical arm technology, to enable exact feed dispensation within rabbit hutches by precisely quantifying feed volume. Inspired by current industrial advancements, the design integrates a mobile robot with a robotic arm and a quantitative distribution apparatus,

culminating in the development of the rabbit feeding robot. Navigation for this robot is facilitated by pre-set magnetic strip tracks, enabling it to autonomously

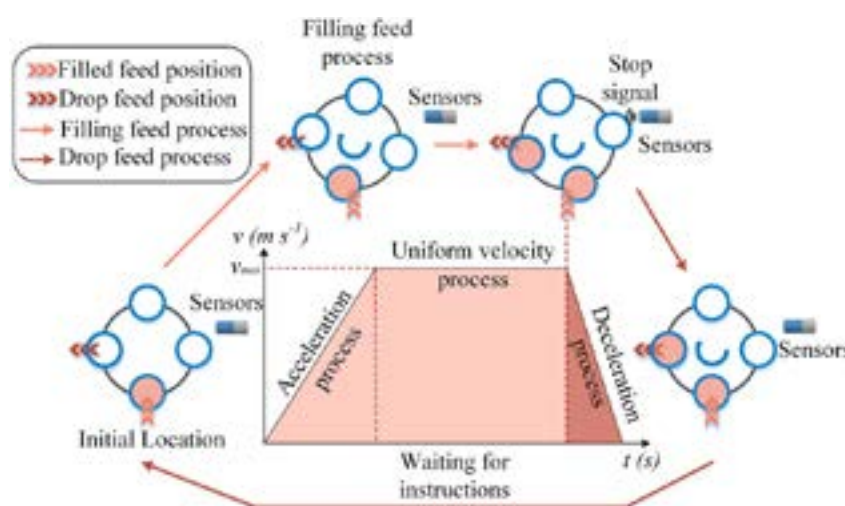


Fig 4 - A conceptual schematic for the feed control flow and the algorithm used to drive the feed quantitative distribution device (robot).

Biosystems Engineering

Volume 239, March 2024, Pages 68-80

Rabbit feeding robot: Autonomous navigation and precision feeding

Wei Jiang, Hongyun Hao, Jiayu Fan,
Liangju Wang, Hongying Wang

College of Engineering, China Agricultural
University, Beijing, China

Highlights

- The design and development of an unsupervised rabbit feeding robot is presented.
- The robot achieved a quantitative error of 4.3% and a low breakage rate.
- The feasibility has been validated in a real farming environment

Feeding remains a critical component in rabbit farming and precise feeding is imperative, to maximise feed efficiency, curtail farming expenses, reduce disease prevalence and mortality rates, and lessen environmental pollution. This study presents the design and development of a rabbit feeding robot

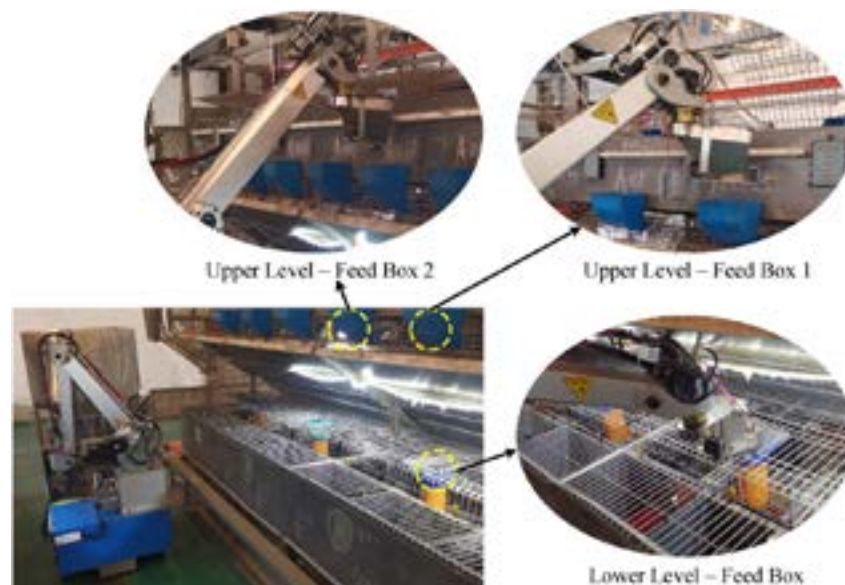


fig 5 - Images of the robot operating in autonomous mode within a rabbit production system, with the distribution arm servicing both upper and lower level feed boxes.

pause at designated feeding points to commence the feeding procedure. At each feeding point, the robot is tasked with dispensing feed into three separate boxes, thereby fulfilling the feeding requirements of the entire rabbit facility as per a prearranged feeding schedule. Experimental outcomes, garnered within a rabbit hutch, revealed that the mobile robot operated at velocities between 0.05 and 0.20 m s⁻¹. And very small speed and deviational errors during operation. The rabbit feeding robot demonstrated a feed quantitative error of 4.3%. At a designated feeding point, the time cycles for dispensing feed across three boxes were recorded as 40.6 s, 50.1 s, and 24.3 s, achieving success rates of 96.3%, 98.8 %, and 100.0 %, respectively. It was also noted that the robot developed for this purpose notably both minimised feed fragmentation and mitigated stress responses in rabbits, as well as facilitating unsupervised, precise feeding tailored to varied dietary needs. These results substantiate the practical applicability of the rabbit feeding robot in farming production, thus fostering the progression of intelligent agricultural practices.

Biosystems Engineering

Volume 240, April 2024, Pages 111-122

Vibration modelling and testing of off-road vehicle incorporating coupled roll and pitch vibrations

Peng Huang, Yanchun Yao, Weijia Xiu, Jida Wu, Duanyang Geng, Zihan Yang, Yongsheng Li

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Luoyang Smart Agricultural Equipment Institute Co. Ltd., Luoyang, PR China
Agricultural Equipment Research Institute of Shandong Wuzheng Group, Rizhao, PR China

Highlights

- A vibration modelling approach of off-road vehicles is proposed.
- The coupling vibration of pitch and roll is considered.
- The methodology for acquiring tractor dynamic parameters has been elucidated.
- An analysis of both time domain and frequency domain results validated the model.

To investigate the vibration characteristics of off-road vehicles resulting from external excitations, this study explored a novel vibration modelling approach

that accounts for the coupling of roll and pitch using a ratio tractor prototype (1:18). A vibration mathematical model and simulation model were developed, taking into account the coupled vibrations in both roll and pitch directions. The mathematical model of the tractor was validated, affirming the accuracy of the off-road vehicle modelling method. A low-frequency vibration test was conducted, and the results were analysed in both the time domain and frequency domains. Key parameters of the tractor, including tyre damping, tyre stiffness, centroid, inertia, and road roughness, were acquired through the experimental testing. Upon comparing the numerical simulation model results with the experimental data, the findings reveal a 6.2% error between the left front axle test data and the simulation, and a 6.1% error for the right front axle. The vertical vibration primary frequency in the test was 13.1 Hz, while the numerical

simulation model registered 11.8 Hz, resulting in a relative error of 10%. Overall, the numerical simulation model was consistent with the experimental results on the model tractor.

The comparison and analysis of theoretical and experimental results served to validate the efficacy of the dynamic tractor model and simulation and established a foundation of reliability for the dynamic modelling and simulation employed. These results not only affirm the accuracy of the modelling approach but also furnish valuable insights for guiding vibration control strategies in off-road vehicles. The findings contribute to the broader understanding of tractor dynamics, providing a reference point for optimising vibration control measures in practical applications. These outcomes also serve as a valuable reference for the parameter design and vibration control of off-road vehicles.

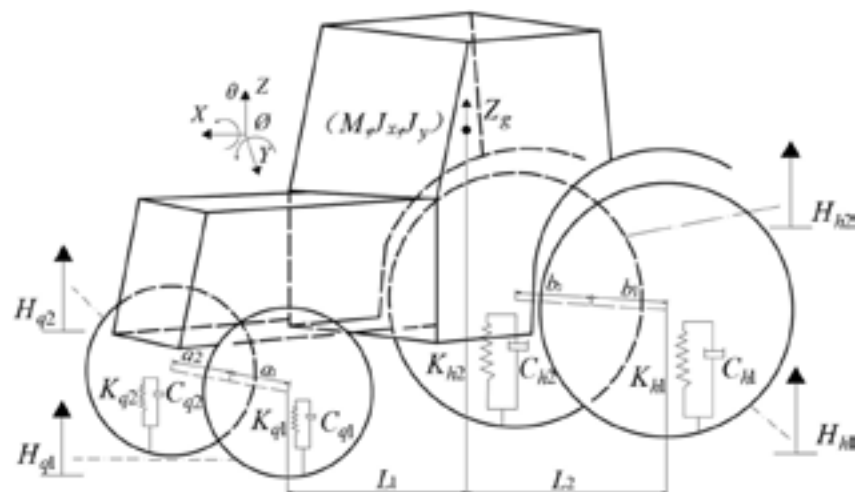


Fig 6 – Schematic of the comprehensive three-dimensional mathematical vibration model for a tractor system developed within the paper. The direction of the arrows represents the positive direction.

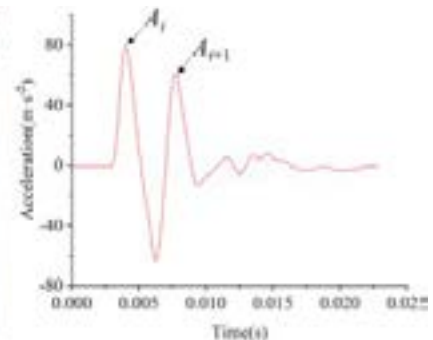


fig 7 - Example of the model prototype tractor (1:18 ratio) fitted with sensors on the front wheels to measure vibrational characteristics with shocks (small drops) that are affected by tractor tyre stiffness and damping characteristics. Bottom Right - An example of the free vibration signal obtained after dropping the tractor system during one of the tests

Innovation

From eco-friendly roofing and waste collection to AI-powered healthcare and farming, 2024 Africa Prize for Engineering Innovation finalists revealed

Four innovators from Kenya, Côte d'Ivoire and Uganda have been selected from a shortlist of 16 to compete for the Royal Academy of Engineering £50,000 Africa Prize in its tenth anniversary year.

- Their innovations address recycling in construction, AI tools for healthcare and farming, and reengineered waste collection
- The three runners up will each receive £15,000, and a £5,000 prize – titled 'One to Watch' – will be awarded to one of the shortlist whose business shows the most potential
- Since 2014 the Africa Prize has supported almost 150 entrepreneurs across 23 African countries, generating over 28,000 jobs and benefitting more than 10 million people through the innovative products and services developed

The Royal Academy of Engineering will host the final of the 10th Africa Prize for Engineering Innovation, the continent's largest engineering prize, on 13 June 2024 in Nairobi, Kenya. From an initial shortlist of 16 innovators creating sustainable, scalable engineering solutions on the continent, four finalists have been selected to present their innovations to the judges in front of both a live and online audience. Registration for this event is now open.

In 2024, the four finalists have developed solutions including an environmentally-friendly roofing material made from recycled plastic, a smart healthcare platform providing direct access to vital healthcare information via WhatsApp, a location-based mobile app connecting customers to independent agents for on-demand

rubbish collection and disposal, and a solar-powered tool using AI and machine learning-enabled cameras to detect and identify agricultural pests and diseases.

One finalist is: Esther Kimani, Kenya, Early Crop Pest and Disease Detection Device

The Early Crop Pest and Disease Detection Device is a solar-powered tool using Artificial Intelligence- and machine learning-enabled cameras to quickly detect and identify agricultural pests and diseases. This helps smallholder farmers reduce crop losses through swift remedial action.

Developed by Kenyan computer programmer Esther Kimani, the patented innovation uses continuous image capturing and analysis to alert farmers within five seconds of an infestation and suggests the best intervention.

Current diagnostic methods are expensive and can take up to three weeks to yield a result. Five million smallholder farmers in Kenya therefore lose on average 33% of their crops to pests and diseases. The situation is aggravated by

excessive use of synthetic fertilisers and chemicals, leading to soil degradation.

The device comprises a high-sensitivity solar-powered camera module connected to a computer system and mounted on an adjustable stand. The stand reaches as high as five metres, dependent on the type of crop. Esther Kimani and her team have coded a locally hosted database that can detect crop pests and pathogens.

My parents would lose up to 40% of their crops each farming season, which affected our standard of living. We are empowering smallholder farmers, many of whom are women, to increase their income. We aim to scale to one million farmers in the next five years.

Esther Kimani



Esther Kimani

Credit - Royal Academy of Engineering

EurAgEng News



Professor Richard Godwin (l)
receiving the award from Professor Peter
Groot Koerkamp (r), Executive Board member of EurAgEng

EurAgEng Award presentation – finally

At long last, during the recent IAgRE awards ceremony at New Holland, Basildon, The European Society of Agricultural Engineers (EurAgEng) was able to present, in person the Award of Merit – Scientific Understanding to Professor Richard Godwin.

This EurAgEng award is granted to an individual

- with an outstanding research record in agricultural engineering
- who made a major contribution to the Scientific Understanding of complex agricultural systems, and
- who has been recognised internationally by others in research, or in industry

The award was made in 2021 during Covid restrictions.



Dealer day has something for everyone from dealers to OEM's and students

- Following the annual Spring Meeting in Brussels, Climmar members took part in the second Dealer Day organised by Fedagrim.
- The Climmar Working Group for Education also met to discuss future developments in European cooperation for vocational education.
- At the event, Climmar's President Rinaldin presented certificates to commend the outstanding work done by some Climmar members in the field of education.

The Dealer Day attracted a large number of tractor dealers, agricultural companies and students of agriculture and agricultural mechanisation to the event, which focused on precision farming. Due to Climmar's presence two Dutch schools and around ten Dutch OEM's also took part.

There were around 150 attendees across multiple sessions, supported by the Belgian Presidency of the European Union.

The morning began with an overview by EPEC on software and the potential applications of PLC control in Isobus. In addition, ILVO conducted a workshop on data and dealers, which stimulated discussions on the evolving role

of dealers in the agri-data space. Flanders Make also contributed with a workshop on remote support options, presenting various methods, including VR headsets and smartphones, for providing remote technical support.

After a productive networking lunch,

the event featured a Jobdate session, where final year students were able to conduct speed dating style interviews with potential employers.

Following the networking sessions, AGCO presented its solutions for mixed fleets, while Jalaco Agri and Coysman shared their practical experiences of using precision farming tools.

The International Office of Thomas More concluded the day with an interesting workshop on setting up international internships. Reflecting on the event, both Fedagrim and Thomas More expressed satisfaction with the enriching experiences shared throughout the day.

Hans Verstreken, Fedagrim said, "It is gratifying to witness the fruitful exchange between students and industry stakeholders. Today, we've sown the seeds for the integration of new technologies into our curriculum, providing crucial support for this essential education".

Kris Michiels, Thomas More teacher added "It was an incredibly enlightening day, even for me as an educator. We're constantly being exposed to the latest advances in technology that enrich our teaching methods."

AgEng24 congress shaping up well

With over 200 confirmed presenting speakers and 100 poster sessions, this year's AgEng2024 conference from 1-4 July at the Agricultural University of Athens, Greece, is shaping up well.

With a theme of Agricultural Engineering Challenges in existing and new agroecosystems, the congress is organised by the Hellenic Society of Agricultural Engineers and sponsored by EurAgEng.

For more information head to ageng2024.com



People Awards



The 2024 award winners outside the New Holland Customer Centre at their Basildon plant in Essex

IAgrE Awards 2024

New Holland very kindly welcomed members and guests to their UK tractor factory and Alternative Fuels Centre of Excellence in Basildon to recognise and celebrate the achievements of Institution members and significant others in agricultural engineering.

Student awards

IAgrE CNH Industrial Award

Made on the basis of a dissertation or thesis undertaken by an undergraduate or postgraduate student as part of their studies demonstrating innovation and practical application in the land based industry.

Undergraduate Award - Aled Beech, Harper Adams University

For his final project *"Concept Development of a Control Traffic Farming Bale Depositor to fit a 1.2m Bale Width Large Square Baler"*.

Postgraduate Award - Patrick Kearns, University of Nottingham MSc Advanced Chem Eng

For his thesis *"Understanding the effects of Beta Glucan rich hydrocolloids produced from different barley milling fractions on the rheological and textural properties of Chocolate"*. Sadly Patrick couldn't attend the awards ceremony due to car trouble.

Student Project Award - James Turner, Coleg Sirgar

This award is given to the best final year project submitted as part of a course leading to ND, NVQ Level 3, or similar qualification in land-based engineering. Awarded to James Turner for his project *"Rear mounted bale loader"*.

IAgrE Safety Award - Hywel Bowen, Coleg Sirgar

This award has been established to encourage and recognise innovation in safe design or operation of equipment or processes by students studying agricultural engineering or subjects related to the application of engineering and technology to the land-based sector. Awarded to Hywel Bowen for his project *"Hydraulic Slurry Chute"*.



Aled Beech receiving his award from Rob Alker of CNH Industrial, the award sponsors.



James Turner receiving his award from President Mark Moore



Hywel Bowen receiving his award from President Mark Moore

Douglas Bomford Paper Award

The Award is offered to the author or authors of a paper which, in the previous calendar year, was published in full in the Institution journals "Landwards" and/or "Biosystems Engineering". At least one of the authors must be a member of the Institution.

The winner of the Award this year, for his contribution to the paper "Automatic detection of locomotor play in young pigs: A proof of concept" Mona L.V. Larsen, Meiqing Wang, Sam Willems, Dong Liu, Tomas Norton Biosystems Engineering, Volume 229, 2023, Pages 154-166, ISSN 1537-5110 [The link to the paper may be found here.](#)

Dr Tomas Norton FIAgrE said he and his team were honoured to receive this prestigious award from the Douglas Bomford Trust and IAgrE and he is always pleased to publish in Biosystems Engineering.



Dr Tomas Norton FIAgrE receiving his award from Vice Chair of the Douglas Bomford Trust and IAgrE President Mark Moore

Branch Meritorious Service Award

Made to members who have consistently rendered outstanding service to their Branch of the Institution or a Technical Group over a number of years.

Padraig O'Kane MIAgrE - Northern Ireland Branch - for his enthusiasm and support of the Northern Ireland Branch.

Paddy (r) was unable to attend in person so his award was presented locally by his branch Chairman Lawrence Knox (l).



The President's Award 2024 (formerly the Michael Dwyer Memorial Prize)

The prize is to a mid-career engineer who has made outstanding progress in the agricultural engineering industry. The Institution is delighted to make the award again this year:

Diogenes Antille CEng CEnv MIAgrE - for his achievements in agricultural engineering academic research.

Dio had travelled from his home in Canberra, Australia to receive this award and felt honoured to be recognised for his achievements by his peers and colleagues within IAgRE.



IAgRE Award For Contribution to the Land-based Sector 2024

This Award is made to those who have made sustained contributions to the land-based sector throughout their career.

Michael Cullen MIAgrE for his tireless contributions to the teaching of agricultural engineering and enthusiasm for the Parloursafe Milking Scheme.

Mike was delighted to receive this award and said that it had been his privilege to teach so many young people. He finds it extremely rewarding to see so many of his students creating successful careers in the land-based sector.



IAgrE Award For Contribution to the Land-based Sector 2023

Ben Taylor-Davies - "Regen Ben" for his immense contributions to the promotion of regenerative farming and soil health. Ben was able to attend and pick up his award from 2023.



The Environmental Engineer Award

An award sponsored by the Douglas Bomford Trust for an individual who has made a substantial contribution to improving any aspect of the environment

David J Cooper CEng CEnv MIAgrE - for his distinguished contribution to environmental innovation and research.

David could not attend the awards. He sent a video expressing his thanks "It's always gratifying when our work, which is very beneficial to the environment, is acknowledged and I'd like to thank the Institution for this award on behalf of myself and the team." The video is available to view on the awards webpage; <https://iagre.org/2024-awards>.



IAgrE Award For Contribution to the International Land-based Sector

This Award is an occasional award made to those who have made sustained contributions to the land-based sector outside the UK throughout their career.

Dr Linus Opara CEng FIAgrE - for his work to promote high standards in engineering across sub-saharan Africa.

Linus was unable to attend but sent a video message thanking the Institution. This is available to view on the awards webpage; <https://iagre.org/2024-awards>



The Environmental Engineer Team Award

An award sponsored by the Douglas Bomford Trust for a team who have made a substantial contribution to improving any aspect of the environment.

Severn Trent Water Soil Health Improvement Project lead by Marion Perrett-Pearson CEnv MIAgrE.

Marion was joined by farmer Simon Deacon MIAgrE to receive this award.



IVEL Award

This award is made at the LAMMA Show to a new product that demonstrates the most positive contribution to the environment.

The 2024 Award was presented to Kverneland Group UK for the PUDAMA system for precision application of fertiliser at the LAMMA show in January by CEO Charlie Nicklin.

Dan Crowe, MD at Kverneland UK was very pleased to join the celebrations.



The Honorary Fellowship Award

An Honorary Fellowship is the highest commendation awarded by the Institution. It recognises outstanding service to both the Institution and to the Agricultural Engineering Profession.

Bill Day HonFIAgrE - for his outstanding service to Biosystems Engineering and the Institution.

Bill said he was humbled and delighted to be given this Award by the Institution.



The retirement of Dr Steve Parkin and Dr Bill Day



L-R Professor Richard Godwin, Dr Steve Parkin, Dr Bill Day and Professor Paul Miller

The Institution were delighted to welcome Dr Bill Day and Dr Steve Parkin to thank them for their years of editorial work for Biosystems Engineering, the IAGrE owned learned journal.

They have steered the journal since 2007 and raised its profile and impact factor considerably.

A gift of decanter and glasses was presented to Bill & Steve by their long-standing colleagues and members of the IAGrE Publication Management Committee, Professors Richard Godwin & Paul Miller, as a small gesture of thanks from the Institution.

About the IAGrE Awards

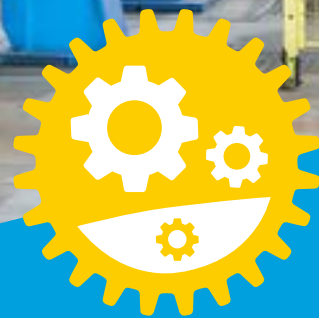
These awards recognise the outstanding contributions to agricultural engineering, associated industries and to the IAGrE. Nominations for awards are requested in the Summer from the branches, technical groups, Council, Executive and institution members. Other Awards are occasionally made on an ad hoc basis.

All nominations are put to the Awards Panel which meets before Christmas, and they select winners for approval by Executive in January.

The Awards Ceremony takes place each year in April/May.

Technical

NH Holistic
energy approach



In the last 12 months methane tractors
have been sold to over 18 different countries

Alternative Fuels

On the day before the Awards ceremony at New Hollands tractor plant in Basildon, editor Andy Newbold and IAgRE CEO Charlie Nicklin were fortunate to be able to spend some time with Tom Kindred, Platform Manager, Alternative Fuels at CNH.



A production T6.180 methane tractor awaiting dispatch

In the field

New Holland have been working on the methane tractor for over a decade now, with the first prototype being launched back in 2013.

Unlike several other manufacturers who are working on concepts for alternative fuelled tractors, you can buy a production T6.180 tractor today. In fact, in the last 12 months, we were told that they had sold production tractors to over 18 different countries.

Customer feedback for all alternative tractor fuel sources has been that it must be 'diesel analogous' to gain its place in the market.

"Some customers expect the alternative fuel tractor to be full of compromises, but are then pleasantly surprised when it performs like the diesel equivalent." Tom Kindred says.

Although many customers with Anaerobic Digester plants are running the T6.180 methane tractor, many larger AD plants want the larger prime mover methane tractor, the T7.270, which will be available in 2025.

Engineering challenges

That said, and once field performance issues have been overcome, operating range and refilling are the key drivers for customers. With this in mind, the energy density of methane (be it compressed or liquid) is a real challenge for the engineers of New Holland.

On the front of each methane tractor is the range extender, which is there to host an additional number of tanks for the gas. This enables the tractor to complete a full day's work without refuelling.

All about the gas

Typically, biogas from AD plants constitutes 55% biomethane, 45% CO₂, but it's not sufficiently dense to be used in a tractor at this point, although suitable for static engines, say for electricity generation.

It's less potent due to the CO₂ dilution at this point.

The biogas needs to be upgraded to biomethane to run a tractor.

Across Europe there are approximately 20,000 plants making biogas, with about 1000 producing biomethane.

There are also opportunities for AD plants to produce biomethane and supply to the mains gas network directly. Currently there are about 100 biomethane plants feeding gas into the UK mains gas distribution network.

It's a growth industry (since the Ukraine crisis) with the push to find more renewable sources of gas and there are lots of biomethane plants in the development pipeline.

Why renewable natural gas?

According to the Elab Thinkstep 2017 Study non-renewable natural gas (ie oil based) has a significant reduction in CO₂ emissions vs diesel of c11%.

In comparison, renewable sources of natural gas, such as biomethane reduce CO₂ emissions even further vs diesel with a reduction of between 80% and -180%, source dependent.

With approx. 113,000 dairy farms of more than 50Ha in the EU, New Holland reckon there is huge potential for on farm biomethane production. Whilst there is a challenge of lots of relatively small dairy farms with low outputs, the company is working with Bennamann towards harnessing this opportunity.

The drive towards biomethane and emission free tractors makes a lot of sense when considering New Hollands investment in the Bennamann system. This recovers and produces biomethane with fugitive methane emissions from on farm slurry storage.

Co-located R & D

One of the advantages of the Basildon site is that product development occurs alongside the production lines.

This enables design challenges to be tackled head on, with design engineers having daily on demand access to products in order to ground truth ideas quickly and in real time.

What's not to like about having 3D 1:1 scale working models next door for reference?

Key facts

CNH has 40 R & D centres globally, with 11 in Europe, of which 3 are co-located with tractor manufacturing locations at Modena in Italy, St Valentin in Austria and Basildon in the UK.



The particular focus of the Centre of Excellence at Basildon is alternative fuels and the methane tractor, but the development team of 70 engineers and technicians also work on the development and validation of standard diesel tractors. It's a global effort with engineers working across the CNH world but with particularly close collaboration with those in Modena, Italy and St Valentin, Austria.



60 years of Basildon

New Holland has recently celebrated 60 years since the opening of its tractor factory in Basildon, England, with the unveiling of a special edition tractor and the strengthening of the plant's role as the brand's Alternative Fuels Centre of Excellence, alongside its position as its global tractor production facility.

Today, a complete tractor rolls off the Basildon assembly line every five minutes, with over 10,000 different product specifications, ensuring buyers across the world – 85% of production is exported – get exactly the tractor they need.

To mark the Basildon plant's 60th birthday, maintaining a tradition that began with the Silver Jubilee 7810 of 1989 and continued with the Golden Jubilee T6.180 and T7.270 tractors of 2014, New Holland has unveiled a celebration edition T7.300 tractor. The graphics that adorn it celebrate the era in which the Basildon factory was founded, taking inspiration from the 1960s decade which saw so many leaps forward in technological advancement. Created by CNH Centro Stile, the anniversary edition's livery is inspired by the colours and patterns of 'Swinging '60s' London, with psychedelic shapes characterized by vivid and fluid colours of blue, yellow, maroon and pink around New Holland's distinctive leaf logo in bright yellow on the hood. The tractor, of which only one unit was produced was unveiled at the Basildon 60th anniversary celebratory event on April 9th, and then will be showcased at exhibitions throughout 2024.

The latest developments at Basildon include significant investment in its role as the New Holland Alternative Fuels Centre of Excellence. In 2006, the firm declared its ambition to be the 'Clean Energy Leader' in the tractor sector, and in 2021 put into production at Basildon the industry's first tractor of its type, the T6.180 Methane Power CNG, to be joined later this year by the T7.270 Methane Power CNG. These developments make possible the Energy Independent Farm, allowing biomethane captured from waste farming products such as livestock manures to be used as fuel.

"We are proud to celebrate 60 years of our plant in Basildon, that well represents the evolution of the New Holland brand, from a manufacturer of agricultural machinery to a company that advances sophisticated software technology for agriculture, fostering the brand leadership on a global level. Today Basildon is a hub for innovation, where we produce tractors that are exported worldwide, and a Centre of Excellence for Alternative Fuels, where our T6.180 Methane Power tractor is produced," says Carlo Lambro, New Holland Brand President. "As the only volume tractor producer in the UK, we are also very proud of our workforce here, with their skills, dedication and commitment. It's a milestone for the whole company and for everyone who works or has worked in the plant.



Technical

AD catch up



Only
feedstock

The need for on farm biogas

Biogas production can make a significant contribution to the replacement of fossil fuels in and around the agricultural industry in relation to energy consumption and nutrient use.

Comparing what is currently happening in the UK to the EU, despite the concerns over energy security, farm anaerobic digestion (AD) has been neglected. The approach to biogas production on farm has been neglected. RASE, in one of its recent Farm of the Future webinars, addressed this problem with a look at the problems facing the industry and how they can be addressed.

Current status

First up was Lucy Hopwood of the bioeconomy consultancy NNFCC, who started off by giving a brief overview of the market, pointing out that we now have exceeded 650 operational AD sites, around 15% of those sites are biomethane injection plants which are generally larger facilities which take feedstock from multiple sources producing



Lucy Hopwood



huge potential and that is where the future policy framework needs to open up these opportunities,” said Lucy. “For farm businesses, there are several opportunities. You can as a farm business get involved with feedstock supply which allows you to diversify the markets and your outlets for your produce. To do this you can extend the rotation and look to produce different crops for AD from break crops for example, or you can monetise waste in ways that you couldn’t otherwise, by installing and operating a digester to generate biogas which can be converted to heat and power on-site. It could also be converted to biomethane on site, by stripping out CO₂ and other gases, it can then be used in vehicles or put into the gas grid”.

A circular benefit

On a more practical front, the webinar heard from Dr Chris Mann, chairman and chief technical officer of Bennamann the innovative energy company, talked about what Bennamann is doing to reinvent anaerobic digestion for dairy farmers.

Bennamann has a different slant

on the accepted view of the livestock industry and greenhouse gases. It firmly believes that livestock are the solution, not the problem. It is looking at how we can access the methane bubbling out of slurry lagoons and use it as an opportunity to reduce the farms carbon footprint. For too long the estimated methane coming from lagoons has been grossly underestimated. On farm, AD is by far the largest climate benefit of all and provides revenue after payback in the form of valuable methane.

Chris explained: “The Bennamann system works by converting the biogas into a valuable fuel to use to drive the vehicles and generators on the farm. We cover the lagoons to collect all the gases emitted which is then cleaned using a gas filtration system. We then visit the farm once or twice a week with a mobile processing unit to upgrade it to compressed biomethane which can then be used as tractor or generator fuel on the farm. The digestate left is displacing around 50-60% of the fertiliser used on the farm. Any need for P and K is completely eradicated.

biomethane for injection into the grid. The remainder are CHP plants which are generally smaller and use feedstock generated on the site to deliver energy back to the site with the capacity for a small amount of exported energy as well. As the larger facilities are generally more efficient, this is where most of the investment has been concentrated in recent years. She also pointed out that the initial growth in plants was driven by various government schemes which have now closed, and the current incentive schemes do not appear to be encouraging further growth in the sector.

“Only 3% of the 90 million tonnes of feedstock generated from animal waste is utilised and so there is a



Chris Mann

People

Mark Moore



Meet the President

Landwards caught up with incoming President Mark Moore recently to find out a little more about his journey and thoughts for the future.

Tell us a little bit about your background?

I grew up in a rural area of North Essex where my family were involved in agriculture. As a child I used to visit the farm where my grandfather worked and was allowed to participate in activities such as potato harvesting, pea picking and collecting straw bales. The farm used Massey Ferguson 100 series tractors and I remember riding inside the cab of the MF185 while bringing straw back to the farm.

At school I guess I was considered a more practical rather than academic pupil as I left school at 16 with "O" level metalwork. When I left

school in 1980, I got an agricultural engineering apprenticeship with Eastern Tractors in Braintree, which was the local MF dealer at the time. Unfortunately, the week before I was due to start, Eastern Tractors closed the Braintree depot, and I was made redundant. 1980 was not a good time to seek employment given the UK's economic predicament and unemployment situation, so at the last minute I returned to school as a sixth former for another year.

In 1981 I obtained 8 more "O" levels and went to work for a land survey company in London. In 1982 I made the decision to leave land surveying and return to agricultural engineering because I was not

enjoying working in the city. In September 1982 I enrolled in an OND in agricultural engineering at Rycotewood College in Thame in Oxfordshire.

What led you to become an agricultural engineer?

I had always been involved in agriculture but was more enthusiastic about machinery and mechanisation than about farming. The idea of being outdoors really appealed and I was enthusiastic about the idea of working as a service technical for a dealer that represented one of the major manufacturers.



“Agricultural engineering has provided me with opportunities which no other career would have”

What about your day job now?

My current role is Director of Government Affairs for Europe, which I assumed in 2022. This is a new position in AGCO, but one that brings together all my engineering and agricultural experience. The aim is to bridge the gaps between the aspirations of policy makers, particularly around climate change and sustainable farming practices, and AGCO senior management. I worked closely with the European machinery Trade Association (CEMA) and am the secretary for the CEMA strategic committee, which is the committee that reviews legislation and regulations, and then forms responses and recommendations. There are 2 categories of policy (1) policy that impacts AGCO's ability to do business, for example, diesel engine emissions which we must comply with, and (2) policy that impacts farmers and whether there

is anything we can do to help them implement it, for example EU Farm to Fork.

Opportunities to serve

Agricultural engineering has provided me with opportunities which no other career would have. I have been fortunate to have travelled all over the world, where I have worked with farmers, governments, and research institutions to understand challenges around feeding people and develop strategies to overcome them. I have been constantly learning all the way through my career and I want to get something back.

In 2013 I became a trustee of the Douglas Bomford Trust as this provided me with an opportunity to give something back by helping support young people that want to embark on a career in agricultural engineering. The IAGre provides a fabulous

platform for networking and discussion as we have some responsibility to deliver the “tools” farmers need to maintain a secure food supply, while implementing sustainable farming practices.

What advice would you offer to anyone heading into ag engineering as a career?

Be prepared to be flexible and adapt. Agricultural engineers need to be dynamic as we are helping farmers produce food in a situation where nature can have a dramatic impact.

This is but a small part of Mark's interview. Hear it in full on the Landwards Podcast, including his views on getting into the industry, the journey with precision farming and what the future holds.

The Landwards podcast

The Landwards podcast is on **iTunes, Spotify** or *click on*

<https://www.buzzsprout.com/1067353/episodes>

for the latest one.



People

Dr Linus Opara
CEng FIAGR



Umezuruike Linus Opara

A long serving IAGR member (since 1997), he works as a distinguished Professor and SARChI Chair in Postharvest Technology at Stellenbosch University in South Africa.*

Linus frequently publishes papers in Biosystems Engineering and is a great advocate for the Agricultural

Engineering discipline in Africa and across the world.

More recently, the IAGR has built its association with Linus through the Pan African Society of Agricultural

passion for developing the next generation and frequently speaks at conferences and influences government thinking on the role of the Agricultural Engineering discipline as a means of building food security across the continent.

The IAgRE is delighted to make this award to Dr Opara and fully supports the discipline of Agricultural Engineering in the African continent. The award also recognises agricultural engineers role in taking forward initiatives that will help to meet the United Nations sustainability goals of which “Freedom from Hunger” is a vital component.

** (South African Research Chairs Initiative, established by the country's Department of Science and Technology [now Science and Innovation] and National Research Foundation (NRF) in 2006.)*



Winner of this years IAgRE Award For Contribution to the International Land-based Sector

Engineering (AfroAgEng) where he was one of the founding fathers and immediate past president. This has enabled IAgRE to become involved with the Royal Academy of Engineering activities to promote engineering in Africa and as such has raised the profile of IAgRE as a professional body not just in the UK but in Africa. Through this, the importance of the agricultural engineering discipline has risen up the agenda and is considered with

more priority than it has been for many years.

Agricultural engineering advocate

With this background, Linus remains a huge advocate for promoting Agricultural Engineering across the continent of Africa and is very well regarded for his work in this area. He is very well respected for his

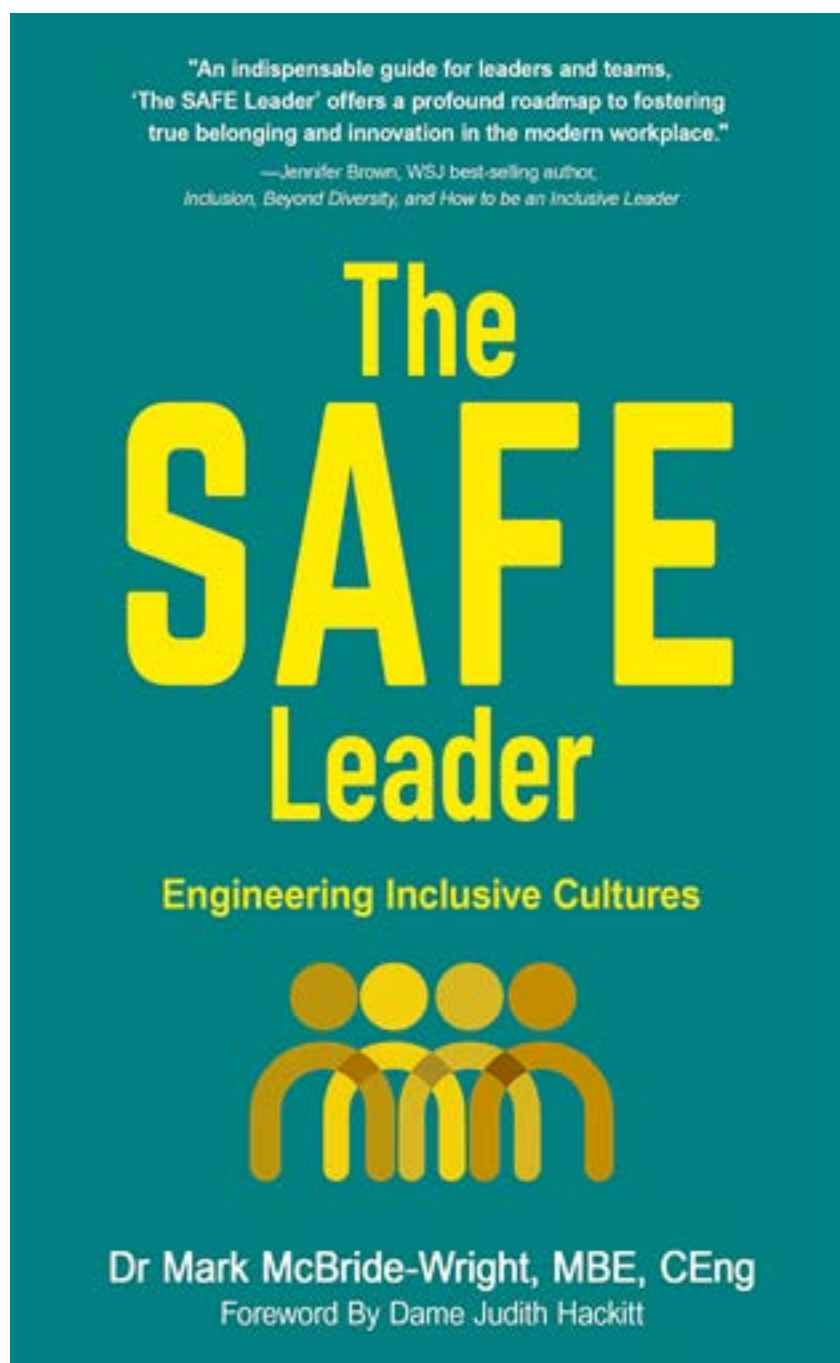
Dr Opara is very well respected for his passion for developing the next generation and frequently speaks at conferences and influences government thinking on the role of the Agricultural Engineering discipline as a means of building food security across the continent.

Book Review

The Safe Leader



Dr Mark McBride-Wright MBE,
CEng, MIChemE



The SAFE leader – Engineering Inclusive Cultures

Its fair to say, and this is not, solely an IAgRE comment, that engineering has historically, and in many cases still is rather ‘male, pale and stale’, so this book should be on the recommended reading list for engineers at all levels. Andy Newbold settled down to a challenging read.

Dame Judith Hackett DBE, FREng, FIChemE, FCGI and chair of the Health and Safety Executive says in her foreword to the book: Mark brings much-needed attention to several aspects of STEM which are

often overlooked but which are fundamentally vital: the intersection of culture, masculinity, mental health, and safety.

As mental health climbs the agenda

at work and in society, this book seeks to stimulate debate around issues of inclusion and giving a platform at work where every voice is valued, heard and respected.

The author starts the book with his mission statement “Build physically and psychologically SAFE teams and organisations.” Sadly no one can take issue with his premise that the engineering sector lack diversity and inclusion with many groups under-represented.

The engineering discipline is in the main missing out on the richness of diverse teams, due to confirmation bias appointing and promoting ‘people like us’.

The books premise is to encourage leaders and stakeholders to understand the need for Diversity, Equity and Inclusion.

Written by an engineer, as you would expect it is clear, and thorough with a step by step walk through the issues, challenges and an engineered solution to action change.

There is a lot to take in when reading the book, particularly the overwhelming statistics around gender and ethnicity in engineering coupled with research results around mental health and suicide. It’s not a relaxing read, but it is a worthwhile one.

The reviewer has struggled to write a concise review, but if you care about mental health and work, and culture and DEI, this is a must read.

About the author

Dr Mark McBride-Wright MBE CEng MChemE is a recognised diversity and inclusion leader. He is the recipient of the prestigious Rooke Award from the Royal Academy of Engineering in July 2022 for his work in promoting in engineering to the public. In June 2023 he was awarded an MBE for services to Diversity, Equity and Inclusion in the King’s Birthday Honours. He is a Visiting Professor of Inclusive Engineering Leadership at University College London, and author of The SAFE Leader© (Released in March 2024).

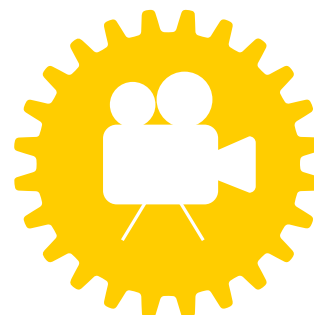
He is Founder and Managing Director of EqualEngineers, a company offering a wide array of diversity & inclusion consultancy and training services, as well as creative events. Mark has delivered over 50 Engineering & Technology careers fairs since 2017 connecting over 10,000 diverse opportunity-seekers with over 100 inclusive employers. Mark also founded the Equality in Engineering conference, and the Engineering Talent Awards, and established the Masculinity in Engineering research theme leading to a new way to deliver more impactful positive interventions on organisational culture change. EqualEngineers has trained thousands of engineers on creating inclusive cultures from front line leaders and operatives to senior leadership and executive teams. Clients include EDF Energy, SSE, Eurostar, GKN Aerospace, Institution of Mechanical Engineers amongst others.

Mark is a Chartered Engineer (IChemE) by training with a focus on health and safety, having worked at KBR Inc (2013-2017) and ERM (2012-2013) before pursuing his work in diversity. He also holds a doctorate (PhD) in chemical engineering at Imperial College London (2009-2013).

Lunchtime lecture

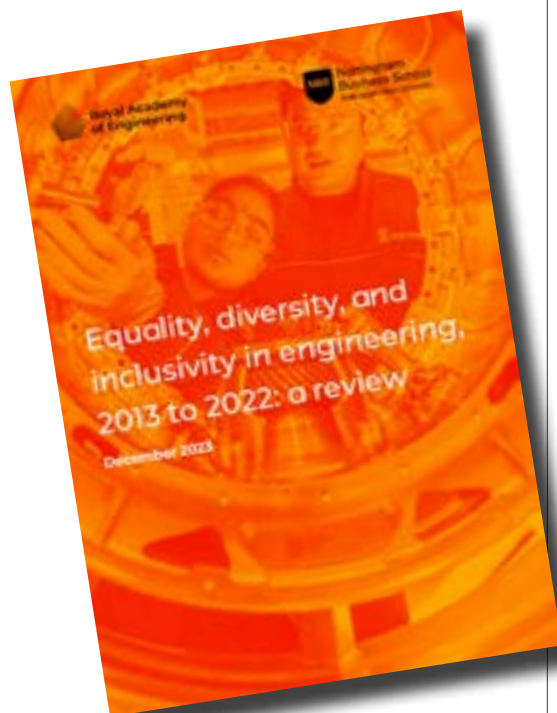
The author is planning to deliver a lunchtime lecture for the Institution on the 9th July. If you would like to know more click here

<https://iagre.org/events/LLJuly2024>



As mental health climbs the agenda at work and in society, this book seeks to stimulate debate around issues of inclusion and giving a platform at work where every voice is valued, heard and respected.

Now & Then



BUSINESS MATTERS

Qualified engineers in Britain — the Engineering Council 1989 survey

by J B Finney

The 1989 survey indicates that the status of engineers in Britain is rising in pay and position terms and that the profession is giving a high level of job satisfaction. The overall conclusion is that the British engineering profession is in good heart.

At a Press Conference in London on 17 October 1989 the results of the latest survey of qualified engineers in Britain were presented by the Director General of the Engineering Council, Mr Denis Filer, the Director – Engineering Profession, Professor Jack Levy, and Mr Peter Stevens of Remuneration Economics who conducted the survey. There were representatives present from some of the engineering institutions, a large number of specialist publications, and 5 national daily papers.

Women engineers – too few to be yet included

The biennial survey sampled 27,000 of the 189,000 registered engineers and technicians under the age of 65 with UK addresses. Those outside the United Kingdom were not included. The total number on the Council's register is 285,000. Women were not included in the sample because numbers were so small as to have little meaning when divided between the categories of the survey. With 11% of those studying engineering in higher education now being women, however, this position will clearly change as the present students become registered with the Engineering Council.

Categories covered by the survey include: earnings, employment, occupation, unemployment, qualifications, location, levels

of responsibility, knowledge of languages, trade union membership, fringe benefits, overtime, further training and career attitudes.

Survey of earnings

A major part of the survey concerns engineers' earnings.

The median earnings for Chartered Engineers increased 1% faster during the last 2 years than the average earnings index published in the Employment Gazette. Median earnings for Incorporated Engineers fell back by 1% in a similar comparison. The average total earnings per year were £24,708 for Chartered Engineers and £17,825 for Incorporated Engineers, compared to £20,387 and £15,524 respectively in the 1987 survey.

Some 64% of all Chartered Engineers are now earning more than £20,000, 37% earn more than £25,000 and 21% are now earning more than £30,000. There was evidence that qualifications, including post-graduate qualifications, were reflected in the earning capacity of engineers.

Unemployment, particularly among Incorporated Engineers, has fallen, with only 0.6% of engineers in the two groups being unemployed on the survey date of 1 April 1989.

Wider employer awareness of qualifications

There was evidence that employers who have been traditionally aware of the C-Eng status

are now becoming equally aware of I-Eng and Eng.Tech.

The awareness figure was about 40%, so that there is still clearly room for further raising the awareness of Engineering Council standards among employers.

Language ability – basic rather than fluent

Other points made in the survey included comments on language ability when 40% of Chartered Engineers were said to have a basic knowledge of a foreign language, although this fell to less than 2% of all engineers at the standard of fluency. There has been an increase in the number of company cars available to engineers and a slight decline in trade union membership by engineers.

Highest median earnings for Chartered Engineers were in the armed forces, followed by the self-employed and then the nationalised industries. The range across these 3 groups on a median basis was less than £3,000 per annum.

The status of engineers is rising in pay and position terms. Some 9,500 registered engineers are now chief executives. Two-thirds of engineers would recommend engineering as a profession, quoting job satisfaction as the main reason. One in 8 engineers takes part in school liaison work to encourage the next generation.

The overall conclusion was that the engineering profession is in good heart.

The report runs to 66 pages of A4, and is priced at £100. A copy is available on loan from the Institution offices in Silsoe.

continued from previous page

7/32 inch or 1/4 inch diameter nozzles operating at ± 350 kPa. Reference to Figure 2 highlights the inadvisability of using this design. However, the problem has been overcome by substituting a combination of either 13/64 \times 1/32 inch or 5/8 \times 1/2 inch double nozzles, which result in a good pattern of uniformity without the need for alterations to pump or motor.

Generally, if one considers uniformity of distribution, capital cost and ease of management, the tests have shown the wisdom of designs embodying an 18 \times 12 in spacing with 4.0 mm or 5/32 inch diameter single nozzle operating at 320 kPa on light soils or a 4.5 mm or 15/64 inch diameter nozzle operating at 330 and 340 kPa respectively on heavier soils.

Careful management still all important

Poor performance under strong winds appears to be unavoidable, but can to some extent be overcome by careful management in the field; that is, by moving the sprinkler positions by half their design positions half-way through the normal "on" time. The move must be made as near as possible at right angles to the direction of wind. That is to say that, depending on wind direction, one should examine the effect of either moving sprinkler positions within the line or of moving the position of the line itself. The former is accomplished by removing, at the start of the lateral line, a section of piping equivalent to half the distance between sprinklers, the latter by adding or subtracting half the length of the header line and then

repositioning the lateral line.

It is also essential to ensure that those areas irrigated at night are relegated to daylight irrigation in the subsequent cycle. This takes place automatically where the designed cycle includes a half day such as 7.5 or 8.5 days, etc.

Efficiency also demands that shortly after the start of each set, a check is made to ensure that there are no leaks at joints, hydrants, etc., and that the correct pressure is maintained throughout the set.

Acknowledgement

I would like to express my appreciation to the late Gavin Wilson who very ably undertook the analysis of all field tests listed in this article.

AGRICULTURAL ENGINEER  504 15. SPRING 1990

9

Now and then - Equality and pay

Recently the editor decided to have a rummage through the back catalogue of Institution publications and came across the Spring 1990 edition of the Agricultural Engineer, Landward's predecessor.

Back in 1990 the Engineering Councils survey said 'women were not included in the sample because numbers were so small as to have little meaning when divided with the categories of the survey'. It continued 'With 11% of those studying engineering in higher education being women, however, this position will clearly change'.

Fast forward to today and the most prominent theme of The Royal Academy of Engineering's (RAE) recent review of Equality, diversity, and inclusivity in engineering, 2013 to 2022, is that of gender inequality.

In 2021 only 16.5% of people in engineering roles were women. By way of comparison around 7% of the Institution's membership are female.

The challenge for us as an Institution is what can we do about this?

The RAE report can be found here:

<https://raeng.org.uk/media/pitehtfm/equality-diversity-and-inclusivity-and-engineering-2013-2023-a-review.pdf>

Engineers Pay

There's nothing guaranteed to get an engineer hot under the collar than what they do, or don't receive as a salary. Interestingly back in 1990 page 9 includes the surveys findings on wages. It says:

Some 64% of all Chartered Engineers are now earning more than £20,000, 37% earn more than £25,000 and 21% are now earning more than £30,000. There was evidence that qualifications, including post-graduate qualifications were reflected in the earning capacity of engineers.

Unemployment, particularly among Incorporated Engineers, has fallen, with only 0.6% of engineers in the two groups being unemployed on the survey date of 1 April 1989.

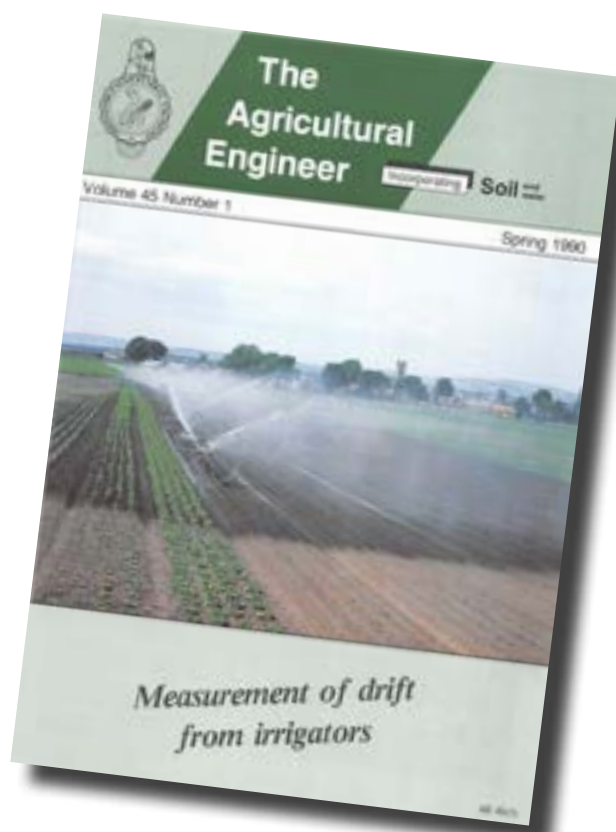
In comparison theengineer.co.uk's annual salary survey points to an average salary across all sectors of £65k and that:

- 44% of UK engineers are actively considering a change of job
- 78% of UK engineers have received a pay increase in the past 12 months
- 51% of respondents would consider taking a role overseas
- 54% of UK engineers have received a bonus in the past months.

Read the full article here:

<https://www.theengineer.co.uk/content/news/salary-survey-the-average-uk-engineering-salary-increases-to-65k>

Did you know?



Landwards back issues 1958 to date (including the Agricultural Engineer (1970 to 1996), the Journal and Proceedings of the Institution of Agricultural Engineers (1960-1969) and the Journal and Proceedings of the IBAE (1958-1959) are available online in the members area of the IAgRE website and can be downloaded as pdfs.

See <https://iagre.org/your-account>

In 1990

The median earnings for Chartered Engineers increased 1% faster during the last 2 years than the average earnings index published in the Employment Gazette. Median earnings for Incorporated Engineers fell back by 1% in a similar comparison. The average total earnings per year were £24,705 for Chartered Engineers and £17,825 for Incorporated Engineers, compared to £20,387 and £15,124 respectively in 1987.

Professional

The Douglas Bomford Trust

First, the AgriFood Charities Partnership (AFCP) 2024 Student Forum took place at NIAB Park Farm, Cambridge on 13th March. A significant proportion of both the presentations and posters were by PhD students supported by the Douglas Bomford Trust (DBT), namely:

Presentations: Bethany O'Sullivan (University of Nottingham) "Conservation agriculture: the soil and the crops"; Ana Prada Barrio (Harper Adams University) "The effects of traffic and tillage management systems on soil organic carbon dynamics"; and Scott Fraser Ewing (University of Glasgow). "Investigating the effects of novel light treatments on crop growth".

Posters: Edwin Toreveyi (Harper Adams University). "The potential for pre-harvest prediction of potato storage disorders"; Josie Lynch (University of Worcester). "Quantifying soil erosion volume using drones"; Theo Welby (Cranfield University).

"Evaluating efficacy of carbon capture based organo-mineral fertilisers (OMF) to meet crop demands"; Callum Lennox (University of Lincoln). "The development of a real-time vision-based spot spraying platform for high efficiency and precision weed management"; Wing Ng (Hartpury University & UWE Bristol). "Achieving net zero through farm level carbon assessment"; Daniel Evans (Cranfield University). "Developing the use of drone-based synthetic aperture radar (UAV&RADAR) for soil moisture assessment"; and, Aaron Ainsworth (University of Birmingham). "Sourcing the next generation of lubricants: exploring the potential of new natural sources of lubricants for industrial applications".

Student Forum

Technical Secretary to the Douglas Bomford Trust David R White has lots to report this quarter.

Well done to everybody. We wish them continued success in their studies.

Travel award result

Sven Peets, Senior Lecturer in Mechatronics, Engineering Department, Harper Adams University, attended the DEWESoft 2024 Measurement Conference in Laško, Slovenia on the 15–19 April. It brought together engineers from all over the world who had a common professional interest in DEWESoft data acquisition solutions. There were technical presentations on products and measurement techniques, equipment displays and user show cases ranging from automotive to space applications. Key highlights were: automotive buses will change to zonal architecture in the future; Open Data Acquisition Platform enables seamless integration of different data acquisition devices; contemporary high-speed data acquisition instruments enable user-friendly integration with industrial real-time control systems over EtherCAT. "A sincere thank you to DEWESoft UK for the invitation, and the Douglas Bomford Trust for the Travel Award.

Student trip to the United States

In April 2024, 6 final year Harper Adams University (HAU) MEng students, Rhodri Williams, Luke Waldram, Harry Rigby, Charlie Jackson, Dominic Neal, and Kelly Billington visited Mississippi State University (MSU) for 2 weeks.

Based at the Agricultural Autonomy Institute (AAI) which is focused on Agricultural Autonomy, supporting Precision Agriculture and more sustainable farming practices. With contributions from industrial partners, researchers, academics and MSU students they work on a range of autonomy projects for different areas of agricultural needs.

Many of their projects were applied to American grown crops, such as cotton, and a fully autonomous boat for scanning and surveying lakes and waterbodies. Based on the HAU Hands Free Hectare project, MSU have recently set up their own Autonomous Acres Proving Ground. The initial contact with MSU was made by Kit Franklin (HAU Senior Engagement Fellow and IAgRE President Elect) and the visit was organised by the students.



Vehicle data acquisition set-up

The students met MSU students and academics, industrial partners, and University Alumni. They worked with Alex Thomasson (AAI) Director and Madison Dixon (AAI) Associate Director.

MSU students will visit Harper Adams in June 2024, where they will engage with HAU projects and culture.

Rhodri summed it up “The culture is very different. It was interesting to experience a different student life and different rural areas. A fascinating trip, and I look forward to seeking further opportunities in



Standing L to R: Dominic, Harry, Charlie, Rhodri and Luke. Kneeling: Kelly



Standing: Richard Robinson and David R White. Seated: Rhodri, Elsa, Jack, Ben, Tom and Ilan. David R White, Douglas Bomford Trust Technical Secretary

the near future with MSU. Thank you DBT for the continued support”. The DBT supported the travel for the trip.

Scholarships awarded

May saw 6 Douglas Bomford Trust Scholarships presented by DBT Trustee, Richard Robinson, to engineering undergraduate students Tom Edwards, Jack Hughson, Elsa Marsh, Ben Middleton, Ilan Williams, and Rhodri Williams at the Harper Adams University Scholarship Presentation. Congratulations to all: the Trust looks forward to receiving updates on how the awards make a difference to your studies and career development.



For further information, see the Trust's website: www.dbt.org.uk or contact the Technical Secretary

David R White via: enquiries@dbt.org.uk

You can also follow:

[@BomfordTrust](#)

on 'X' and on LinkedIn, for news of interesting events, opportunities, or developments.

New Technology



Drone launch expands aerial crop protection capabilities

DJI, a world leader in civilian drones and creative camera technology, has announced the international launch of the Agras T50 and Agras T25 drones.

Building on the existing drone line, the company claims the T50 offers unmatched efficiency for larger-scale growing operations, while the

lightweight T25 is designed to be more portable for smaller fields. Both drones are compatible with the upgraded SmartFarm app

which offers powerful features for comprehensive aerial application management.

Data privacy

DJI places the highest priority on data privacy – and puts customers in control of their data's use. No flight logs, photos, or videos are synced with DJI by default. DJI Agras drones are designed to store data locally in the remote control and the drone. Operators must opt-in to share or store their data on DJI servers.

For users outside of the Chinese mainland, drone data shared with DJI are housed in U.S., Japan, and Europe servers (depending on where the user is based) and TLS-protected. Any personal data shared for account registration is further secured with AES-256 encryption. Operators can easily delete any data they have shared through their DJI account or by contacting DJI Support. Since 2017, they have regularly submitted our products for third-party security audits and certification, including Booz Allen Hamilton, FTI Consulting, and Kivu Consulting.



Whilst drone spraying remains prohibited in the UK, elsewhere in the world it is gaining traction

T50's dual atomization spraying system, with an increased flow rate of up to 16 litres per minute with two sprinklers and adjustable-sized spray droplets, is ideal for a variety of applications from fields to orchards. Easily converted to its spreading configuration, the T50 can carry 50kg of dry granules and spread at a flow rate of up to 108kg/min² or 1.5 tonnes per hour². This combination of power, precision, and versatility sets T50 apart as a top choice in

agricultural drones, designed to meet the evolving needs of modern farming.

T50 features dual Active Phased Array Radars and binocular vision sensors. These work together to accurately reconstruct the T50's surroundings and detect nearby obstacles, for intelligent obstacle sensing and bypassing, and terrain following over slopes.

The Agras T25 packs all the advanced features of the T50 into a smaller, portable design. It can carry a 20kg spraying or 25kg spreading payload.

The DJI SmartFarm app streamlines daily drone operations for crop protection and plot management with enhanced data visualization and reporting, a dynamic device management dashboard, and easy access to after sales support and learning resources on DJI Academy.

New robotic platform drives practical autonomous agricultural systems

The DLG (German Agricultural Society) is launching its new FarmRobotix platform at the DLG Feldtage trade fair.

FarmRobotix offers an international platform for farmers and experts seeking compact and comprehensive information on the latest developments in robotics, AI, automation and digital solutions in crop production. Aimed at farmers, manufacturers, start-ups and technology providers, FarmRobotix also offers representatives from science and research as well as development engineers, investors and venture capitalists the opportunity to network, share knowledge and explore innovative technologies.

Florian Schiller, an expert in digitalisation at the International DLG Crop Production Centre (IPZ) in Bernburg, Saxony-Anhalt, says that FarmRobotix is a platform, which focuses on farming requirements for digital technologies.

Ultimately, digital technologies should be practical tools to make the day-to-day operational work of agricultural entrepreneurs more efficient, simpler and less time-consuming and labour-intensive.

The goal is more user-friendliness for digital tools “There are currently a large number of digital solutions available to farmers for various crop cultivation tasks,” explains Schiller.

“However, their application requires prior knowledge on the part of the user. This is because each provider of digital solutions typically supplies a customised software system for using the digital tools and the data. “For agricultural farming entrepreneurs, this means that the number of software applications they need to master potentially increases with every digital tool they introduce on their farm,” explains

Schiller. “the FarmRobotix platform can play a role in providing impetus in the dialogue between farmers, manufacturers and science in order to make the digital applications of

different manufacturers compatible with each other,” adds Schiller. Another important issue for robotics in general is the large-scale application on farm land. There are



Florian Schiller, International DLG Crop Production Centre (IPZ) Germany

already robotic solutions for seeding and for mechanical crop protection. However, according to Schiller, these are generally applications that are used on a small scale.

AI in agriculture requires highly specialised training in contrast to some other industries, the use of autonomous systems in agriculture is still at the pilot and research stage. This is mainly due to the fact that an agricultural robot has to perform more complex tasks than a robot used in industrial production, for example.



Innovation can help mitigate methane emissions, Lords inquiry hears

UK Agri-Tech Centre CEO, Phil Bicknell gave evidence to the House of Lords environment and climate change committee as part of their inquiry on methane.

The UK Agri-Tech Centre has published reports on potential actions farmers can take to reduce emissions and the innovation pipeline that will help the livestock sector reach net zero. The Centre is involved in trials and projects aimed at reducing methane emissions through breeding, such as the low-methane sheep project, and feed additives, such as the “Dancing with Daffodils” project.

Phil Bicknell said: “It is important to remember that livestock production systems are diverse and that ruminant animals don’t just emit methane: they are

valuable because they take low-quality feed, such as grass, and turn it into a high-quality and nutrient-dense product.

“Calculating methane emissions from agriculture is complex; it is all very well to generate national figures, but what happens at a farm level is very important. There are pros and cons in the current emissions calculators for farmers, but we do have better information than was previously the case.

“Different approaches are being used to monitor methane emission levels, such as closed chambers, sniff techniques and handheld lasers, and there are different trials and opportunities being developed. The technology isn’t quite there yet but the cost and accessibility are improving all the time.



Phil Bicknell - UK Agri-Tech Centre CEO

Membership Matters

East Midlands Branch

Branch visit to Claas Eastern

Report by Mark Palmer

Claas Eastern Ltd hosted the IAgRE East Midlands Branch for a dealer visit at their new Ulceby Cross dealership on Tuesday 7th May 2024. It was well attended with a total of 26 attendees, some travelling for over an hour and a half to get there.

The evening began with a presentation detailing the companies history, from 1913 when the company was founded by August Claas right through to present day where the global organisation employs over 12,000 people. Attendees were pleased to hear that Claas is still very much a family owned business. After an overview of the Claas product range, the final section talked about the Digital Solutions on offer, including GPS Steering and telematics, as well

as a glimpse into the future with autonomy and Claas Connect 3.0.

The presentation was followed by a tour of the dealership, led by both the Parts and Service Manager at Ulceby Cross. This demonstrated the significant investment Claas puts into its dealerships, with a large parts warehouse and an overhead crane in the workshop, to ensure they are able to support the customers to the best of their ability.

Finally, attendees were shown around a brand new Claas Lexion 8700 combine harvester and Convio Flex cutter-bar, by the Ulceby Cross Sales Manager. The evening was then closed with some refreshments before a vote of thanks for an informative and enjoyable meeting.

Northern Ireland Branch

Effects of reducing traffic and tillage on agricultural land

Report by Terence Chambers

Dr Paula Misiewicz, Senior Lecturer in Soil and Water Management and Agri-Tech Research Lead at Harper Adams University recently addressed members and guests of the Northern Ireland Branch of IAgRE on the subject of "Reducing agricultural

traffic and tillage in arable and grassland production systems."

In her role, within the Crop and Environmental Sciences and Engineering Departments at Harper Adams, Dr Misiewicz has been directly involved, since 2012, in research quantifying the effects of traffic and tillage on agricultural land.

The importance of soils

Dr Misiewicz commenced by emphasising the importance of protecting the scarce and vital resource of soil which is the foundation for up to 99% of our world food supplies. Up to 75% of soils are believed to be already substantially degraded. The role of soil in controlling ground water movement and holding it to support crop growth is unique and vital. Across the earth's surface its total volume for a 200mm deep soil layer over 8,400km², is equivalent to a 25km diameter sphere!

Dr Misiewicz continued to give a fascinating view on the history and progress of the project.

The meeting closed with sincere thanks to Dr. Misiewicz for her excellent / most enjoyable





Peter Frost , Dr Paula Misiewicz and Lawrence Knox IAgRE Branch Chairman

presentation and to AFBI for use of their impressive venue.

Due to space constraints the full report is online : <https://iagre.org/northern-ireland-branch>

Northern Ireland Branch

Branch visit to RL Produce Newtownards

Report by Terence Chambers

N. Ireland IAgRE Branch members recently enjoyed a visit to RL Produce at Newtownards, Co. Down. This told the story of the business's

origins in 1980 and its continuous development to now being a main specialist supplier of fresh horticultural produce. Roy Lyttle left school in 1976 and started the business, with just 2 acres at his present HQ site, from 1980. His wife Sheila joined him, after their marriage in 1984, to be part of the business in addition to her teaching career. Their son, Alexander, joined the family business in 2015 following his 2 years of formal study at CAFRE Greenmount and more than a year of work experience in both New Zealand and Australia. He now manages the soil care and crop production part of the business.

The company initially sold their produce to retailers through the traditional Belfast fruit and vegetable market. In 1993 they began directly supplying the, then Stewarts Supermarket chain, and when it was acquired in 1997 by Tesco, they further developed direct farm contract sales with them. RL Produce became a limited company in 2004 and now also supplies Avondale Foods (Craigavon), Nature's Best (Drogheda), Henderson Food (Newtownabbey), and a range of other wholesale and independent outlets.

The visit went on to consider the land, cropping system, crop protection, cultivations, harvesting, production and packing, recycling, energy efficiency and the importance of local food production.

After a very enjoyable and informative guided tour, of the storage and processing facilities, the group thanked both Sheila and Alex for their warm hospitality and for sharing with us the details of their company's formation, expansion and everyday working activities.

Due to space constraints the full report is online : <https://iagre.org/northern-ireland-branch>



Alex Lyttle explains cool storage at RL Produce

Western Branch

Bygone days and mega scale bulk handling

Report by Mike Whiting

“Why haven’t I been here before” and “you need a full day’s visit” were the responses during lunch after a visit to Oakham Treasures at Portbury. The museum is one of the largest privately owned displays that specialises in rural and farming related memorabilia. Western Branch members found exhibits which took them back to their youth and reignited memories of the ‘salad days’. Displays include tractors, cars, and farm machinery dating back to 1910. There were sections dedicated solely to tractor toolboxes, tractor seats and spanners. Fifth generation West Country farmer Keith Sherrell is the owner who has travelled the UK and surfed the internet to source new items.

We were greeted at the Agricultural Bulk Storage (ABS) offices by Trade Manager, James Reeson who has 30 years-experience with the business. The Severn Estuary has the 2nd highest tidal range in the world, spanning 15m. Hence time management and efficiency drives decision making. The Avonmouth and Portbury docks were purchased by entrepreneurs Terence Mordaunt and David Ord in 1991 from Bristol Council. With the docks previously losing money, Mordaunt and Ord created The Bristol Port Company (BPC), setting their sights on exploiting the benefits of the location. This includes berthing ‘Panamax’ vessels with up to 130,000 tonnes dead weight, their draft descending 14.m below the waterline. Two 25 tonne grab bulk unloaders mounted within gantry framework can quickly achieve a combined unloading capacity of

2000 tonnes per hour. Product flow stops momentarily as material is check weighed through 25 tonne inline scales. Emphasising the fact that BPC principally acts as a warehousing facility and must account for all volume movements in and out. The unique profile of the storage sheds applies the natural characteristics of bulk materials ‘angle of repose’ to maximise storage capacity within the available footprint.



Oakham Treasures is one of the largest privately owned displays that specialises in rural and farming related memorabilia.



Avonmouth and Portbury Docks expect to achieve 8000 tonnes per 24 hours.

The Port will be expecting to achieve a minimum unloading rate of 8000 tonnes per 24 hours. Sounds easy, until 36 hours of continuous rain prevents movement of bulk cargo. The 'daily quota' accumulates meaning the 24-hour target output and maximum conveying capacity are almost equal. Cleaning out the ships hold with excavators and front end loaders, referred to as 'trimming' also limits handling capacity as the minutes tick by.



a minimum unloading rate of

Looming in the background are demurrage charges, fines imposed on the dock handler when the vessel fails to raise its anchor at the agreed time. James referred to costs potentially reaching many tens of thousands of dollars per day.

Engineering skills and creativity are required to ensure the plant operates efficiently and safely. This included housing a milling system in a purpose-built construction located externally to the main storage area. Milled product is then conveyed back from the hammermill into the allocated bays ready for final despatch to customers. Products from this system are one of many ways BPC adds value to raw materials, creating new revenue streams.

Asked about new technology, James cited the introduction of a new cloud-based stock control system, linked to tablets allocated to the articulated loading shovels. This helps to rapidly link up arriving HGV bulkers with the mobile handlers, decreasing waiting times and reducing fuel usage. Other initiatives are evident with the array of wind turbines generating renewable energy. The BPC's commercial team seeks trade handling opportunities for many other materials. This includes wine, timber, gypsum steel and liquid products. A thoroughly enjoyable visit with James's enthusiasm and knowledge emphasising the scale of activities undertaken across the docks.

Bristol Port company 'Facts and figures'

Bristol Port Company land area	2,600 acres comprising docks, offloading facilities, warehousing, vehicle storage, industrial estates, interlinking roads
Lock gate width	42.7m - widest of its kind in the UK
Employment	Approximately 600 direct employees. 12,000 employed within the dock's industrial estates
Connectivity to markets	67% of the UK population (43 million people) are within 250km of Bristol Port
Annual car and van handling	300,000 imports, 200,000 exports
Hinkley Point C nuclear project	Production of 38,000 concrete segments in a purpose-built structure at Avonmouth Docks by Balfour Beatty. Each weighing 4000kg, combined they formed three tunnels supplying cooling water from the Bristol Channel for the two nuclear reactors. One of many projects at BPC supporting Hinkley Point C
Bulk liquids	Molasses, kerosene, fertiliser, concentrated orange juice, wine
Examples of countries of origin for raw materials destined for animal feed	Palm kernel extract from Indonesia, soya bean meal from South America, molasses from Egypt and South Africa
Direct links to manufacturing	Expansion of existing bulk gypsum handling facilities direct from ships to Etex's newly constructed £140 million plasterboard manufacturing plant

Membership Changes

1/02/24 to 30/04/24

New Members

Fellow

Dr Peter Demeyer (Belgium)

Member

Mr Stuart Jones (Western)
Dr Charles Okpala (USA)
Mr Simon Deacon (East Midlands)
Mr Timothy Farrow (Yorkshire)
Mr Gerald Mhakayakora (Herts & Essex)
Dr Teo Chee Loong (Malaysia)

Affiliate

Mr Nick Finlay (Wrekin)
Mr Colin Page (South Eastern)

Technician

Mr Thomas Eckton (Yorkshire)

Transfers

Member

Dr Brighton Chunga (Malawi)
Mr Michael Cullen (Wrekin)
Mr Thomas Kindred (Herts & Essex)

Associate Member

Mr Martin Muus (Wrekin)

Students

Coleg Cambria

Edward Lloyd
Bryn Broomhall
Tomas Jones
Max Wingeatt
Daniel Tinsley
Rhun Lewis
Owain Ap Dyfed
Gethin Wigley

Easton College

Luna Finch

Moreton Morrell College

Samuel Ingles

CAFRE

Joseph Cleland
Harry Millar

Munster Technological University

Ambrose Hartnett
Colm Garahy
James O'Donnell
Ben Claffey
Jack Garry
Chris Scully
Senan O'Byrne

Harper Adams University

Charlene Lantigua

Royal Agricultural University

Sneh Rawat

Writtle College

Noah Bodman

Suffolk New College

Joe Virr
Rey Wickenden

University of Glasgow

Scott Ewing

Sheffield Hallam University

Daniel Painter

Reaseheath College

Oliver Le Toquin
Joseph Nash
Bobby Plant
Noah Madeley
Hugo Dollar
Jack Whitehurst
Danny Zouhbi
James Fallows
Harry Ward
Edward Townsend
Robert Stockton
Murray O'Donnell
Albert Morten
Benjamin Flint
Ben Spurr
Josh Reade
James Hunt

Rice University

Aarthi Toniappa

Arkwright Scholarship

Daniel Axentiev
Thomas Scott

University of Abertay Dundee

Georgia Kirts-Mathieson

Edinburgh Napier University

Michael Allan

Ulster University

Joseph Davies

TEDI – London

Jaylani Scantlebury-sy

University of Bath

Noah Johnson

Open University

Jake Cowley
Fiona Jackson

ENGINEERING COUNCIL

Registrations

CEng

Mr Michael Whiting (Western)

IEng

Mr Benjamin Osborn (South Eastern)

EngTech

Mr Arthur Penlington (East Midlands)
Mr John Gildersleeves (Southern)
Mr James Perry (East Anglia)
Mr Joshua Fulton (Southern)

SOCIETY FOR THE ENVIRONMENT

CEnv

Dr Laura Cumplido-Marin (East Midlands)

Deaths

We have recently learned of the death of the following members and we send our condolences to their family and friends:

Mr Hugh J McIlvenna EngTech MIAgrE

Mr McIlvenna joined the Institution as an Affiliate in March 1972. He gained his Engineering Technician Registration in June 1977 and went on to transfer to Associate Member grade in June 1985. He then went on to upgrade to Member grade in January 2001. Mr McIlvenna was a long-standing member of the Institution with over 50 years membership.

Dr Michael Anderson-Upcott MIAgrE

Dr Anderson-Upcott joined the Institution as an Associate Member in June 1961. He then went on to transfer to Member grade in January 1969. Dr Anderson-Upcott was a long-standing member of the Institution with over 60 years of membership.

Dr Daniel S Boyce CEng FIAgrE

Dr Boyce joined the Institution as an Associate Member in August 1954. He then transferred to Member grade in October 1968 and then onto Fellow grade in January 1969. Dr Boyce gained his Chartered Engineer registration in July 1979 and was a long-standing member of the Institution with nearly 70 years of membership.

Mr Brian L Roger IEng MIAgrE

Mr Roger joined the Institution as an Associate Member in December 1979. He then transferred to Member grade in November 1981. Mr Roger gained his Incorporated Engineer registration in January 1982 and was a long standing member of the Institution for 45 years.

Long Service Certificates

April - June 2024

60 years

Name	Grade	Date of Anniversary
William Thomas Worthington Cory	MIAgrE	5 April 2024

50 years

Humphrey Sidney Guy Cholmeley	MIAgrE	5 June 2024
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35 years

Daniel Ezra Perlman	AMIAgrE	13 April 2024
Brian Charles Robinson	MIAgrE	26 April 2024
Alexander Philip Charles Keen	AMIAgrE	27 April 2024
William Day	FIAgrE	5 May 2024
Duncan James Wilson	MIAgrE	17 May 2024
Richard Bernard Silvester	MIAgrE	1 June 2024
Simon William Ernest Butler	MIAgrE	21 June 2024
Richard Earl	FIAgrE	26 June 2024

25 years

Angus Malcolm Buchanan	AMIAgrE	30 June 2024
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Forthcoming Events

Western Branch Visit to Jordans and Ryvita at Poole

Potential visit to Jordans and Rivita at Poole and possible visit to a boat manufacturer. Visit to be confirmed. Further updates nearer the time.

19/06/2024 - To be confirmed

20 Albion Close Poole BH12 4LL

<https://iagre.org/events/WesternbranchRyvitavisitJune2024>

Webinar on Land-based Engineering English Apprenticeship Level 2/3 Standard Changes

Over the past 12 months our two apprenticeship standards have undergone a rigorous review via an industry working group enabling them fit for the future. There are several changes that effect how the schemes operate and the associated funding available.



It is important that employers, training providers and scheme sponsors understand how these changes will affect the apprenticeship standards going forwards.

If you teach, employ or sponsor the current Level 2/3 Land-Based Service Engineer Apprenticeship scheme, attendance at this event will be of significant interest to you.

Please join us online at 2pm on Wednesday 19th June 2024, where David Kirshner, Independent Consultant and Education and Apprenticeship Expert in the Land-based sector, will take us through these important changes.

19/06/2024 - 2pm-3pm

Online via Zoom

West Midlands and pioneering technology specialist interest group visit to Martin Wadland's vintage collection

Martin Wadland has a large vintage collection of tractors machinery and lorries.

We meet at 2pm and expect to spend at least 2 hours looking over the collection.

We will organise some light refreshments towards the end of the visit.

Please RSVP to westmids@iagre.biz

More details will follow nearer the date but registration opens immediately.

22/06/2024 - 2pm

Three Shires Farm, Lower Boddington NN11 6XX

(Located midway between Claydon and Lower Boddington between the canal bridge and the HS2 works site).



Commercial Members



Academic Members



Why we need Agricultural Engineers



THE IAgrE LANDWARDS CONFERENCE 2024

Date: **6th November 2024**

Location: **Rothamsted Research**

Abstract: Population growth, climate change, renewable energy, sustainable food production - all things we hear all too often but its evident that working in silo's is not going to achieve the results we need. These topics are inherently linked to each other and will require a collaborative systems based approach to solve. Our conference this year will not focus on the challenges, but on how we can achieve the solutions. By encouraging the thought process between the different stakeholders, we intend to highlight what engineers working in agriculture need to focus on for the future.

<https://iagre.org/conference-2024>

e: secretary@iagre.org **t:** 01234 750876



AGRICULTURE



HORTICULTURE



FORESTRY



ENVIRONMENT



AMENITY