GU

GAS UTILISATION

THE MAGAZINE FOR ALL THINGS DOWNSTREAM

AUTUMN 2022

- SCOTLAND PROPOSES 2024 NEW BUILD BAN ON NATURAL GAS BOILERS
- UNDERSTANDING GAS PRESSURE AND GAS FLOW IN PIPES
- WINLATON FIRST TO INTEGRATE HYDROGEN INTO PUBLIC NATURAL GAS NETWORK

BEHIND THE SCENES

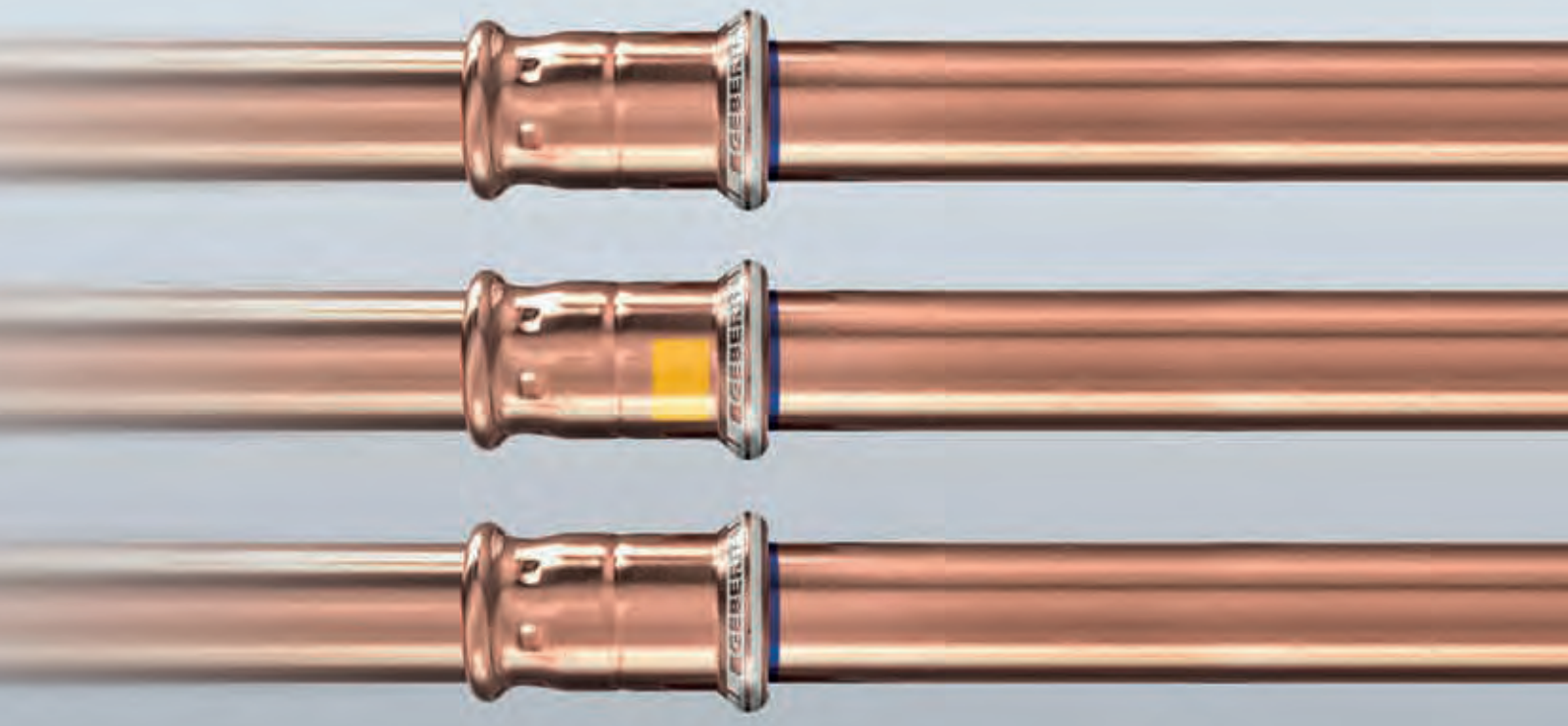
AN INSIGHT INTO WORKING ON THE HYDROGEN HOMES AND H21 PROJECTS

IGEM
Institution of Gas Engineers & Managers

GEBERIT

GEBERIT MAPRESS GAS

DESIGNED FOR SPEED. BUILT FOR BUSINESS. **RESULT.**



KNOW HOW INSTALLED

Gas applications require a safe connection for such volatile media, and fittings and pipes must comply with specific requirements for gas. Geberit Mapress Copper Gas and Stainless Steel Gas have all the necessary approvals for natural gases, liquefied gases and several technical gases, ensuring a safe and certified installation.

geberit.co.uk/mapress

WELCOME TO GAS UTILISATION

WITH THANKS TO OUR CONTRIBUTORS...

STEVE CRITCHLOW

Principal Gas Engineer at Health & Safety Executive

Steve Critchlow is a Fellow member of IGEM and Chair of the EngTech Working Group, having joined the institution as an EngTech in 2010. He is a Gas Safe-registered engineer and works for the Health and Safety Executive's Science Division.

Having worked for HSE for more than 20 years, Steve now covers the whole of the UK, investigating gas explosions, carbon monoxide incidents and making assessments of poor engineering concerning gas, oil, solid fuel and biomass installations.

DAVID TOMKIN

H21 Engineer & Hydrogen Homes Project Lead at Northern Gas Networks

David works for Northern Gas Networks as part of the H21 project, which is a suite of projects carrying out the vital research to prove that the gas network can safety transport hydrogen in the future. In addition, he is the Project Lead for the Hydrogen Homes and has first-hand experience of installing, testing and purging hydrogen installations as well as supporting the wider business' energy futures projects.

David began his career in the gas industry over 20 years ago as an Apprentice Engineer and has held roles in the Gas Distribution National Control Centre (DNCC), as an Engineer for British Gas and as the Technical Manager for Gas Safe Register.

David is a Chartered Engineer and Vice President of the Institution of Gas Engineers and Managers (IGEM) and holds an MSc in Gas Engineering. In his roles, he has contributed to and sits on numerous industry standard committees, panels and working groups as well as the Council and Executive Board of IGEM.

EDITOR'S LETTER

WELCOME TO THE Autumn 2022 edition of *Gas Utilisation (Gu).*

In this edition, we're recapping IGEM's Gas Utilisation conference, which took place in March, and rounding up IGEM's attendance at this year's InstallerSHOW.

Steve Critchlow, Principal Gas Engineer at Health & Safety Executive, continues our series of technical articles with an article about gas pressure and gas flow in pipes, while elsewhere, we're hearing from David Tomkin, H21 Engineer & Hydrogen Homes Project Lead at Northern Gas Networks, as he shares some insight into his experiences working on the Hydrogen Homes and H21 projects.

Following close collaboration with the LP Supply Working Group, IGEM has published IGEM/G/13 *Domestic supply capacity and operating pressure at the outlet of the meter,* so we're taking a look at the changes to working practice too.

We're also talking to Nico Ross, Plumbing and Heating Engineer at Home Group, in our latest member profile.

We hope you enjoy this edition.

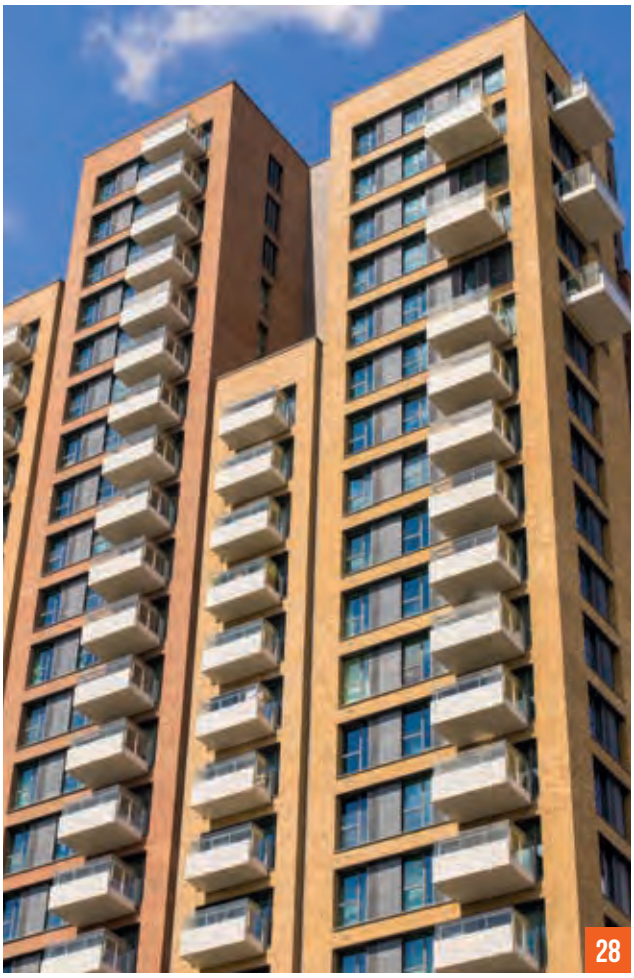
JODIE SHEPHERD
EDITOR
BA (HONS) AIGEM
INSTITUTION OF GAS ENGINEERS AND MANAGERS (IGEM)

GOT SOMETHING TO SAY?

If you would like to send any readers' letters or have any comments or feedback, then please get in touch with us. We are also looking for contributors for future editions of Gu. If you are interested, contact us by emailing editor@igem.org.uk with details of your proposed contribution.

CONTENTS

24


28

SCOTLAND PROPOSES 2024 NEW BUILD BAN ON NATURAL GAS BOILERS

GAS BOILERS WOULD BE BANNED IN NEW HOMES UNDER THE PLANS

THE SECOND PART of a consultation launched to define a new national standard for new and converted buildings in Scotland could see a ban on fossil fuel heat systems that directly emit carbon, *H&V News* reports.

Scotland is proposing to ban the use of natural gas boilers in new build properties from 2024. The pledge is one of several measures set out in the second part of a Scottish government consultation for a New Building Heat Standard (NBHS).

The proposals would mean direct emissions heating systems (DEH) cannot be installed in new domestic and non-domestic buildings. These proposals are also expected to apply in the case where an existing building is being converted.

Boilers running on natural gas or oil would be among the systems banned under the NBHS. However, further research is still needed into whether hydrogen should be considered a solution that can provide zero emissions heat, the Scottish government said.

The UK government is expected to set out aims for a Future Homes Standard for England that it is expected will ban using existing gas boilers in new build properties from 2025.

However, Scotland is looking to move even faster to introduce a ban on systems designed to exclusively operate on fossil fuels and that directly produce carbon emissions to produce heat.

Independent research commissioned by the Scottish government has looked to identify the different options that could be considered compliant with the NBHS. The research was undertaken by the ClimateXChange (CXC) advisory group and has listed several technologies that do not produce "direct, in-building greenhouse emissions from normal operation at point of use".

Under this definition, the following systems can be installed under the NBHS proposals:

- Heat pumps
- Heat networks
- Solar thermal and solar thermal storage systems
- Electric storage heaters
- Electric boilers
- Fuel cells

Direct electric heaters, such as fan heaters, thermal fluid-filled radiators and radiant heaters are also considered compatible with the new standards, based on the research.

One solution not approved for use under the Scottish government's proposals is bioenergy. It concluded that bioenergy and biofuels do not have a "significant long-term role in providing heat in buildings" as it still emits greenhouse gas at the point of use. Concerns were also raised in the research about the impact of ensuing a sufficient supply of bio-resoruces to meet demand for possible use of the fuel in heating.

The consultation document added, "Our approach is to see bioenergy used where it has the greatest value in reducing emissions, and where the value of wasted bioresources can be harnessed efficiently – therefore, we have established a Bioenergy Policy Working Group which will consider these issues before publishing a Bioenergy Action Plan in 2023."

This approach to bioenergy mirrors the conclusions of Scotland's Heat in Buildings Strategy that was published last year.

The consultation also called for more studies into the potential for using 100 per cent hydrogen in domestic heat. It said that existing research had been inconclusive about whether greenhouse gas emissions are produced from the combustion of pure hydrogen under the normal operating conditions of boilers designed for the gas.

Further independent laboratory testing will be commissioned by the Scottish government into the issue.

The consultation said, "Once the testing has concluded, we will set out our position on the use of 100 per cent hydrogen for space and hot water heating in new buildings."

UK GOVERNMENT ALLOCATES £54M HEAT NETWORK FUNDING AMID SLOW UPTAKE OF HEAT PUMP GRANTS FOR INDIVIDUAL HOMES

THE UPTAKE OF HEAT PUMPS HAS BEEN LOWER THAN ANTICIPATED

THE UK GOVERNMENT is allocating a £54 million tranche of funding for district heat network projects, pledging to support networks serving 28,000 properties in three areas across the South of England, *edie* reports.

The confirmation of the funding, from the Heat Networks Investment Project (HNIP), comes amid concerns that just 2,500 vouchers have been issued for individual heat pumps through the Boiler Replacement Scheme, which has made 30,000 vouchers available this financial year.

Opened in late 2018 after a pilot scheme during 2016 and 2017, the HNIP is set to allocate a total of £320 million of funding from government coffers. A £19.1 million tranche of funding was made available in March, and the government has stated that a larger pot is on offer this time to "shield homes and businesses from costly fossil fuels" amid the energy price crisis. Wholesale gas prices in the UK on 26 July were around six times higher than on the same day last year.

More than £27 million of the funding will be allocated to two projects in Haringey, North London. The remainder will be split between a project in Stewartby, Bedfordshire (£17 million) and Woking, Surrey (£9 million). With this funding added, the HNIP has allocated around £250 million to date.

The Department for Business, Energy and Industrial Strategy (BEIS) claims that the four projects confirmed to receive funding will collectively serve around 28,000 properties.

In Haringey, the selected projects are the Wood Green District Heating Network and the Tottenham Hale and Broadwater Farm District Heating Network, with the former receiving five times as much funding as the latter. Heat for both networks will be supplied primarily from the energy recovery facility being built at the Edmonton Eco Park as an upgrade to the existing facility. The energy-from-waste facility is due to come online in full by 2025-26, burning around 700,000 tonnes of waste from multiple London Boroughs. It will be co-located with a new recycling centre.

In Stewartby, BEIS's funding will go towards Vital Energi's plan to open an energy-from-waste plant in a former brick clay extraction pit. Vital Energi estimates that the facility could serve up to 12,000 properties if connected to a heat network. Other partners in the project include Veolia and Covanta, which claim that the project, originally granted permits by the Environment Agency in 2018, will process 550,000 tonnes of waste annually.

The chosen project in Woking is an expansion of Thameswey Energy's existing heat network serving the town centre. Thameswey is a private company with the local council as the single shareholder. The network is served with heat generated at local combined heat and power (CHP) plants and currently has connections to around 2,000 properties. The investment will enable up to 3,450 new homes to connect.

BEIS Minister Lord Callanan said: "These projects will transform how tens of thousands of households and businesses keep their properties warm.

"By investing in cutting-edge low-carbon heating technologies we are helping to secure a lasting move away from using fossil fuels and protecting consumers from the costs that are driving up energy bills at a time of high global prices."

Some may see the irony in this statement, given that BEIS has repeatedly stated its support for increased UK fossil fuel extraction since the publication of the Energy Security Strategy. Nonetheless, it has done so while increasing ambitions for offshore wind and nuclear and while pressing ahead with low-carbon heat plans.

On heat networks specifically, the strategy confirmed plans for the government to appoint a regulator of the heat networks market as it expands. Ofgem has been appointed to this role and will have powers and responsibilities to ensure that consumers get fair energy prices and quality customer service.

WINLATON FIRST TO INTEGRATE HYDROGEN INTO PUBLIC NATURAL GAS NETWORK

WINLATON IS LEADING THE WAY FOR HYDROGEN

WINLATON, A VILLAGE near Gateshead, has become the first community in the UK to receive hydrogen blended with natural gas via the public natural gas network, *Energy Voice* reports.

The HyDeploy project saw up to 20 per cent hydrogen blended with natural gas on a public gas network in Winlaton, operated by Northern Gas Networks (NGN).

A total of 668 houses, a church and a school received the blend for 11 months and residents were able to use their gas supply as usual with no changes to appliances, thanks to current gas appliances being designed to operate with a blend of up to 23 per cent hydrogen.

Unlike natural gas, hydrogen does not produce carbon monoxide when burned, cutting carbon emissions and helping to tackle climate change.

However, large-scale hydrogen production will also have to be decarbonised to make the switch worthwhile – whether that's using renewable electricity or gas production linked with carbon capture and storage (CCS).

Heating in the UK is currently responsible for around a quarter of carbon emissions. Hydrogen is a viable solution to cut emissions and help reach the government's 2030 net zero targets.

The report of findings from the Winlaton project will be submitted to the government later this year, ahead of a decision around the wider blending of hydrogen in the UK gas network, which is due to be taken in 2023.

Earlier this year, Ofgem shortlisted two UK locations for a Hydrogen Village demonstration, which will see natural gas swapped to hydrogen in around 2,000 properties.

The Hydrogen Village programme will start in 2025 and is expected to last around two years.

Hydrogen Programme Manager at Northern Gas Networks Fergal O'Donovan said: "We're delighted to have successfully completed blending hydrogen into the gas supply at Winlaton.

"The recent unprecedented hot weather has brought the need to tackle climate change to the forefront of people's mind and this project has demonstrated that hydrogen blending can play a role in decarbonising heat with no disruption.

"We'd like to thank the residents of Winlaton for their participation and support in this vital demonstration."

Cadent's Director of Strategy Dr Angela Needle added: "We've been thrilled to pass the baton from the first ever hydrogen blending trial at Keele University to Northern Gas Networks, who have successfully completed blending into the gas network in the village of Winlaton.

"This project is the culmination of a huge amount of work putting consumers at the heart of the energy transition.

"By blending hydrogen into the gas network, the people in Winlaton could start using a greener gas without having to make any changes to their home or the way they use their heating and cooking.

"Forming part of the evidence we are putting to government to enable their 2023 policy decision on blending hydrogen into the gas networks as a means to support decarbonisation targets."

Great products & the best aftercare support OR YOUR MONEY BACK!

KANE ★★★★★ CARE

10 YEAR WARRANTY

RECERTIFY SAME DAY DESPATCH

FREEPOST SERVICE

0800 059 0800

www.kane.co.uk/kanecare

Follow us on...

★★★★★ ★Trustpilot






TOMORROW'S GAS SYSTEM

IGEM Marketing Assistant **Jodie Shepherd** reports from our Gas Utilisation conference, which this year looked at how the downstream gas industry is responding to the challenges it faces now and in the future

ON 29 MARCH, professionals from across the utilisation sector of the gas industry came together for IGEM's 2022 Gas Utilisation conference: Today and Tomorrow, sponsored by Radius Systems and supported by the Large Business Forum.

The event, which was held at the National Conference Centre in Solihull, aimed to tackle key areas in the transition to hydrogen. Featuring industry experts presenting, discussing and debating the hot topics of the day, the conference was tailored to equip those working in downstream operations with what they need to prepare for the future.

In his welcome speech, IGEM Chief Executive Officer Ollie Lancaster said: "When it comes to the title of this session - the 'today' part - little did we know when we put this conference together a few months ago what position the energy sector would find itself in with the conflict that's happening in Europe right now.

"That's on top of all the matters and reasons for the high gas prices that have emerged over the last six to eight months or so. I'm sure you've been asked by your family and friends and clients about that, and I'm certainly no expert in it, but it's helpful to have some understanding of what the reasons are."

He went on to list some of those reasons, which included 2021 being a low wind year accompanied by a longer-than-usual winter.

He said: "We, as a collective energy sector, need to work to prepare for forthcoming winters to ensure security of supply as well as becoming less reliant on imports.

"Meanwhile, in our net zero ambitions to prepare for tomorrow, we find that from a safety perspective there aren't any showstoppers for a transition to hydrogen networks, unless I'm going to find something out today that I hadn't been expecting to hear.

"However, the evidence case continues to be built with innovative demonstrators that many of you here might be involved in. IGEM is facilitating those projects through the development of standards with support from our industry volunteers.

"We're also involved as partners in some funding programmes on the innovation side as well.

Turning to the subject of skills, Ollie said: "Having a skilled and ready workforce to build and deliver the energy transition needs some focus because most of us may be finding out that recruiting at the moment is really difficult - and we're only just at the beginning of the transition.

"We need many more engineers, and we need qualified engineers to join our sector now, plus young people who want to become engineers as well. But let's, for a start, make sure that the engineers of today are equipped with everything they need."

Ollie also chaired the first session of the day – Hydrogen in Buildings. This session was focused on the latest knowledge and future plans around metering, appliances and boilers for domestic and commercial properties. It also included updates from the





HyCompact and the Port of Milford Haven hydrogen heating projects.

Speaking first in this session was Tony Goose, Commercial Director at Pietro Fiorentini UK. Tony provided an interesting presentation on technology and solutions for a digital and sustainable world.

The next speaker was Martyn Bridges, Director of Marketing and Technical Support at Worcester Bosch Group. Martyn's presentation was focused on the future of heating.

He was followed by the third speaker of the day, Paul Needley, Managing Director at Enertek International.

Darren Cushen, Net Zero Project Manager – Hydrogen at Wales & West Utilities, provided the fourth and final presentation of the session, giving delegates an update on the HyCompact project.

The session concluded with a panel question and answer session featuring all the presenters. This included discussion of projects already underway and those for which network deployment is anticipated in the coming years, plus data on hybrid boilers and heat pumps courtesy of HyCompact, and further follow ups to the presentations.

Session two, titled The Safety Case, was chaired by Chris Clarke, former Energy Strategy Director with Wales & West Utilities and past IGEM President. This session outlined what is affecting the industry now and what is being learned to help shape safety and standards for the future.

Opening the session was Jonathan Samuel, Chief Executive Officer at Gas Safe Register, who gave an in-depth update on the work of his organisation, before Dr Sarah Kimpton, Vice President – Energy Transition & Innovation at DNV, took to the stage to share her presentation on gas quality. She also shared her thoughts on gas safety including factors such as fuel poverty and energy security.

Dr Stuart Hawksworth, Head of the Centre for Energy and Major Hazards at HSE, then gave his presentation on safety cases leading to transition, before handing the stage over to the final speaker of the session, Tommy Isaac. Tommy is Head of Hydrogen Research at Progressive Hydrogen and his presentation focused on HyDeploy (the project management of which is his primary focus) and unlocking hydrogen blending in the UK gas grid.

The third and final session, Skills in Demand, kicked off after the lunch break. Chaired by Trevor Smallpeice, Chair of the Large Business Forum, this session was focused on providing updates to new IGEM standards, PAS, skills work and the plans for H100 trials, as well as looking at how IGEM/G/5 has evolved, the lessons learned since 2017 and how net zero could impact gas in multi-occupancy buildings. `

Delegates were joined by speaker Andy Durber, Director of Consultancy Services at Blue Flame Associates Ltd, as he spoke about IGEM standards for hydrogen and BSI PAS.

Richard Harper, Contract Manager – Gas at Energy & Utility Skills gave a presentation on which skills are in demand in relation to the hydrogen transition, and David Garner, Head of Engineering (2bar and below) at Cadent, took to the stage as our final presenter of the day. David spoke about the past, present and future of multi-occupancy buildings, discussing how the industry standard is changing as a result of the UK's green ambitions.

Trevor offered some closing remarks to end the day, thanking delegates and saying: "I hope you've found today both informative and enjoyable, and a bit thought provoking," later adding that the conference had re-enforced his belief that gas has a positive future.

IGEM would like to thank Radius Systems for sponsoring the event, and the Large Business Forum for their support. Thank you also to all our exhibitors.

If you were unable to attend this year's Gas Utilisation conference, you can catch up on IGEMtv as recordings of the event are now available to view.

JOINING THE DEBATE AT INSTALLERSHOW 2022

In June, IGEM's EngTech Working Group attended InstallerSHOW, aiming to increase both awareness of IGEM and membership. Here, the Chair of the Working Group, Steve Critchlow, talks us through the event

THE 140,000 Gas Safe-registered engineers working in the UK represent a large and important sector of the gas industry, and yet IGEM membership amongst them remains relatively low. The IGEM EngTech Working Group has recognised that if IGEM is to be truly representative of the whole gas industry, it must have more members from the downstream sector and that this is an area where membership has potential for significant growth.

The challenges to recruitment of Gas Safe-registered engineers into IGEM are a little different to those from elsewhere. All too frequently, they are unaware of both professional registration and of IGEM despite the many great resources the institution actually puts into downstream. Understandably, as they already pay a significant annual fee to Gas Safe Register, downstream engineers want to know what they are getting in return for their investment, especially as many of them are either sole traders or employed in small businesses.

Given this, recruitment cannot be the first step. Engagement, awareness and information sharing must be dealt with first before recruitment can be considered. To do this, the EngTech Working Group has been exploring new methods for getting our message out there – and what better way than direct face to face engagement?

With this in mind, myself and David Tomkin, of the EngTech Working Group, along with Claire McHugh and Ross McCart, of the IGEM Membership Services team, attended the UK's biggest plumbing and heating trade fair for three days in June where we staffed the IGEM stand.

Over three days, InstallerSHOW hosted a record-breaking event as it opened its doors for the first time at the NEC Birmingham. The show was double the size of the previous year, with over 300 exhibitors and just under 10,000 visitors, making it the UK's biggest exhibition for heating, plumbing, electric and renewables professionals. The sheer scale of the show was really something to behold and it gave us a chance to meet and engage with a significant number of registered gas engineers and people working in and around the downstream gas industry.

A feature of day one of the show was The Great Hydrogen Debate, a live panel discussion in front of the show audience. As one might expect, this discussion was eagerly awaited and unearthed a number of misunderstandings and misrepresentations about hydrogen and the future of the gas industry, both in the room and in the many social media discussions around the debate.

David Tomkin represented both IGEM and his employer NGN, and was able to share his real-world experience of hydrogen appliances working at the H21 Hydrogen Homes and of the research and testing being undertaken. To many in the audience, it was big news just how far along the road our industry is towards getting hydrogen into UK homes. Having such informed experience really cut through the debate. It was great that IGEM could be represented in such a positive light.

With the IGEM stand set up, we were able to spend the rest of the show engaging with gas engineers, explaining the role IGEM plays in the gas industry and the benefits of membership. Engagement with us on hydrogen was particularly noticeable, with visitors commenting how informative they found speaking with us.

One visitor to the stand remarked that we were the best people he had spoken to and that, having spoken to IGEM, he now felt that he understood the issues and the current position around the gas transition. He promised to look into membership now that he realised what IGEM could do.

Another visitor, a newly qualified registered gas engineer, told us he had never heard of IGEM. We explained that he had used IGEM standards such as UP/1B and G11 everyday throughout his training and work, and that IGEM is helping to build a future for his industry.

Throughout all of our discussions with visitors, Claire and Ross were taking dozens of names for membership, and keeping notes of ideas and problems. This has allowed Ross to produce an excellent paper on things IGEM can do to increase its appeal to downstream engineers.

Attending the show proved to be a fantastic exercise in engagement, which will provide lots of benefit to IGEM and members over time. We've provided a report to IGEM on ideas to make it even more successful next time.

Our thanks are due to Installer for the support they have provided to IGEM, and to Carl Stokes and the IGEM team for their hard work in making it happen. We hope more members will feel able to represent IGEM at events in the future and increase the reach of our institution.

CARBON MONOXIDE ALARM REGULATIONS ARE CHANGING – ARE YOU READY?

This year, the laws are changing for smoke and carbon monoxide alarms in homes in the UK, meaning many more domestic properties will be legally required to have CO alarms. Here, we tell you everything you need to know so you can be prepared for the changes

A number of important policy changes were recommended by the All-Party Parliamentary Carbon Monoxide Group (APPCOG) in its 2017 report, *Carbon Monoxide Alarms: Tenants Safe And Secure In Their Homes*.

Severe carbon monoxide poisoning causes approximately 60 accidental deaths per year in England and Wales, and exposure to carbon monoxide at sub-lethal levels causes non-specific symptoms – meaning that exposure to carbon monoxide could be under-reported. The latest data from the National Poisons Information Service indicates that the majority of exposures occur in the home.

As a member of the All-Party Parliamentary Carbon Monoxide Group (APPCOG), IGEM is delighted to support the changes.

All four UK governments have recognised the need to mitigate the risk of carbon monoxide exposure in homes by increasing the number of homes that will be required to install alarms. So, what do the regulations mean in all four UK nations?

In Scotland, since 1 February 2022, all Scottish homes have been required to have a carbon monoxide alarm in all rooms where there is a fixed combustion appliance (excluding an appliance used solely for cooking) or a flue. In rented properties, landlords are responsible for supplying the alarm.

Carbon monoxide alarms must meet the relevant British standards (EN 50291-1) and must have 'a sealed battery for the duration of its lifespan' to prevent tampering or the need for battery changes.

For England, the Smoke and Carbon Monoxide Alarm (Amendment) Regulations 2022 came into force on 1 October 2022. These changes require carbon monoxide alarms to be installed in all rented accommodation and new build properties where there is a fixed combustion appliance, excluding gas cookers. Carbon monoxide alarms are also required when an appliance is first installed in any home. Both private and social sector landlords will have a duty to repair or replace alarms, once informed that they are faulty.

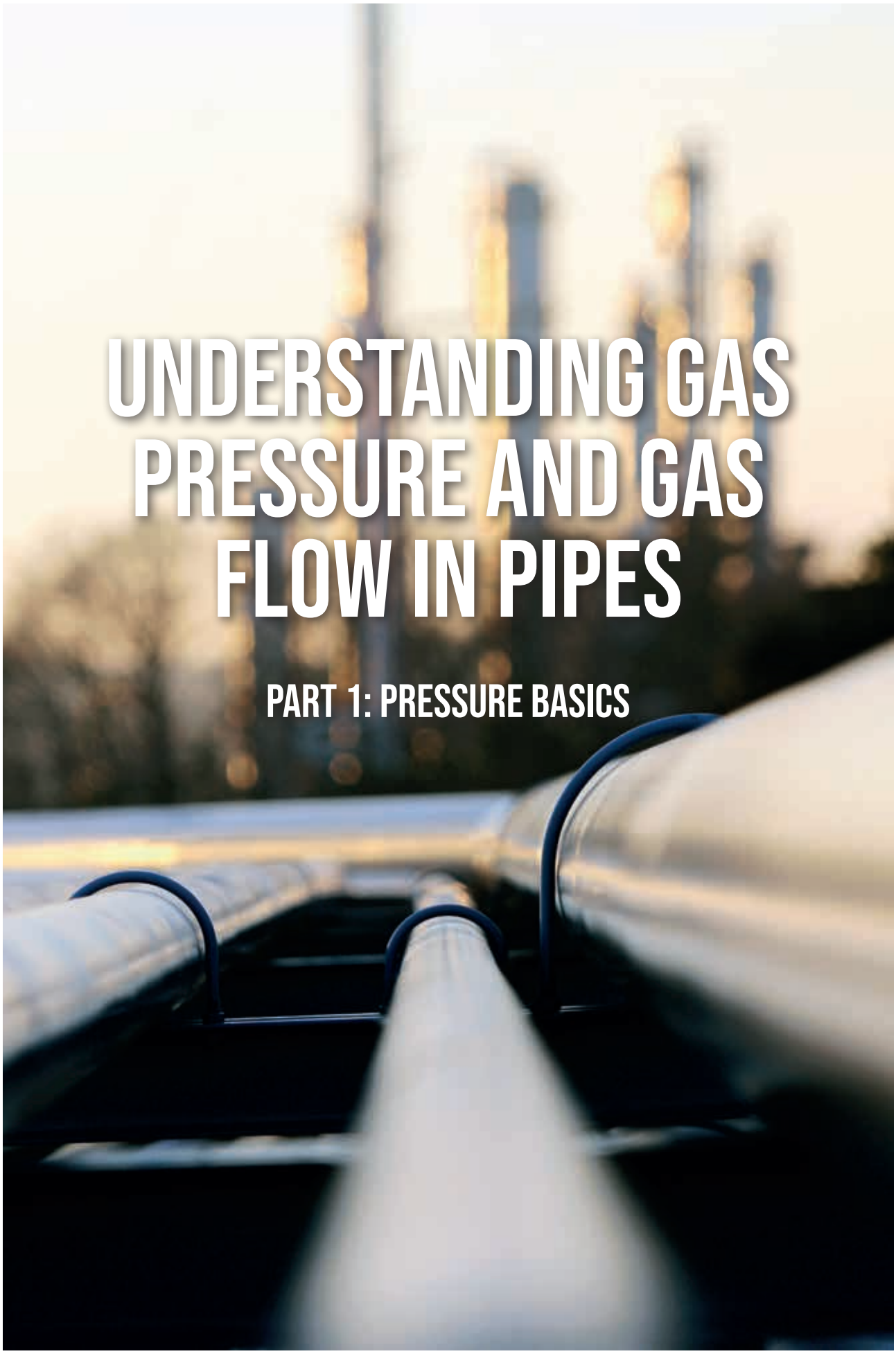
In Wales, the Welsh government will bring forward changes from 1 December 2022 with the Renting Homes (Wales) Act 2016 which, under the Regulations for Fitness for Human Habitation (FFHH), will require landlords to ensure working carbon monoxide detectors are fitted in their properties where there is any gas appliance, an oil-fired combustion appliance or a solid fuel burning combustion appliance.

In Northern Ireland, carbon monoxide alarms are a mandatory requirement for all homes where a new fossil fuel appliance is installed, after a change to The Building Regulations (Northern Ireland) 2012 came into operation on 31 October 2012. The Private Tenancies Act, which requires carbon monoxide alarms to be installed in privately rented homes and places a duty on landlords to repair them, received Royal Assent on 27 April 2022.

There are, however, some gaps remaining:

- Gas cookers are excluded from the regulations in England and Scotland.
- The type of carbon monoxide alarm is only mandated in Scotland's regulations.
- Owner-occupied households are outside of the remit of regulations, except in Scotland. The regulations in England, Wales and Northern Ireland cover rented accommodation and new appliance installations. Owner-occupied homes are regulated by separate rules.

If you'd like help understanding these regulations or want to seek legal advice, you can contact Citizen's Advice, which provides a free advice service for all four nations. Visit www.citizensadvice.org.uk



UNDERSTANDING GAS PRESSURE AND GAS FLOW IN PIPES

PART 1: PRESSURE BASICS

This is the latest in a series of technical articles aimed at introducing those in the utilisation sector of the gas industry to some of the fundamental science and engineering underpinning their work. **Steve Critchlow** is a Fellow of IGEM and a Principal Gas Engineer at the Health and Safety Executive Science Division. Steve's previous articles in *GU* have looked at combustion and combustion analysis, and understanding important gas characteristics. Over the next three articles we shall look at the important subject of understanding gas pressure and gas flow principles. Here we start with the basics of understanding pressure

Pressure, in its most basic form, is a force exerted by the fluid over the surface area of a structure resisting it (or in the case of gas containing it).

Pressure is calculated by dividing the force (measured in Newtons) by the area over which the force acts (measured in square meters), and therefore the pressure is measured in N/m^3, which we call Pascals, having the symbol Pa. Figure 1 shows the concept of pressure as a force acting over an area. Now, of course gas engineers won't generally be working in Pascals or N/m^3, but rather bar and millibar, but that's just a conversion. More of that later. So, if we have a large force acting over a small area, that area is under a high pressure, whereas if we spread that same force over a larger area we get a lower pressure even though the mass (and, hence, the force) is the same. A good way of picturing this is to imagine the effect on a floor of a person standing in stiletto heels and compare it to the same person standing in training shoes. The force acting downwards (the mass of the person x acceleration due to gravity) is the same but the pressure exerted on the floor under the stiletto heel is far greater than that under the sole of the training shoe.

Anyway, enough about fashion. Gases and liquids are both considered to be fluids, and are composed of molecules which are not so tightly fixed that the overall structure is solid. The molecules are constantly moving in a gas and, as those molecules hit the wall of the vessel containing the gas, a force is exerted. If we put more gas in the vessel then there are more molecules hitting the vessel wall, or if we increase the speed of the molecules by increasing energy (typically by increasing temperature) then there will be more impact on the walls by the molecules, and hence a greater force acting on a fixed area, which gives us a higher pressure.

One interesting difference I notice is that downstream engineers will say they've measured '20 mbar' whereas upstream engineers will say they've measured '20 mbar gauge' (written as mbar(g)). The upstream engineers are making an important reference to atmospheric pressure. The pressure measured by the gauge (manometer) is the pressure inside the pipe or vessel relative to the pressure outside the vessel. The air around us is a gas and it has a weight – a mass acting downwards – which creates a pressure on the Earth's surface of approximately 1,013 mbar, which is known as atmospheric pressure. The upstream engineers are referring to the reading on the gauge, which is actually 20 mbar above atmospheric. Atmospheric pressure can be extremely important for design calculations in the gas industry, and of course is variable depending on things like temperature and height above sea level. When we get into studying the physical behaviours of gas we must consider the total pressure exerted by a gas: this is known as absolute pressure.

Absolute pressure = atmospheric pressure + gauge pressure

If we think for a moment about the simple U gauge (shown in Figure 2), the instrument many of us use for measuring gas pressure, we can see that it's a form of a simple balance scale. The gas pressure we are measuring pushes down on one side, and the pressure of the atmosphere pushes down on the other. The reading that we take from the displacement of the fluid is the pressure above atmosphere.

Figure 3 represents a glass jar containing gas, with a moveable piston at the top. On the left hand side we can see that the gas has exerted its pressure to lift up the piston. Gas pressure acts in all directions, and an increase in

FIGURE 1 PRESSURE IS A FORCE ACTING OVER AN AREA

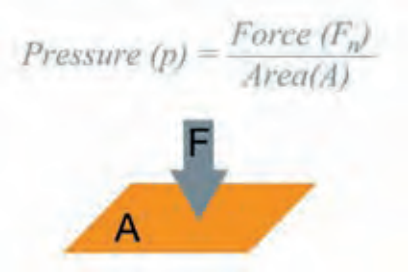
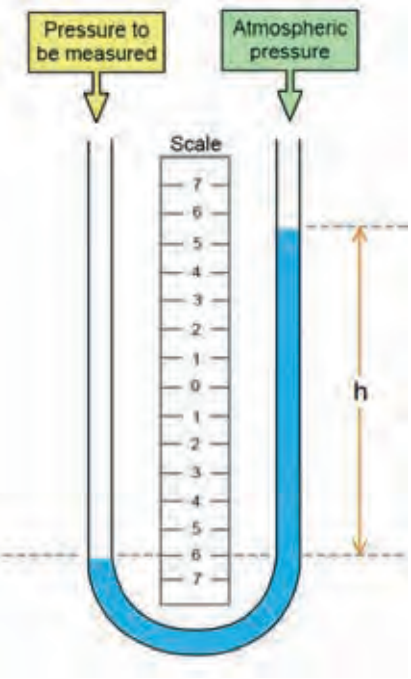


FIGURE 2 A U GAUGE MANOMETER COMPARES GAS PRESSURE TO ATMOSPHERIC PRESSURE



pressure can directly cause the volume of the gas to increase. We know this because when we add air to a balloon it expands and might eventually pop. On the right-hand side the gas pressure is lower, and so the volume is lower. And yet the number of molecules is the same, so the reason for the pressure change is not that we simply have altered the amount of gas in there.

So what's going on? Scientist Robert Boyle gave us a law for the relationship between pressure and volume of gases. This says that the pressure is inversely proportional to volume. In other words, in conditions where the temperature is fixed, if we increase the volume of the vessel containing the gas, the gas pressure will fall and vice-versa. It also allows us to calculate the pressure of a gas if we alter the volume of its container.

Equation 1 Boyle's law

$$P1 \times V1 = P2 \times V2$$

where P1 = first pressure, V1 = first volume etc

This can also be written as PV = constant, showing that if we increase pressure then volume must fall.

Now, we need to be aware that because gas is compressible, Boyle's law only holds true at low pressures. Fortunately for us, most pressures employed in gas engineering 'ideal' conditions can be assumed up to 7 bar(g).

Of course, this doesn't fully explain what is happening in Figure 3, because there we are seeing both the pressure and volume increase in the left-hand vessel. There must be a third factor, and of course that's the temperature. Scientist Jacques Charles formulated a law which states that volume of a gas is proportional to its temperature. This can be written as V ∝ T or V/T = constant. Another way of expressing Charles's law is that the volume of one gas divided by its temperature will be equal to the volume of a second gas divided by its temperature. This can be written as:

Equation 2 Charles's law

$$\frac{V1}{T1} = \frac{V2}{T1}$$

where V1 = first volume, T1 = first temperature etc

So Charles's law tells us that, for a fixed pressure, if we increase the temperature of the gas its volume will increase in proportion. This is because the energy from that temperature causes the molecules to move faster and further, thus they spread out creating an increased volume. Of course, in gas engineering we have fixed volumes, namely pipes and vessels, because we need to contain the gas. So, if the volume cannot change what happens then? Let's introduce a third gas law, known as the pressure law. This tells us that, at a constant volume, the pressure of a fixed mass of gas increases by 1/173 of its pressure at 0°C for each degree centigrade rise in temperature. Another way of looking at this is that the volume of a fixed mass of gas varies directly with its absolute temperature. This can be expressed as:

Equation 3 Pressure law

$$\frac{P}{T} = constant \text{ or } \frac{P1}{T1} = \frac{P2}{T2}$$

Now, we have learned that pressure, volume and temperature are all important, and crucially can all affect each other. We therefore need to combine the gas laws we have studied. One common way of expressing the combined gas laws is:

FIGURE 3 INCREASING GAS PRESSURE ACTS IN ALL DIRECTIONS, AND CAUSES THE VESSEL STOPPER TO RISE

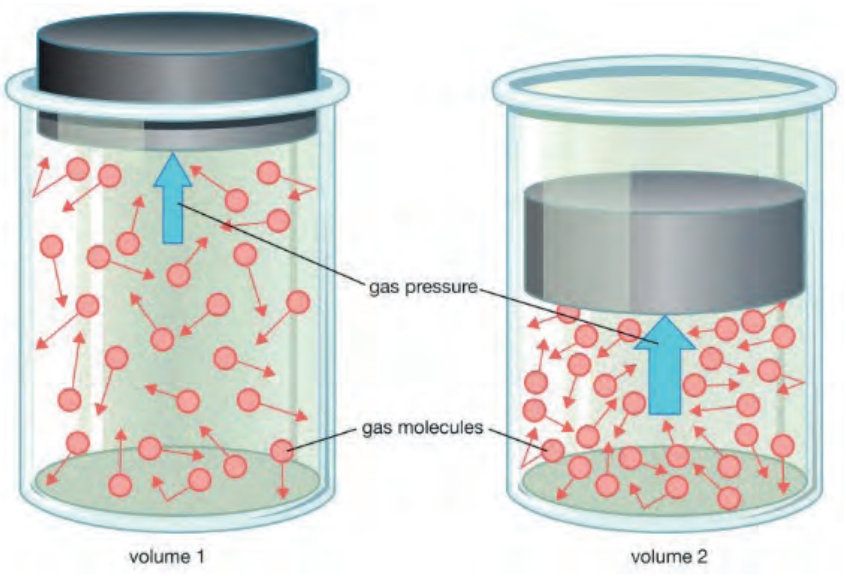
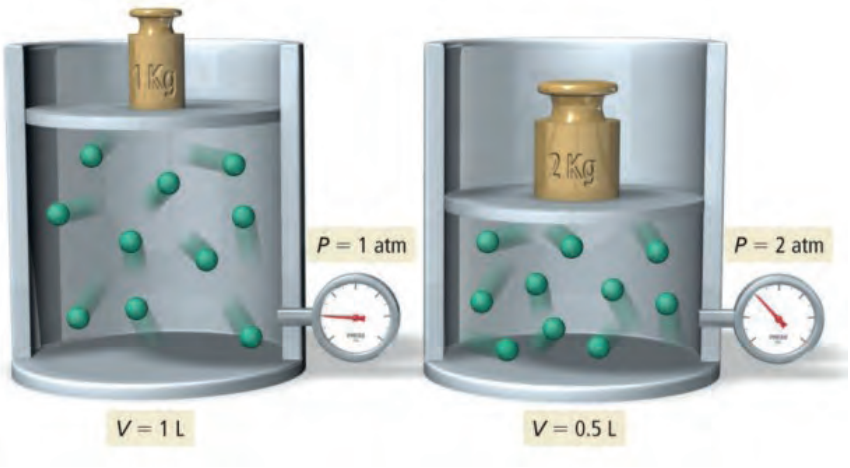


FIGURE 4 COMPRESSING THE GAS CAUSES THE PRESSURE TO RISE



Equation 4 Combined gas law

$$\frac{P1 \times V1}{T1} = \frac{P2 \times V2}{T2}$$

where P is pressure, V is volume and T is temperature

So now we have an equation which deals with pressure, volume and temperature, and we can see that just changing one of these variables has an effect on the others. Another way of expressing this is:

Equation 5 Combined gas law

$$\frac{P \times V}{T} = k$$

where P is pressure, V is volume, T is absolute temperature in Kelvin and k is a constant

In this second expression of the combined laws the value of the constant is dependent upon the mass and nature of the gas. We'll get more into that next time as we move onto Avogadro's laws and the Ideal gas law. For now the important learning is that volume, pressure and temperature all have an effect on each other. We can see this when doing a gas tightness test. The temperature stability part of the IGEM/UP/1 tightness test procedures is very important and is intended to prevent the change in gas temperature as it moves from an underground pipe to an exposed pipe (for example) from effecting the reliability of the tightness test result. Another example is that an LPG vessel must never be completely full, because room needs to be left in it for the gas to expand into if the external temperature causes the gas pressure, and hence volume, to increase. The vessel PRV needs to be set at a pressure above the expected gas pressure that might be experienced on a hot summer's day. Hopefully you can see from this article how the designer might start to work out what that expected pressure might be.

The Gas Safety Book...
There's an app for that

- Access publication and technical bulletins without internet connection
- Bookmark key topics and regularly used technical information
- Seamlessly switch from smartphone to tablet using your preferences stored in the cloud
- Get updates to publication and technical bulletins throughout the lifetime of the 9th Edition

DOWNLOAD NOW

Visit the Gas Safety Shop at **gassafetyshop.co.uk/Gas-Safety-Book**
Available on Android, coming soon to Apple

PRESSURE POINTS
CHANGES TO WORKING PRACTICE

Following close collaboration with the LP Supply Working Group, IGEM has published IGEM/G/13 *Domestic supply capacity and operating pressure at the outlet of the meter*

In July this year, IGEM published Communication 1830: Recommendation for changes to working practice, which is free to download from our website. Since then, work has been underway to prepare training material to disseminate across the industry and enable the recommended changes to working practice to be implemented.

The requirements for those changes to working practice are set out in IGEM/G/13 with training material. A webinar will be available in early October.

INTRODUCTION

During 2016, following complaints raised by installers to the Standards Consultation Forum (SCF) (part of the Standards Setting Body), work was carried out by the gas distribution networks (GDNs) to produce an Energy Networks Association (ENA) document entitled *Gas industry bulletin - Response to poor pressure reports*.

This document, which was provided to the SCF, was not seen by this industry group as satisfying their concerns resulting from incidents of low pressure experienced by installers. As a result, the SCF asked IGEM to facilitate a working group to consider the matter more fully.

METHODOLOGY

IGEM sought agreement from the Technical Coordinating Committee (TCC) to undertake the work on behalf of the industry, which was tabled at a TCC meeting in June 2016. The request was accepted, and the first meeting was convened in June 2017, chaired by Vic Tuffen, Chair of IGEM's Gas Measurement Committee (GMC). The chair of the working group was passed onto Trevor Smallpiece, Chair of the Standards Consultation Forum (SCF) and Large Business Forum (LBF), in 2021.

The LP Supply Pressure Working Group and IGEM wrote to all its consultees seeking their involvement with the work. There was cross-industry engagement with the working group and 24 participants attended the first meeting, including meter equipment managers (MEMs), sole-traders, independent consultants and representatives from the GDNs, large businesses, installer groups, gas appliance manufacturers, BSI, HSE and Gas Safe Register.

The working group oup agreed a set of proposals to address the concerns of the industry, which cover:

- limits on the normal capacity in kW of a domestic gas supply service
- harmonisation procedures for installing appliances covering: pre-commissioning, commissioning, post-commissioning, conditions for reporting low pressure supply, response from emergency service providers and method of downstream testing for low pressure.

FREQUENTLY ASKED QUESTIONS

HERE WE ANSWER your burning questions about IGEM/G/13 Domestic supply capacity and operating pressure at the outlet of the meter and the changes to working practices

The industry has listened to the concerns of registered gas engineers and has worked with them to find a consistent approach to deal with low pressure supply. IGEM has brought together representatives from across the gas industry to agree on new working procedures.

This whole process is about working together to resolve the issues so the customer can use their gas supply and appliances safely and efficiently.

Q. What is this all about and why do we need a new guidance document?

A. This is the outcome following complaints by Registered Gas Engineers (RGEs) concerning reports of low pressure to domestic premises. A gas industry working group was put together and consisted of representation from GDNs, emergency service providers, metering equipment managers and approved meter installers, RGEs and appliance manufacturers through the Heat and Hot Water industry Council (HHIC).

The intended outcome of the WG was that incidents of low pressure would be dealt with:

- safely
- efficiently and effectively
- with mutual acceptance from all parties
- with the customer being satisfied in a consistent manner

Generating understanding, acceptance and trust this would produce a:

1. Limit on the nominal gas load for domestic premises in kW
2. Mutually agreed pressure test point
3. Harmonised procedures for installing appliances covering:
   - pre-installation
   - commissioning
   - post commissioning.
4. Procedures for responding to reports of low pressure supply
5. Methodology for reporting low pressure supply
6. Common approach for investigating low pressure supply.

Q. So, what should the capacity and pressures be and where should it be measured?

A. A standard domestic gas load (capacity) is capped at gross 65kW.

However, any existing gas service is likely to have been designed for the demand appropriate to the property type and appliances at the time it was constructed, so it cannot be assumed that the existing service has been designed for a gas supply of 6m³/h (65 kW).

Note: *Requests for larger gas loads are to be made to the gas supplier/gas transporter (the contacts from the gas user's bill).*

The test point at the outlet of the meter installation is the point of common access to all parties.

So, the gas pressure measured at the outlet of the meter is to be used to determine the suitability of the gas supply for the gas load of the premises.

The operating pressure of the outlet of the meter after a one-minute stabilisation should not be less than 18.5mbar and not exceeding 23mbar.

Q. Can I find out what the domestic gas load is on a property that I am going to install a new appliance in?

A. Yes, there are two processes the RGE should use: 1) undertake tests on the current supply if practicable and/or 2) use the GT1 process:

1. These procedures are intended to establish that the gas supply is suitable for the intended new appliance(s) and if not, enable contact with the gas supplier and/or the gas emergency service provider (ESP) so that action to resolve the issue can be made before the appliance(s) are installed.

Therefore, before the RGE (or installation designer) decides what the customer and installation needs, the following pre-installation checks should be undertaken to establish the existing gas supply.

As soon as possible, and if practicable (if appliances can be operated safely) operate all the appliances within the premises at a **high operating load** and take a reading to confirm that the outlet pressure of the meter after a one-minute stabilisation period is not less than 18.5mbar and not exceeding 23mbar.

*So **high operating load** is the maximum operating load for the entire gas installation in the premises for a period of high demand. To replicate this, operate:*

- *the highest output appliance (typically the boiler) at its maximum load. (For combination boilers, this will be hot water demand to taps, in which case operate all hot taps at full flow)*
- *and all other appliances at 50 per cent load e.g., hob with four burners only two are lit.*

The GT1 process for establishing the gas supply capacity of a domestic premises works like this:

1. In order to confirm the supply capacity, an application can be made to the gas supply company (gas transporter), who will usually be Cadent, NGN, SGN or WWU. There are independent gas transporters so the customer can check through their gas supplier who the gas transporter is.

2. Refer to GDN/PM/GT/1 Management procedure for requesting gas service pipe pressures and capacity information.

3. The relevant forms can be accessed at www.energynetworks.org/gas/regulation/gtp-documents.html
4. Find the Resource Library and search for GT1 Application, which will offer a download of a document entitled: ENA GT1 form 'Standard form for requesting information on pressure and capacity'.
5. Complete the form and then apply to the relevant GT. If the property is served by an independent GT, then the application needs to be made to them.

Q. What should I do if I have low pressure (below 18.5mbar) at the outlet of the meter when installing a new appliance or during servicing/ maintenance?

A. **1.** Commissioning the appliance shall be undertaken in accordance with the manufacturer's instructions. This confirms the appliance is operating as specified by the manufacturer.

Verify the appliance inlet gas pressure as per the manufacturer's instructions – operate the installed appliance at maximum appliance load - this is as specified by the appliance manufacturer in the commissioning instructions, e.g., commissioning/ chimney sweep mode.

After commissioning an entire installation check is required, so operate all the appliances within the premises at a high operating load and take a reading to confirm that the outlet pressure of the meter after a one-minute stabilisation period is not less than 18.5mbar and not exceeding 23mbar.

If the outlet pressure of the meter after a one-minute stabilisation period is less than 18.5mbar (or exceeding 23mbar), report to the gas emergency service provider (ESP) contact centre using the 'Reporting of Low Pressure' process.

2. If the appliance(s) has been commissioned, check the working pressure at the outlet of the meter installation and ECV by operating all the appliances within the premises at a high operating load* and then take a reading to confirm that the outlet pressure of the meter after a one-minute stabilisation period is not less than 18.5mbar and not exceeding 23mbar.

***High operating load**
This is the maximum operating load for the entire gas installation in the premises for a period of high demand. To replicate this, operate: the highest output appliance (typically the boiler) at its maximum load (for combination boilers, this will be hot water demand to taps, in which case operate all hot taps at full flow) and any other appliances at 50 per cent load, e.g., hob with four burners, only two are lit.

Note 1: *Providing the RGE with the appropriate competence is present on site, allow the appliance(s) to be set up to operate in their commissioning mode.*
Note 2: *Modulating gas boilers will operate periodically at maximum output, in normal use, e.g., when heating the house from cold, or combis drawing large hot water flow rates, such as multiple showers/baths being used simultaneously.*
Note 3: *For appliances with variable rating, they are only to be operated at the agreed or set load for the installation.*

Note 4: *Lower pressures may be experienced under winter or maintenance conditions (see Appendix 5).*
Note 5: *Where poor pressure has been reported by the RGE and the ESP attends site then this procedure is to be undertaken in cooperation with the ESP.*

If the outlet pressure of the meter after a one-minute stabilisation period is less than 18.5mbar (or exceeding 23mbar), report to the gas emergency service provider (ESP) contact centre using the 'Reporting of Low Pressure' process.

Emergency numbers are:
England, Scotland, Wales 0800 111 999
Northern Ireland 0800 002 001
Isle of Man 0808 1624 444
Guernsey 01481 749 000
Jersey 01534 755 555.

Throughout this process, the RGE should manage customers' expectations and understand the limitations of the ESP First Call Operatives (FCOs).

- ESP FCOs cannot work on or set up appliances
- Therefore, FCOs will need the RGE to work with them to undertake all necessary checks and tests
- Job reports are a critical part of the process
- For a satisfactory outcome for the customer, ESP FCOs and RGEs need to work together for agreed outcomes
- Think of the customer

The RGE should wait for the ESP to attend whenever possible (this will be within two hours) especially if the appliance is new.

Where it is not possible for the RGE to wait, their job report should contain:

- confirmation that the internal pipework is correctly sized
- working pressure measurements taken
- any recent changes, e.g., new appliances, meter position moved
- the installation's total load

And, the following actions are required, as appropriate:

For an existing appliance which affects safe operation, e.g., combustion and/or flame stability the appliance shall be made safe in accordance with IGEM/G/11 GIUSP.

Where the installation is new, the appliance must be disconnected from the supply and sealed with appropriate fitting(s) in accordance with Reg 26(5) of the GS(I&U)R as an uncommissioned appliance.

Note: *If this action is taken, the RGE will need to be available to enable the ESP engineer to undertake a joint investigation.*

Q. So, what will happen when the ESP attends? What is a joint investigation?

A. The ESP takes responsibility for investigating the pressure issues and sharing the outcome of the investigation with the customer and RGE, as appropriate. The ESP will undertake tests in line with their company procedures as well as tests undertaken with the RGE.

1. If the appliance(s) is new and uncommissioned, providing the RGE with the appropriate competence is present on site, allow the new appliance(s) to be set up to operate in their commissioning mode. Then check the working pressure at the outlet of the meter installation and ECV by taking a reading to confirm that the outlet pressure of the meter after a one-minute stabilisation period is not less than 18.5mbar and not exceeding 23mbar.

Note: *If the outlet pressure of the meter installation falls outside of this range, and if necessary, in order to assist in finding the root cause of the problem, then check the working pressure with appliances operating at normal and/or high operating load*.*

Normal load for the new uncommissioned appliance would be set to working on hot water demand to taps and/or heat demand.

2. If the appliance(s) has been commissioned, check the working pressure at the outlet of the meter installation and ECV by operating all the appliances within the premises at a high operating load* and then take a reading to confirm that the outlet pressure of the meter after a one minute stabilisation period is not less than 18.5mbar and not exceeding 23mbar.

Note: *This may be at the time of an appliance service or maintenance visit.*

The ESP may carry out further investigations including the standard service six-minute average pressure test under normal load conditions.

If the average working pressure over a six-minute period at the outlet of the ECV is unsatisfactory, and the problem is limited to a single property, the investigation should focus on the service pipe. Where problems are experienced at adjoining premises, or where there is any history of problems at adjacent properties, the possibility of a wider underlying issue should be considered by the ESP.

Where poor pressure in a wider vicinity is confirmed, the ESP will request support and start an investigation to determine the extent of the affected area by:

a) Checking opposite and adjacent premises

b) Checking pressures at strategic locations in the surrounding area and extremities of the mains, as appropriate

The low pressure could be for a number of reasons, e.g., water ingress into the service/main, network issues like faulty distribution regulators or extreme weather conditions. However, if the investigation leads to the conclusion that the service is at fault, the ESP will explain to the customer/RGE/AMI the actions to be taken with a likely timescale for resolution.

For more information, visit www.igem.org.uk/technical-services or contact technical@igem.org.uk. IGEM will also be running a webinar on the changes and providing training material along with IGEM/G/13, all of which will be free to download from the website www.igem.org.uk.

If you have any questions, contact IGEM's Technical Services team by submitting your enquiry through the website or email technical@igem.org.uk or call +44(0)1509 678150.

BEHIND THE SCENES: HYDROGEN HOMES

David Tomkin is a Chartered Engineer and Vice President of IGEM. He began his career in the gas industry over 20 years ago and is currently Northern Gas Networks' H21 Engineer and Hydrogen Homes Project Lead. Here, he shares some insights from his experiences working behind the scenes of the Hydrogen Homes and H21 projects

Since returning to Northern Gas Networks back in July 2020 (I had started my career in the gas industry back in 2001 with Transco/NGN), I have been really fortunate to have been given the opportunity to work with

some incredible colleagues across the business and to work on some truly ground-breaking hydrogen projects. One such project is the Hydrogen Homes.

The Hydrogen Homes are a pair of semi-detached homes located at NGN's Low Thornley Research and Development site, and which have been built to demonstrate to gas engineers and homeowners alike the use of 100 per cent hydrogen appliances in a normal domestic setting. In the homes, we have gas boilers, fires and cooking appliances all working on 100 per cent hydrogen and being supplied through 100 per cent hydrogen meters. These meters and appliances were developed as part of the government's Hy4Heat programme. The purpose of the homes demonstration is to highlight that these hydrogen appliances exist and work, and to show just how normal and unobtrusive the change to hydrogen will be for homeowners and gas engineers. The homes and appliances look and behave exactly as you would find in a home right now.

My involvement in the homes began when I was asked to assist the project in the sizing of the gas pipework in the homes to supply the proposed hydrogen appliances. The challenge was that, unlike natural gas and LPG, there is no 'off the shelf' reference document such British standard BS6891 and/or IGEM/UP/2 (as appropriate) to use with regards to domestic hydrogen pipework.

At this time, I was also involved in work on another project: the H21 hydrogen-ready services project. This project was looking at the suitability of existing service pipes for the transport of hydrogen, specifically relating to flow rates. As I think we can agree, the flow of gas in a pipe isn't affected by the regulatory demarcation of 'upstream' and 'downstream' but rather by more tangible physical properties of the pipe and fluid. Using general flow equation principles and modelling software, it was possible to develop the theoretical pressure losses per length of pipe and in some instances validate these with physical tests at DNV's Spadeadam test and research site to produce the design for the pipework installation with the expected design load.

As any gas engineer who has sized pipework will know, the design is simply there to put you in the ballpark of achieving that maximum pressure loss as determined by the standard – i.e., 1mbar(g) in the case of natural gas and to ensure the appliance obtains the correct heat input. The physical check to see if this was adequate wouldn't be known until we installed the pipework and appliances, and then of course purged and gassed up the new hydrogen main and services from our storage unit to the ECVs. Even then, it wasn't just a case of turning it on. What about tightness testing and purging? Again, something we take for granted in the recognised standards – produced by IGEM – such as the IGEM/UP/1 suite. There is no hydrogen equivalent.

So, I drew upon work being undertaken across the industry via projects such as H21 and work from the Health and Safety Executive's Science and Research Centre, to develop a tightness testing methodology and purging procedure specific for the hydrogen homes. Once these had been developed, they had to be presented to the internal NGN standards steering board for approval. However, that doesn't mean they are done. These procedures are constantly being reviewed – having over a year's worth of experience working on the homes allows me to see what works, what doesn't and iterate as required.

Needless to say (and much to my deep relief under the watchful gaze of the appliance manufacturers), on the day we commissioned the appliances my calculations had worked, and we hadn't exceeded the pressure drop across the installation I had aimed for. It should be stressed at this stage, that formal industry standards are being developed to which Gas Safe-registered engineers will be working to and the procedures I have developed for the homes do not necessarily constitute what will be the case in formal standards. Pressures at the appliances were what the manufacturers had asked for and we successfully got them all up and running on time and ready for launch day when the homes were opened by the Energy Minister. With a long list of VIPs on site, I was pleased to be able to hide behind the fence and watch people enjoy the homes.

"In the homes, we have gas boilers, fires and cooking appliances all working on 100 per cent hydrogen and being supplied through 100 per cent hydrogen meters. These meters and appliances were developed as part of the government's Hy4Heat programme"

That was almost exactly a year ago to the day as I write this. In that last year, we've welcomed over 1,700 people through the doors to the Hydrogen Homes. Guests from as far as Australia, the USA, Canada, India, Germany, France, Spain and Ireland to name a few, along with UK guests have come to view the appliances and the homes and learn about what we are doing at NGN.

As mentioned, we continue to operate the homes and refine our procedures as new information is learned, both on site and from across wider research - research that we also are helping to support in the homes by providing the manufacturers with as close to realistic usage as possible. We are also providing them with materials for testing. That real usage includes using the cooking appliances to make all sorts of food – something my waistline hasn't thanked me for in the slightest.

The homes, however, wouldn't be what they are if it wasn't for Alex Brightman. Alex has been the face of the homes and leads visits and tours. She has developed events, visits, information and educational programmes, so the success of this project is in no small way down to her efforts – and this includes fattening me up with cakes, etc., that she has baked.

This hard work was recognised earlier this year when the Hydrogen Homes won the Project of Year at the IGEM and Energy & Utilities Alliance Gas Industry Awards in London – something which was a highlight in my career.

Working on this project has been an absolute privilege and I thank NGN for the opportunity to do so. This includes being able to work so closely with the amazing engineers at Pietro Fiorentini, Continental, MeterSit, Worcester Bosch, Baxi and Enertek International, who developed the meters, regulators and appliances and who have, of course, been instrumental in this project. A house with some pipe in it wouldn't have the same appeal without the appliances.

As the homes have just celebrated their first birthday, it's fair to say that the last year has been hectic – but I'm lucky to wake up and look forward to work, to get to see what the next challenge we have is and to work with such an amazing group of people on site and across NGN.

"Our next project is our Customer Energy Village, which is under construction. This is a project to build a unique energy village next to the hydrogen homes featuring nine properties built to mimic current UK housing stock from across the decades, right from the 1910s to present"

Our next project is our Customer Energy Village, which is under construction. This is a project to build a unique energy village next to the hydrogen homes featuring nine properties built to mimic current UK housing stock from across the decades, right from the 1910s to present. These homes will be used for research and innovation to learn how we can decarbonise the current housing stock.

We've recently completed the HyDeploy Phase 2 project on site where we had been blending 20 per cent hydrogen into the public network

supplying existing occupied homes since last year – this has been a phenomenal success.

The NGN-led H21 project continues to produce world first projects such as that led by my colleague Neil Travers, at Southbank in Middlesbrough, where an existing part of the network has been converted to 100 per cent hydrogen and, for the first time ever, odourised to smell the same as natural gas. Then there is the huge 1km long 'microgrid' we built at DNV Spadeadam, where my colleague Ryan Mallinder has led the work to test operational procedures and more. And there is our Hydrogen Village project or, as we call it, the 'Redcar Hydrogen Community', where we are working on a design to convert up to 2,000 meter points (including domestic and non-domestic) to 100 per cent hydrogen. Subject to our project being approved next year, we will begin this process in 2025.

Needless to say, there is a lot of work to do and there's never been a more exciting time to be in the gas industry. I'm lucky to be part of it.

Being a member of IGEM has helped in my career and I credit them with helping me get to where I am now – such as providing me with financial assistance to begin my MSc in Gas Engineering back in 2019 – something I have since completed before going on to become a Chartered Engineer. Being part of IGEM allows me to contribute to industry standards, meet fascinating people, attend training, events and site visits, and provides me with valuable information and skills I can use at work.

This year, I was honoured to be selected as IGEM's Vice President and will become President in 2024-2025. I will work to my fullest potential to support our industry and ensure we support the next generation of engineers (who we will need many of).

As the industry faces the challenges that are thrown at it, from climate change and the energy transition to energy prices, it's important that we continue to work and support the most vulnerable in our communities and each other. The members of IGEM should remember we are there to support them, not only in their development, but financially too. The Incorporated Benevolent Fund of IGEM is the gas industry's leading welfare charity and exists to provide support and financial assistance to needy and distressed members of the institution and their immediate families.

It's my sincere desire as Vice President of IGEM to work to keep our industry safe and see it thrive by working together, I think we can do that and I'm always happy to have a conversation with anyone who wants to know more, is thinking about joining IGEM or just wants to have a chat about anything, and I'd invite you to drop me a line on LinkedIn if you would like to.

HYDROGEN
KNOWLEDGE CENTRE

All you need to know in one place

- A digital repository for everything related to hydrogen
- Latest research and resources
- Content from a range of industries

- Applications and pathways
- Hydrogen blending
- Safety

and much more...

Free access for IGEM members

For more information visit
h2knowledgecentre.com

IGEM

FROM THE PANELS

IGEM regularly receives technical queries and provides responses with the help of its panel volunteers. In this series, we are sharing some of those queries and responses

ENQUIRY:

I am looking at purchasing the latest versions of gas standards attributed to commercial catering kitchen environments, could you point me in the right direction? I have been told that the IGEM/UP/19 document is most relevant and that it has just been updated. However, I cannot see any reference to that on your website or the web? Can you advise?

RESPONSE:

The standards below are applicable in commercial environments:

1. **IGEM/UP/2** *Installation pipework on industrial and commercial premises*
2. **IGEM/UP/4** *Commissioning of gas fired plant on industrial and commercial*
3. **IGEM/UP/9** *Application of Natural Gas and fuel oil systems to gas turbines and supplementary and auxiliary fired burners*
4. **IGEM/UP/10** *Installation of flued gas appliances in industrial and commercial premises*
5. **IGEM/UP/16** *Design for Natural Gas installations on industrial and commercial premises with respect to DSEAR*
6. **IGEM/UP/19** *Design and application of interlock devices and associated systems used with gas appliance installations in commercial catering establishments*
7. **IGEM/IG/2** *Catering equipment engineers guide to relevant sections of IGEM/UP/19* (this is free to download).

All the above standards are available to buy online from the IGEM website. When you click on each standard, you will have an option to download the introduction and scope, which will tell you what the particular standard is all about. You could go through each one and finalise the ones you wish to buy. You can either buy a licence to view the standards online, or have hard copies sent out to your preferred address.

ENQUIRY:

Is there a minimum distance between an existing gas main and a proposed new building?

RESPONSE:

Yes, please refer to IGEM/TD/3 for the requirements and guidance about the mains. This standard gives requirements for design, construction, inspection, testing, operation and maintenance of steel and polyethylene (PE) pipelines for the distribution of dry natural gas, predominantly methane, with or without odorisation, and liquefied petroleum gas (LPG).

Also, please refer IGEM/TD/4 for gas services and service pipework that are divided into four sections depending upon the pressures involved and the diameter of the pipework.

ENQUIRY:

I'm looking for some more information on what kind of tests are required annually for gas proving units in school laboratories please, also if there is any specific paperwork that needs to be completed for this? I'm a Commercial Gas Supervisor and we are potentially taking over a contract at a secondary school that has both Merlin 10005 and Medem GPPS-A gas proving units.

RESPONSE:

The requirement for gas proving systems in school laboratories is contained in IGEM/UP/11: *Gas installations for educational establishments*. Reference will also need to be made to IGEM/UP/2 *Installation pipework on industrial and commercial premises*. We advise you to refer to subsection 17.2 for requirements on maintenance and planning.

ENQUIRY:

Could you confirm if a standard efficiency boiler (Ferroli Modena 80e, Worcester 28i Junior RSF) will work on 20 per cent hydrogen blend that may be introduced into the gas grid by 2023? We have 10,000+ properties in the Glasgow area that are still standard efficiency boilers but can't get a definitive answer. There is very little information regarding standard efficiency appliances on the market and hydrogen blending.

RESPONSE:

IGEM is not able to provide a direct answer to your question. However, we would suggest that you contact the manufacturer for further advice.

For information on appliance testing please refer to the appropriate British standard. However, BS EN 437 (1994) specifies the test gases, test pressures and categories of appliances relative to the use of gaseous fuels of the first, second and third families. It serves as a reference document in the specific standards for appliances. This included testing appliances to G222, which contains 23 per cent hydrogen.

You may also wish to refer to the IGEM Hydrogen Knowledge Centre, which contains a series of reports detailing the fundamental properties of natural gas and natural gas/hydrogen blends pertinent to support the application to the Health and Safety Executive (HSE) for an exemption to the 0.1 per cent mol/mol hydrogen limit within Schedule 3 of the Gas Safety (Management) Regulations (GS(M)R). The exemption being for the safe use of natural gas/hydrogen blends containing up to 20 per cent H_2 within an on-network demonstration scheme at Winlaton.

ENQUIRY:

Our off-grid sites use LPG as an auxiliary fuel and a client has asked about the feasibility of blending LPG with hydrogen. Given the fire and explosion risks associated with hydrogen/air mixtures, what options would be available to supply a hydrogen/LPG blend (with up to 10 per cent v/v H_2)?

RESPONSE:

IGEM is not able to provide a direct answer to your question. It is possible to blend LPG with hydrogen, but current industry trials are focused on an LPG/DME blend and have not as yet considered studies that have data on a 10 per cent blend. The investment in the industry is heading towards a drop in fuel with up to 20 per cent DME in LPG for off grid homes.

ENQUIRY:

We are undertaking refurbishment works to our high-rise blocks of flats. The contractors carrying out the works have requested information on whether or not the gas riser cupboards need to be ventilated as at present they are not. We sought advice from Wales & West Utilities and they recommended getting advice from yourselves. Is there someone we can liaise with to get advice on the ventilation requirements of existing gas risers in high rise blocks?

RESPONSE:

I would refer you (and your contractor) to IGEM/G/5 Edition 3 *Gas in multi-occupancy buildings*, section 9.4 of which sets out the specification for ventilation in risers.

The requirement for ventilation in a multi-storey riser is also defined in IGEM/UP/2 Edition 3 *Installation pipework on industrial and commercial premises*.

Section 10: Pipework in ducts, voids and enclosures inside and external to buildings deals with pipework in ducts, voids and enclosures such as those above false ceilings and those below suspended floors through which pipework may be routed. Pipework must not be located in unventilated ducts, voids or enclosures and there shall be adequate ventilation around pipework joints (see clause 4.2.1.8).

Section 11: Pipework in multi-occupancy and multi-storey buildings (11.1.3) states it shall not be possible for gas that has leaked from the riser and laterals to accumulate within the building and ventilation shall be provided in all areas where escaping gas could accumulate.

Our technical standards enquiry service is designed to provide answers to queries regarding the scope and content of IGEM technical standards. Submit a technical query online at www.igem.org.uk/technical-services/technical-standards-enquiries

NICO ROSS CASE STUDY

In this ongoing series of case studies, we're speaking to some of our members, asking them about their careers so far, how IGEM supports them and finding out what their thoughts on the future of gas are. **Nico Ross** is a Plumbing and Heating Engineer at Home Group and has recently had his IGEM EngTech application approved. Here, he tells us his story so far

"IN 2013, I WAS working in the security industry as a Security Coordinator and, within the first half of the year, I was faced with back-to-back redundancies, and this took its toll on me. I decided to return to education and complete my degree and, despite my subject matter being design, this is where my journey into the gas industry started," Nico says.

Nico was a mature student with a small family so an additional source of income was required. He was offered the opportunity to do a few days labour for a heating and plumbing engineer on a second fix of an HMO project he was completing.

After those few days, Nico was asked back to labour on a range of other jobs within a domestic setting. This led to further work and his progression from labourer to semi-skilled labourer. When his time in education came to an end, Nico joined the company as a Trainee Heating and Plumbing Installer, working predominantly on the contract with an HMO developer. Nico says he jumped at the chance and accepted the job immediately.

"Over the next few years, I continued to learn and get to know the trade from the ground up and, as his company didn't solely focus on gas, I learnt bits of other trades work such as minor electrics, joinery and brickwork as this was often required in order to complete installations of both gas and plumbing systems," he says.

"When Covid hit, I witnessed its impact on small businesses first-hand and work came to an abrupt halt. Despite the government's furlough scheme, there was always something in the back of my head saying that I could be at risk of redundancy once again, especially as the contract I primarily worked on had stopped with immediate effect. Once work was allowed to recommence on building sites, I returned to work only to witness the lack of availability of materials. Again, I was very aware of how this could affect myself and the other trades."

Towards the end of 2020, Nico decided that he would start to look for other work where he expected there would be job security. This led him to social housing, and, in January 2021, he took up employment with Home Group on their new DLO team, working as a Gas Plumber.

"Working within the social housing sector, my role is primarily focused on the repairs and maintenance of both the plumbing and central heating systems within Home Group's void properties. I bring a multi-trade approach to the role to complete all possible tasks on my initial visit, with the aim of reducing the time that the property remains empty and, when possible, reducing multiple trades on site.

"Since joining Home Group, I've been provided the opportunity to undertake further development by completing additional gas qualifications and assisting the Gas Supervisor with audits of work – the purpose being to check that all work completed is in line with current regulations and, when required, to source and act upon guidance through relevant documents such as GIUSR, manufacturer's instructions, technical bulletins, and British standards. Alongside the auditing of work, each void property attended goes through a visual inspection of all gas appliances to ensure that the current stock is meeting the required regulations for safe use, all issues are reported and, where possible, steps are taken to rectify the issue or provide further guidance and feedback to the Gas Supervisor."

In October 2021, Nico became a mentor to the DLO's first Plumbing and Heating Apprentice, which he says has given him the opportunity to put his leadership and training skills into practice by guiding practical learning on site in relation to lessons learnt within the classroom.

"My health and safety knowledge has been brought along to ensure the safety and welfare of a young person operating on a construction site with a range of access equipment and power tools. To

establish a safe routine of working on new sites, I go through the relevant risk assessments for the tasks being completed, paying particular attention to the asbestos surveys, ensuring they know where it is located if identified," he says.

Discussing why he chose to become a member of IGEM, Nico says "I became aware of IGEM through my ACS assessments as I was looking through various standards and technical bulletins to source the correct answers and, over time, I came to realise the importance of joining a professional body to stay up to date with any changes or guidance within the industry.

"I initially joined IGEM with the Gas Technician membership grade, which I felt was right for me at the time, and it did show my management team that I was focused and very serious about my work. In turn, I feel that this has led them to take me seriously when I raise a concern about any situation I come across."

Nico is now an EngTech member of IGEM and says: "I feel that this grade shows people and employers just how serious you are about the industry and how it will develop in the future and how willing you are to learn new ways of working but, ultimately, I want to show people that I uphold the professional principles and standards expected by a gas engineer."

Offering some advice for fellow gas industry colleagues, Nico says: "For anybody starting out in the industry, and those who want to show their dedication to their role, I highly recommend joining IGEM as an EngTech. Don't be put off by anybody else's thoughts or opinions, and don't be put off by the application process like I initially was when first joining IGEM."

Looking to the future of gas, Nico says: "The world is changing, and we need to change with it. If the industry decides that going down the route of blended hydrogen is the way forward, then engineers must embrace the new way of working."

So, what's next for Nico personally? "Now that I have gained my Engineering Technician grade, my next step is to further my knowledge of health and safety within a construction environment by completing my SMSTS and Water Regulations. My other target for 2022 is to complete the Level 3 VRQ in Gas Auditing Processes through Corgi Technical Services and then look to advance my career by moving into a compliance-based position," he says.

If you're interested in becoming an IGEM EngTech member, visit www.igem.org.uk/membership for more information or call our Membership Services team on +44(0)1509 678150.

PRODUCTS AND SERVICES GUIDE

AUGHTON HIRE & CALIBRATION SERVICES

ONE OF THE UK'S LEADING SPECIALIST INSTRUMENT HIRE COMPANIES

Instrument Hire

- We offer a wide range of the latest test equipment complete with certification.
- Competitive prices and discount structure with full technical support included.

Calibration

- Providing a calibration and repair service with traceable certification for electric, electronic and pneumatic equipment. This is backed up by an annual re-calibration reminder via email.

01928 589600
info@aughton.co.uk
www.aughtonhire.co.uk

Fingleton White

Fingleton White provides multi-discipline engineering services to the energy industry. It operates across multiple sectors including Natural gas, CHP, Renewables, Energy & Utilities and Water.

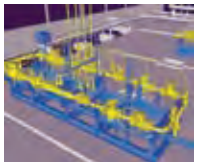
- Design approvals/appraisals
- Feasibility, conceptual & detailed design
- FEED studies
- Piping/pipeline design
- Routing assessments
- BIM
- Station capacity upgrades
- Pipeline diversions
- Hazardous area assessments
- Stress analysis & modelling

+44 1618 202460
info@fingleton.ie
www.fingleton.ie

SAITH LIMITED

SKID MOUNTED PROCESS PLANT

- For use in gas transmission, distribution and power generation installations
- Filtration, metering, heating and pressure reduction
- Specialising from 2bar to 80bar pressure range
- Inhouse process design and 3D CAD modelling
- Engineered to order
- Fabricated and tested in the UK
- Full turnkey capabilities



+44 (0) 1425 207 555
info@saithlimited.com
www.saithlimited.com

RUSH CONSTRUCTION SERVICES

Nationally approved framework contractors and consultants for design, engineering and project management services.

- Feasibility, conceptual and multi-discipline detailed design for all pipeline related facilities
- Quantity surveying, contract documentation and cost control
- Construction site management
- HSE and CDM support services

+44 (0)1837 658 515
+44 (0)1252 370 955
www.rush.gb.net

STATS GROUP

MANAGING PRESSURE, MINIMISING RISK

WORLD'S SAFEST: DNV TYPE APPROVED, LEAK-TIGHT DOUBLE BLOCK AND BLEED PIPELINE ISOLATION TOOLS (3" TO 56")

- BISEP® (>153barg) Hot tap deployed line stopping tool through a single fitting
- TECNO PLUG® (>230barg) Tethered or remotely operated (piggable) pipeline isolation plugs
- TYPICAL APPLICATIONS Pipeline Diversions, Valve Changeouts, Pipeline Repair and Emergency Response

TEL: +44 (0) 1224 772461 EMAIL: SALES@STATSGROUP.COM STATSGROUP.COM

TracPipe

Flexible Gas Piping by Omega Flex

TracPipe by OmegaFlex:

TracPipe® stainless steel semi-rigid gas piping is used for LPG or natural gas on domestic, commercial and residential projects. TracPipe® is supplied on long length reels, and bends by hand, making it faster, easier and safer to install than copper or steel, without special tools or hot work.

+44 (0)1295 676 670, fax: (0)1295 267 302
eurosales@omegaflex.net
www.omegaflex.co.uk

DMS METERING SOLUTIONS

DMS are an award winning independent supplier of metering and control solutions, with a proven track record for excellent customer service and technical support spanning over 20 years.

- Honeywell UK Channel Partner
- Supplier of Honeywell Bryan Donkin and Elster Regulators, Valves and Spares
- Supplier of Commercial and Industrial Gas Meters and Installation Kits
- Nationwide next day delivery service.

01773 534555
meters@dmsltd.com
www.dmsltd.com

Ex~i Flow Measurement Ltd

Specialists in flow computer design and manufacture for the gas and liquid industries

The future of gas and liquid measurement and flow control developed through evolution not revolution

+44 (0) 1243 554920
mail@exiflowmeasurement.co.uk
www.exiflowmeasurement.co.uk

Ex-i Flow Measurement Limited, Unit 22, Ford Lane Business Park, Ford Lane, Ford, West Sussex UK BN18 0UZ

To ensure your company is included in this guide please email: gi@syonmedia.com or telephone 0203 900 0147

PRODUCTS AND SERVICES GUIDE

To ensure your company is included in this guide please email: gi@syonmedia.com or telephone 0203 900 0147

INCREASE YOUR PIPELINE RESILIENCE WITH PROFUSE® PIPE AND EASIGRIP® COUPLERS

RADIUS Systems

For more information contact us on

t: +44 (0) 1773 811112

e: sales@radius-systems.com

www.radius-systems.com