WATER INDUSTRY JOURNAL

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ENVIRONMENTAL RISK REDUCTION

Welcome

Editor Karen Southern

Can spending a penny make a radical difference?

Challenging times lie ahead for the water industry – there's absolutely no doubt about that.

Customers face an average 1.7 per increase in their water bills from next month, with some rising by up to 10 per cent.

And as household budgets are squeezed to the max, we are all experiencing a cost-of-living crisis that's unparalleled in recent times.

So, what is the future for our utilities? The industry itself faces a perfect storm of rising costs and scarcer resources. It continues to grapple with major leaks and pollution spills, while trying to 'green up' its act.

However, radical change does not need to be eye-wateringly expensive, argues Siemens Head of IoT Adam Cartwright. In fact, it could cost as little as 1p per person to start weeding out the blockages which cause the worst polluting spills, while also optimising sewer capacity to stop the high volumes of wastewater which end up flushed into our lakes and rivers. Adam's affordable AI solutions are outlined on page 26.

And then there are PFAS – the 'forever chemicals' used in a wide range of everyday products from waterproof coats to non-stick pans. They are toxic, they don't break down, and they are creating havoc with our health and environment (to an extent which is still unknown).

Agilent scientific expert Marcus Chadha and his team are working with the Environment Agency to develop a test method for the presence of PFAS compounds in our water. He explains the challenges that lie ahead for UK water measurement companies on page 20.

On the other hand, it's heartening to see the proactive steps that the industry is taking to protect customers and safeguard precious resources.

South-East water companies are collaborating on their first ever regional water resources plan to tackle climate change and water shortages. The plan is looking closely at the future needs of all customers, water users and the local environment, as the region faces the most severe pressure on supplies of any region in the UK.

It will also investigate much-needed alternative sources to groundwater and chalk river supplies, as well as sustainable reductions in water use and waste. Find out more about the plan on page 58 and at **wrse.org.uk.**

Contents

Editor
Karen Southern
karen.southern@distinctivegroup.co.uk

Design
Distinctive Media Group Ltd, 3rd Floor, Tru Knit House, 9-11 Carliol Square, Newcastle, NE1 6UF
distinctivegroup.co.uk

Advertising
David Lancaster
Business Development Manager
Tel: 0191 580 5476
david.lancaster@distinctivegroup.co.uk

DISTINCTIVE

London Flood Review examines future resilience after summer flash floods

A review into the flash flooding that affected London in July 2021 reveals its findings early this year.

The London Flood Review seeks to better understand the extent and causes of these floods, to assess how the drainage systems performed, and to recommend how the increasing risks of future flooding events can be managed.

Commissioned by Thames Water, the independent review will play an integral part in ensuring the company future-proofs its infrastructure to protect its customers, their communities and the environment as severe weather events look set to become the norm across the UK.

The review will also play an important role in improving future collaborative working between all parties responsible for managing future flooding risks. As part of its focus, the review will provide insights on London's wider drainage infrastructure and broader recommendations that could be adopted by all organisations with surface water management responsibilities.

The London Flood Review is being led by an independent expert group (IEG) of external specialists to ensure objectivity and impartiality, chaired by leading water strategist Mike Woolgar and supported by flood modelling expert Professor Roger Falconer and city resilience expert Lykke Leonardsen, from Copenhagen.

To assist with the review, the IEG has established a strategic stakeholder panel (SSP) which helped shape the objectives and will provide input, guidance and feedback, and help deliver its recommendations where appropriate. This group comprises senior representatives from the Greater London Authority, Transport for London, London Councils, the London Drainage Engineers Group, the Environment Agency, the Consumer Council for Water, the Thames Regional Flood and Coastal Committee. Ofwat will also join the SSP to act as an observer throughout the process. Although the review is independent, Thames Water will continue to work as part of the SSP to provide necessary information and progress updates.

Chair Mr Woolgar said: "The extreme flooding London experienced this past summer is likely indicative of events we may see more of under climate change. Flooding like this is frightening for those affected and the mess, losses and damages for so many people underlines just how important this review is.

"I look forward to bringing my experience and that of my fellow Review Group members to establish how and why the flooding occurred so we can help ensure the capital's drainage systems are as resilient as possible in the face of our changing weather patterns."

Thames Water spokesman Warren Buckley added: "We welcome and support the London Flood Review, led by Mike Woolgar. The severe weather patterns that led to some of the flooding incidents this summer look likely to become the new normal for the UK.

"While we can't prevent every flood from happening, we know that we can do better and we must invest in resources today in order to build greater resilience tomorrow. This independent review will be at the heart of driving future improvements at Thames Water, and we hope it will also prove valuable for all authorities with surface water management responsibilities."

The final report will be presented at a public session in the first half of 2022 with interim reports provided ahead of this, at key stages of the review. Both the interim and final reports will be made available at **londonfloodreview.co.uk.**

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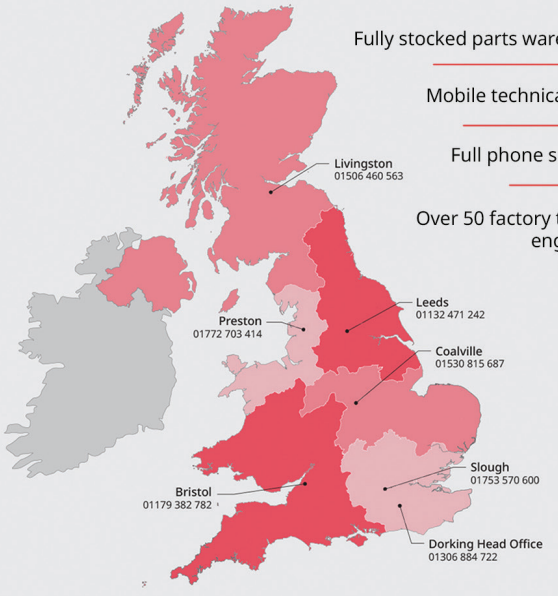

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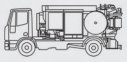

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Time to seize the moment on micropollutants

Lila Thompson, CEO of British Water, examines how water companies can demonstrate they are up to the task of measuring, monitoring and tackling this critical issue.

Micropollutants pose a huge challenge for operators in both drinking water and wastewater. Made up of a myriad of natural and synthetic organic compounds, these substances include plastics, pharmaceuticals and personal care products, industrial chemicals such as polyfluoroalkyl substances (PFAS), cleaning detergents, steroid hormones and pesticides.

As governments, pressure groups and consumers grow increasingly aware of the environmental and health impacts of micropollutants entering our water sources and drinking water – the pressure is on for the water sector to respond quickly and robustly. A report published by the UK Parliament's Environmental Audit Committee in January 2022 uncovered "multiple failures" in the monitoring, governance and enforcement of water quality.

Philip Dunne MP, chair of the EAC, said, "To deliver real change and improve the state of our rivers, a wide range of stakeholders must come together including the Government, regulators and water companies. The Environment Act signalled the first welcome sign of political will to tackle this issue."

So how can water companies demonstrate they are up to the task of measuring, monitoring and ultimately tackling this issue?

Those working across the water industry and supply chain understand the urgent challenge of tackling micropollutants, and it is heartening to note there is already an upswing in collaboration, underpinned by robust research, to combat this issue.

To deliver real change and improve the state of our rivers, a wide range of stakeholders must come together including the Government, regulators and water companies. The Environment Act signalled the first welcome sign of political will to tackle this issue.

Philip Dunne MP, Chair of the EAC

British Water is committed to playing its part and in 2020, a collaborative technical focus group was set up to find new ways to reduce levels of micropollutants in wastewater. The group, which comprises British Water members, is working to develop solutions to treat these emerging pollutants and sharing our findings on new developments with the rest of the industry.

The consensus among those working on this issue is that the solutions for the removal of micropollutants lies in using drawing together expertise and experience from both the water sector, supply chain and key stakeholders such as government bodies, while using combinations of existing technologies alongside innovative research and development.

To that end, British Water is working with stakeholders across the water sector to highlight technological advancements and promote this collaboration, specifically at the supply chain level, with the view to stimulate research and development.

In March 2022, British Water is **hosting a conference** on micropollutants in water and wastewater which will delve into three key areas:

- Installations for the removal of micropollutants from water and wastewater
- Concerning trends of micropollutants in the environment
- Effective multi-stakeholder interventions

Longer term, the sector must be prepared for the fact that tackling micropollutants will require higher investment and operational expenditure. By placing this issue at the top of their agendas now, water companies can better anticipate the likely upcoming regulations – allowing for greater preparedness in AMP8 – the regulatory asset management period 2025-2030 for water companies in England and Wales.

However, it is important to stress that tackling micropollutants is not solely the responsibility of the water sector, and it is imperative there is a holistic approach, including making producers responsible for the whole lifecycle of products they make, meaning some contaminants would never enter the water system at all.

What is clear is that there is no quick fix to this issue, but the acute spotlight it is under gives new impetus. The sector must seize the moment, showing itself ready and willing to work closely with the supply chain, business and government to develop and implement new solutions rapidly and at scale.

To find out more about British Water's micropollutants focus group please visit: **britishwater.co.uk/page/TechnicalForum**

Cutting-edge research is crucial to cleaning up our rivers

A major report on the water quality in England's rivers, recently released by the House of Commons Environmental Audit Committee, follows hot on the heels of an inquiry that received evidence from organisations including the UK Centre for Ecology & Hydrology (UKCEH). Dr Gwyn Rees, Science Area Head for Water Resources at UKCEH, explains the significant challenge that pollutants pose to river water quality and biodiversity, outlines what improvements have been made, and where more work needs to be done.

The challenge

The UK's rivers receive an increasingly wide range of chemicals and other pollutants from homes, industry and agriculture, posing a significant challenge to water quality and biodiversity.

Pollution arriving in rivers from our homes includes detergents, personal care products and pharmaceuticals, but also microplastics and legacy chemicals, such as flame retardants (PBDEs) and non-stick coatings (PFASs), escaping from our furniture, clothing and household items. A significant proportion of these pollutants enter our rivers through treated or untreated sewage.

Industrial pollutants, metals and other chemicals can also enter the environment through sewage discharge, as liquid waste (wastewater) from industrial or commercial premises, from airborne particles (eg from fuel burning), and in runoff from painted surfaces and roads directly or via surface water drains.

Runoff from farms and agricultural land typically contains pesticides, fertilisers and animal waste, which often contains veterinary medicines (eg antibiotics). Such pollutants usually enter the environment directly, accumulating on the land and in the soil before entering nearby water courses either through gradual leaching or as pulses during storm (heavy rainfall) events.

Nutrients (nitrogen and phosphorus), from fertilisers and manure and from sewage discharges, can cause algal blooms in rivers and lakes, resulting in lower oxygen levels in water and, sometimes, toxic cyanobacteria (blue-green algae) that is harmful to humans and animals alike. Meanwhile pesticides may harm aquatic wildlife more directly.

Britain is a relatively small island and England, in particular, is very densely populated. This results in us having one of the lowest river water volume per capita ratios in Europe to dilute and absorb pollutants. The levels and impacts of pollution are likely to be exacerbated in future by the expected increases in extreme weather due to climate change: predicted reductions in summer river flows will cause even less dilution, while more frequent and intense high rainfall events threaten to increase combined sewer overflows and runoff from land.

UKCEH's water quality science

UKCEH has developed considerable expertise in integrating the monitoring and predictive modelling of river flows and concentrations of nutrients and algae, pathogens, legacy and emerging contaminants like metals, organic pollutants and microplastics.

A vast range of pollutants enter our rivers, including from wastewater, as well as from industry and agriculture

Our scientists have spent decades monitoring and assessing the health of Britain's rivers, and the evidence from this work reveals a mixed picture, with some improvements to river water quality over time, and some new threats.

While the amount of metal entering the environment has declined over the past 30 years, some long-lasting chemicals such as PCBs remain in the environment, continuing to accumulate and threatening wildlife we help monitor.

With a few exceptions, there generally have been large decreases in the amount of phosphorus and ammonia entering our rivers, much of which can be attributed to water company investments in upgrading sewage treatment works. This improved water quality has helped increase invertebrate diversity, which has supported other wildlife.

At the same time, we have seen an increase in pharmaceuticals and chemicals from personal care products in rivers. We are only starting to understand the potential effects of microplastics on wildlife and how increasing human and veterinary medicines are making bacterial, fungal and virus pathogens more resistant to medicines, putting future human and animal health at risk.

Areas for future research and innovation

There is further work to be done to build capacity of the sewerage network and improve wastewater treatment technologies to cope with future climate change, emerging pollutants and a growing population. Our recent research has shown that, in many UK rivers, the majority of phosphorus pollution during spring and summer (a critical time of year for wildlife) is still derived from sewage discharges, despite large reductions in sewage effluent phosphorus loads over the last 25 years.

The Environment Agency measures a huge array of chemical pollutants in UK rivers, and its focus on dissolved phosphate, dissolved oxygen, pH and ammonium is sensible. However, in recent years its monthly monitoring regime has been reduced to seasonal sampling at many sites; this is not adequate to capture storm events, sporadic pollution incidents, or seasonal extremes.

Novel approaches could and should increase the quality, scope and cost-effectiveness of water quality monitoring programmes. Machine learning can predict untreated wastewater discharges to help water companies identify problems, while the use of environmental DNA for biological monitoring, passive and automated sampling for chemical monitoring, the wider use of water quality monitoring probes, and citizen science all have the potential to improve and supplement current national monitoring by environmental regulators.

UKCEH has developed, with the water industry research body UKWIR, pioneering methods to sample and detect microplastics in rivers and wastewater, while our web-based ASSIST E-Planner tool identifies where agri-environment farm management options will deliver most benefit, including improving biodiversity and reducing agricultural runoff.

We also carry out innovative computer modelling to predict how pollutants change in form as they pass through waste treatment and the environment, and what the fate and impact of these pollutants may be in where they might end up and what impact this is likely to have on freshwater and terrestrial ecosystems.

This type of cutting-edge research will ensure UKCEH continues to play a leading role in improving our understanding of the complex threats the vast range of pollutants jointly pose to the environment, enabling effective decision-making and actions that will help to clean up our rivers, improve biodiversity and reduce risks to human health.

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ANGLIAN WATER MARKS HALFWAY POINT IN NEW LINCOLN TO GRANTHAM PIPELINE

Anglian Water has reached the halfway point on the first section of new major pipeline route between Lincoln and Ancaster.

The pipeline is the inaugural scheme for Anglian Water's Strategic Pipeline Alliance (SPA), which will in total create hundreds of kilometers of interconnecting pipelines, making it longer than the M6, and the largest water infrastructure project the UK has seen for a generation.

This long-term project will be crucial in addressing the predicted future imbalance where demand for water greatly outstrips the available resources in the east of England. It will create the ability to move water in stages from wetter parts of north Lincolnshire to the south and east of the region, where it is less readily available. The new pipeline will also strengthen local resilience by reducing the number of homes and businesses which rely on a single water source.

As work continues on the first section, the water company has now submitted further planning applications to Lincolnshire, Cambridgeshire and Norfolk Local Planning Authorities for permission to begin work on a further 99km of pipeline running from Grantham in Lincolnshire to Bexwell in Norfolk.

This section of pipeline will run from Wilsford Heath, south of Ancaster, via Welby Heath, to the east of Grantham, down to Etton, near Peterborough, ending at Bexwell, near Downham Market. It will include two new pumping stations and a new covered treated water reservoir at Welby Heath. Subject to planning consent work will commence on site later in 2022.

> *The strategic pipeline is vital in addressing the predicted 'jaws of death' moment for water availability in the East of England – the point at which demand for water greatly outstrips the available supply.*
>
> **James Crompton, Strategic Pipeline Alliance Director for Anglian Water**

The mammoth project is part of Anglian's Water Resources Management Plan, which looks 25 years ahead to make the East resilient to drought. Without taking this action, the East of England would face a water deficit of 30 million litres a day by 2025 due to the combined impact of a rapidly growing population, climate change, and being located in the most water-scarce part of the UK. That's a shortfall of 4,380 Olympic swimming pools of water, every year.

Strategic Pipeline Alliance Director for Anglian Water, James Crompton said: "The strategic

pipeline is vital in addressing the predicted 'jaws of death' moment for water availability in the East of England – the point at which demand for water greatly outstrips the available supply.

"That point in time is very real and not far into the future. Time is of the essence and crucially, we need local planning authorities to work with us to grant the necessary permissions as quickly as possible so we can meet these timescales. With 175,000 new homes to be built in the next few years, it is vital we ensure we have resilient infrastructure in place to support local authorities in delivering their Local Plans. We look forward to working with all of the local councils on developing these proposals."

As a business with environmental and social purpose at its core, Anglian applies green thinking to every aspect of its capital programme. The strategic pipeline will make use of the latest technology, some never used before in the UK, each one designed to reduce the carbon footprint and any environmental impact associated with the scheme delivery.

The Grantham to Bexwell pipeline has been specifically designed to bypass sensitive ecological sites where environmental surveys have found protected species like badgers, water voles, bats and Great Crested Newts.

The entire pipeline has also been designed to have the lowest carbon footprint possible in line with Anglian's pledge to reach net zero carbon by 2030.

James added: "Our commitment to protecting the environment is as vital as securing customer supplies. This project will help meet our targets to reduce the amount of water we take from the environment by 84 million litres a day, but our infrastructure needs to be sustainable too.

"Climate change isn't just a risk in terms of the challenges it poses us, it is also an opportunity to challenge established practice and to do things differently and more efficiently, for wider gain. This scheme is an excellent example how we're doing both for the long-term benefit of our region."

- **Engineers complete first half of 24km pipeline between Lincoln and Ancaster**
- **Next 99km Grantham to Bexwell pipeline planning application submitted as work continues on a half-billion-pound nvestment into hundreds of kilometres of new interconnecting pipelines to prevent water scarcity 'jaws of death'**
- **Almost twice as long as the M6, the entire project from Lincolnshire to Essex will address the 30 million litre a day water shortage facing the East of England**
- **Anglian offers support to local planning teams to help them work 'at pace' to develop and approve plans**

Breaking the CSO cycle

Three steps to increased capacity, without capital expenditure

The use of combined sewer overflows (CSOs) has placed water companies in the firing line of regulators and ratepayers. The industry faces intense pressure to scale back reliance on CSOs and implement a smarter, more sustainable approach to sewage management.

The current AMP cycle, however, does not allow for capital spending on increased storm tank capacity through in-line or off-line retention storage. So water companies need to get creative.

Matthew Humphreys, Utilities Sector Manager, Adler and Allan, discusses cost-saving solutions to increase capacity, cut CSO use, and extend asset life – without the red tape of CapEx requirements.

Step one – Pinpoint your network's weak spots

CSO use is the product of an overburdened network. Using cutting-edge techniques, an experienced environmental consultant can highlight the root cause of pollution risks and identify hidden drainage problems that lead to costly CSO discharges.

CCTV surveys

CCTV asset management surveys examine sewers, sewer diversions, culverts, and tunnels up to 500 metres long between access chambers. The highly accurate inspections diagnose existing or emerging structural and service concerns, including collapses, scale build up, grease, cracks or displaced pipes, and root intrusion.

Syphon surveys

Syphon blockages can limit a pipe's hydraulic capacity, overloading CSOs and risking large-scale sewage releases. Regular maintenance is crucial, starting with a comprehensive asset review to evaluate syphon condition, access routes, and hazards. Qualified confined space entry crews determine ideal isolation, drainage, and cleaning techniques, while CCTV reveals grease or debris build-up and any structural issues.

Environmental monitoring

Environmental monitoring services, such as biological riverbed surveys and upstream catchment surveys, accurately classify the status of storm overflows. Coupled with the installation of event duration monitors, these specialist services use cumulative data to identify worst-offending assets and prioritise improvement work.

Step two – Use tech to tailor your CSO action plan

A detailed outline of your infrastructure helps you systematically manage upgrades, budgets, and resources. An OS19X-qualified team can map your underground assets, defining present and future targets for repair, maintenance, and monitoring.

Sonar tracing services

When a CCTV survey uncovers a drainage problem, sonar tracing equipment accurately locates the defective or collapsed sewer, indicating its line, depth, and direction. Your environmental consultant then uses this data to determine the most suitable excavation point and repair method.

Step three – Maximise your existing assets

With in-depth knowledge of your network, an environmental professional will plot the route back to optimum performance. This could involve instant fixes to restore pipe capacity or estate-wide maintenance plans for ongoing compliance.

High pressure jetting

High-pressure water jetting effectively clears root intrusion, silt build-up, concrete deposits, bricks, and grout. Large-scale blockages are removed by powerful deep lift vacuum tankers, while efficient recyclers treat and re-use water for jet cleaning.

Drainage repairs and planned preventative maintenance (PPM)

In the short term, a fixed-cost network cleaning and servicing programme controls pollution threats, using purpose-built remediation equipment for sewerage, effluent, and surface water. Down the line, proactive repairs and routine maintenance extend the longevity of your assets.

Looking ahead – cut CSO use with strategic thinking

Reducing reliance on CSOs begins with a deep understanding of your network's strengths and weaknesses. Aim for small, strategic investments that boost capacity and buy back precious years of asset life – with no capital expenditure needed.

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NI Water invests £15 million on essential sewer work

Over the last six years, NI Water has invested £15 million to improve over 75 miles of sewer network across Northern Ireland.

Nine million pounds has been invested on essential sewer improvement work, part of an ongoing programme to reduce the risk of out-of-sewer flooding and blockages, and strengthen parts of the sewerage network which are in very poor condition. An additional £6 million has also been invested to address emergency and urgent sewer repairs to prevent collapse, alleviate localised flooding, and address environmental pollution.

The rolling programme of sewer improvement work identifies the highest priority areas through analysing the history of blockages and flooding and undertaking CCTV surveys of the existing sewers.

Over the last six years, works have been completed in key areas right across Northern Ireland, and more recently in areas such as Culmore and the wider L'Derry area, Randalstown, Antrim, North Coast, Ballynacor, Downpatrick, Newtownards, Comber, Newtownstewart, Enniskillen, Coalisland, Tandragee, Richhill, Gilford, Markethill, Waringstown, Donaghcloney, Carrickfergus/ Whitehead, Newry and Warrenpoint. This work included the following improvements:

- Surveying and cleaning of over 100km of combined, storm and foul sewers
- The trenchless relining of 22km of existing sewers
- The replacement of around 2km of existing sewers

We are delighted to mark a successful six years on this rolling programme of work, which will benefit customers across Northern Ireland by improving the sewer network, reducing blockages and the risk of out-of-sewer flooding. This work is essential to future-proof the sewer network for our customers and prevent future problems.

Robert McLean,
NI Water's Project Manager

Infrastructure Minister Nichola Mallon said: "The Sewer Improvement Programme continues to improve the sewerage infrastructure for customers in areas across the North, while enhancing the local environment and reducing the risk of out-of-sewer flooding. NI Water is using innovative new technologies to minimise disruption for customers and also ensuring investment is targeted where it will have most impact.

"The right infrastructure will improve people's lives. Continued investment in the water and wastewater services throughout Northern Ireland is essential to improving this critical infrastructure. These important works will enrich the environment and the lives of citizens in the area as well as supporting economic growth in local development and tourism."

NI Water's Project Manager, Robert McLean added:"We are delighted to mark a successful six years on this rolling programme of work, which will benefit customers across Northern Ireland by improving the sewer network, reducing blockages and the risk of out-of-sewer flooding. This work is essential to future-proof the sewer network for our customers and prevent future problems.

"The majority of these works have been undertaken using underground trenchless techniques, which significantly reduces the duration and disruption of the works at various locations. Recent works have been carried out in Newry, Keady, Bushmills, Portrush, Maghera, Loughgall, L'Derry, Ballymena, Sion Mills, Augher, Strabane, Castlederg, Belleek, Donaghadee, Lurgan, Banbridge, Newtownards, Ballynahinch and Belfast."

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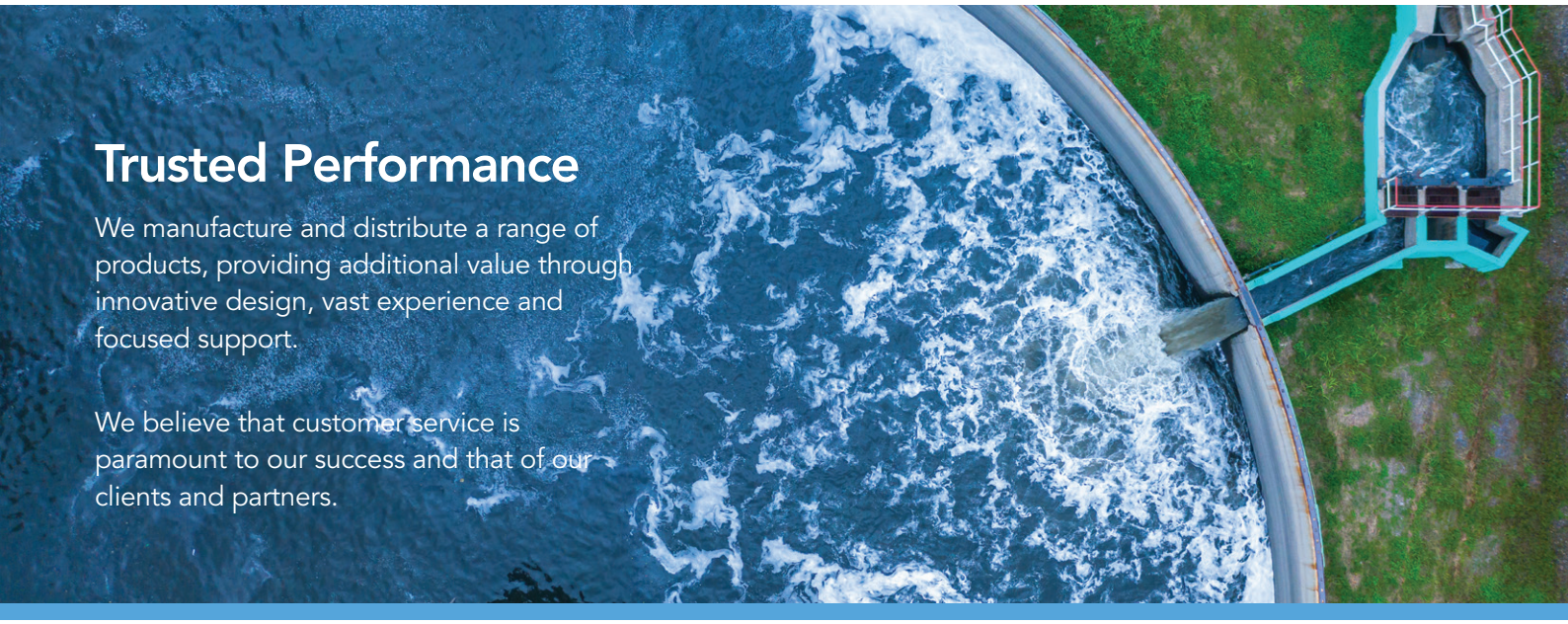

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Building resilience with sustainable SMART solutions

Pioneering technological innovations, along with collaborative partnerships, are leading the way in the future of water treatment. ATi discusses the most creative approaches that are delivering resilience and sustainability within the water industry to proactively safeguard water quality.

Over the last few years, there has been increasing pressure from government regulators and stakeholders to manage water systems efficiently, effectively and in a transparent manner to safeguard water at all points on its journey from Source to Tap.

Until recently, utilities lacked the tools to manage ageing water systems and proactively manage water quality from source to the end user. However, advances in digitalisation are now enabling better knowledge, system hygiene, efficient monitoring, diagnostics and targeted investments, along with intelligent system management, creating, optimised, smarter water treatment.

Collaborative, intelligent, networked systems are the key to the future of water management, assisting in identifying and predicting water quality issues. But they also improve operational tactics, promote conservation, minimise consumption and offer 24/7 reassurance that safe and wholesome water is being delivered to communities and this is what is helping to drive the industry towards becoming truly smart. However, as is the case with most problems, there isn't a 'one size fits all' solution. This is where technical innovation and collective expertise play a vital role.

Source to Tap Water Quality Solutions

Intelligent solutions create real-time awareness of water quality throughout the cycle and suggest optimal control mechanisms to ensure the efficient delivery of high-quality water, reducing the risk of compliance violations and customer complaints. ATi's commitment to developing pioneering, innovative solutions has led to us to being one of the few companies able to provide an intelligent and sustainable Source to Tap journey, thanks to our flexible range of industry-leading, Smart Water quality and Q-Series potable and waste water solutions that deliver real-time, continuous monitoring for all water quality applications. Our versatile, industry-leading monitoring product-range ensures optimal control, enhanced operational efficiencies and improved compliance, providing sustainable solutions for pro-active water management to safeguard water quality. These solutions provide no-compromise water quality monitoring in service reservoirs, pipes, valves, meter chambers and hydrants, along with measuring right through to the end user.

Source to Tap Metrinet

Smart 'Lift & Shift' Technology

Utilising this technology, pioneering new projects are currently underway, which has seen major water companies investing in ATi's MetriNet smart water quality monitoring solution and surveying 'Lift and Shift' systems, NephNet, ChlorNet and SiteBox. This equipment is being deployed in various controlled problem areas, with the data helping to identify problems and pinch-point locations. Following data analytics, the 'Lift and Shift' equipment is then moved to the next priority area, while ATi's WRAS approved MetriNet multi-parameter, smart water quality monitoring solution is then installed permanently. MetriNet, in collaboration with technology partners, then use dedicated apps to pull the data from each area together to deliver real insight, value and control.

Embracing these new technologies and employing them in legacy infrastructures is helping water companies extract deeper insights on their pipeline networks and enhance operational efficiencies. Collaborative, intelligent systems, with a neural network of smart sensor technology, are not only helping to identify issues including leaks, they are also improving operational tactics, promoting conservation and help to minimise consumption.

Future-Proofing Smart Water Quality

Due to this pioneering, strategic approach, ATi is trusted globally to deliver reliable, accurate and low maintenance process water control, providing water companies with high-powered, smart tools to ensure the energy-efficient delivery of high-quality water to communities.

These innovative solutions are designed to offer customers simplicity, range, low risk and sustainable water quality, continuing to make a lasting difference in the lives of the communities that water companies serve.

ATi's solutions also help utilities make progress on the problems that matter most: water accessibility, environmental sustainability, resilience and affordability, giving decision-makers a structure for environmental issues, collaboration and sharing information for setting priorities.

The challenge now is to keep evolving and work smarter, developing new, innovative, customer focused technologies, with inter-disciplinary ways of working that are motivated by the goals of each individual project, tailored to the applications they are used in. Digital and collaborative innovation will be the key to success and survival, enabling organisations to build a connected workforce, modernise operational processes and deliver enhanced customer service. Smart Water is changing the water industry as we know it and embracing innovation and digital transformation is not only enabling utilities to address today's unprecedented challenges, but also invest in the future.

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ATi's smart water solutions deliver accurate, real-time, water quality data to support evidence-based investment in networks.

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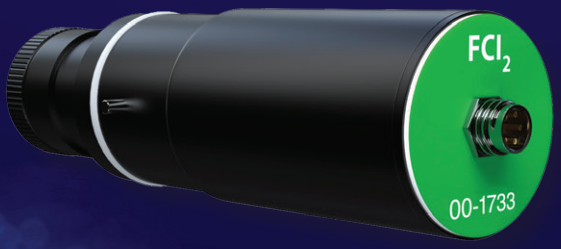
By utilising these insights, water companies can manage networks more efficiently and resiliently to proactively safeguard water quality, creating intelligent, optimised, smart water networks.

Implementing digital water quality sensors helps to enhance analytical platform performance, identify leaks, improves strategies and enables informed decisions, removing the guesswork from planning and investment.

Become data rich and knowledge smart with ATi's trusted smart water quality solutions.



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Solutions for a Smarter Future

TACKLING THE SCOURGE OF 'FOREVER CHEMICALS': CHANGING PFAS GUIDELINES IN THE UK

Water Industry Journal talks to PFAS scientific expert Marcus Chadha about the tough challenges that lie ahead for UK water measurement companies.

How many PFAS have been identified globally? Which ones present the most serious risk to health / the environment?

There are over 4000 known or suspected PFAS compounds globally in commerce. Their thermal and chemical stability as well as their surface-tension lowering properties, has led to their prominent use in many products for more than 50 years. For example, as coatings in grease proof food packaging, stain repellents, surfactants, and firefighting foam. PFAS cause environmental concern as many types do not naturally degrade and often bioaccumulate.

As a result, PFAS are almost ubiquitous in the environment, and assessments are being increasingly applied by governing bodies to gain a comprehensive understanding of the risks they pose.

In terms of their detection, each PFAS compound falls into two categories: volatile and non-volatile. We can measure volatile PFAS using Gas Chromatography Mass Spectrometry (GCMS) and non-volatile using Liquid Chromatography Mass Spectrometry (LCMS). That being said, we must not forget neutral PFAS, while we know they are present; it is much harder to detect chemically neutral PFAS compounds because of their lower functional properties used to aid their detection.

What specific types are recognised in the UK?

Every country is at a different stage in their regulated PFAS monitoring. Until recently, the UK routinely monitored for two types of PFAS compounds: PFOS and PFOA. These were the most commonly used by manufacturing in UK[1], with PFOS being banned completely in June 2008[2]. They are extremely toxic and are known to bioaccumulate in the food chain, having entered the environment from manufacturing effluent and consumer products.

The collaborative research between Agilent and the Environment Agency has led to the development of a method which can test for the presence of 47 PFAS compounds in water.[3]

How are PFAS currently regulated in the UK compared to the rest of the world?

Implementing this new method will take the number of PFAS compounds regulated in the UK from two to 47 in 2022. However, other countries have seen a quicker acceleration. For example, in Sweden, testing has been extended to 26 PFAS compounds since 2013. The European Union drinking water directive has recently increased their regulated list to 20 PFAS compounds as of December 2020. Federal regulation in the US by USEPA is expected imminently for PFOS and PFOA, but several states already have regulations in drinking water for many PFAS and national monitoring studies for PFAS have been ongoing for the last decade.

In the UK, the extended list of 47 PFAS compounds has been tested in groundwater and will soon be tested in other waters such as surface water. The Drinking Water Inspectorate (DWI) is using the data from the research to inform fellow environmental monitoring companies on the PFAS compounds they will need to investigate in the UK.

Testing multiple sub-classes of PFAS in one method with the presence of short-chain and long-chain compounds with differing solubility can present challenges, however advances in mass spectrometry and method development are helping to navigate these challenges. We have developed a new method using direct injection into an LCMS and utilizing Agilent's proprietary dynamic multiple reaction monitoring (MRM) to achieve sensitivity of less than 1ng/L.

Why are more stringent regulations needed?

Greater regulations are needed because we simply do not know enough about the extent of the effect that PFAS have on health and the environment. As we investigate further, newer and different PFAS have been detected in waters around the world.

There have been discussions [4] that all the 4000 plus PFAS will need some form of methodology capable of detecting them within the next three years. We may not necessarily measure them all but need to better understand which sub-groups or certain compounds are more prevalent and pose a greater risk.

In terms of detection levels, they have initially been set quite conservatively at 100 nanograms per litre. The industry expects these to drop significantly to one nanogram per litre and even lower than one nanogram per litre for some compounds for certain water types in the future.

Analytically there are two main ways to monitor for PFAS compounds: targeted, where we look at a set list of compounds using quantitative analysis, and untargeted, where we screen for suspect PFAS compounds or unknowns PFAS compounds in the environment. This enables us to have a holistic understanding of the presence of different types of PFAS in the UK's waters and an idea of the extent of the problem.

Do the UK water industry and decision-makers appreciate the scale of the problem?

Yes, they are becoming increasingly aware, but water companies and commercial contact laboratories have risen to the challenge and

are moving quickly to adapt to meet the new requirements to protect customers.

Something we've seen in the US that will soon be introduced in the UK is requiring manufacturers to authenticate the PFAS they create; they must measure how much PFAS their products contain and monitor PFAS in influent and effluent to reduce their environmental impact. This accountability is becoming of paramount importance. In fact, studies using our chemometric software for environmental profiling have detected PFAS in waters and been able to track them back to their original source of contamination. [5]

There are calls to increase number of PFAS measured in UK waters from two to 47. If enforced, what is the scale of the challenge ahead for our water measurement companies in terms of cost and logistics.

There is a big challenge ahead for water measurement companies, and it will help to collaborate with analytical companies to bolster PFAS measurement procedures. For example, companies will need to first understand the regulations for measuring the 47 different compounds. They will then need to develop existing applications for PFAS testing with new instruments, as some of the new PFAS compounds are trickier than others to detect and require more sensitive equipment. This may mean staff will require extra training to become familiar with the new test requirements. This will have some cost implications for water companies.

What innovations could help solve the problem?

The work on this new targeted workflow for detection and identification of 47 PFAS compounds in drinking water, can be made more efficient with several innovations.

There are a few tips and hardware modifications to make the testing of PFAS as efficient and accurate as possible. We recommend that as well as using the most sensitive mass spectrometers to achieve the best results, using direct injection will make workflows as time efficient as possible, preventing the need for additional sample preparation. Investing in a PFC Free Kit helps to avoid contamination of these ubiquitous compounds by removing 'background noise' from the instrument and achieve true blank injections to ensure subsequent samples give accurate readings. Valve switching can also help reduce background levels and carry over of the long-chained PFAS compounds.

What is the importance of LCMS analytical instruments for environmental analysis?

The advantage that LCMS brings for environmental analysis is the ability to detect compounds at lower levels. Using traditional HPLC and GC, we can detect low milligrams per litre which are parts per million. Using the latest and most innovative instruments, we are now able to detect sub-nanograms per litre which are parts per trillion and streamline analysis even further.


Marcus Chadha

In the UK, the extended list of 47 PFAS compounds has been tested in groundwater and will soon be tested in other waters such as surface water. The Drinking Water Inspectorate (DWI) is using the data from the research to inform fellow environmental monitoring companies on the PFAS compounds they will need to investigate in the UK.

This new PFAS method uses an UHPLC coupled to a triple quadrupole mass spectrometer - the Agilent 6495C Triple Quadrupole LC/MS - for targeted analysis at lower levels.

About Marcus's work

Marcus Chadha, an EMEA LCMS Field Application Specialist Manager at Agilent Technologies, is working closely with the Environment Agency on a new method for monitoring an increased number of PFAS. The new method, developed on Agilent instrumentation, has now been adopted by the Drinking Water Inspectorate (DWI).

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4 *https://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=ENV-JM-MONO(2018)7&doclanguage=en*

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A commitment to cleaner, greener operations drives Wessex Water's major improvement project at water recycling centre

Wessex Water's commitment to minimising the environmental impact of its operations was a key driver behind its decision to carry out major improvement works at a major Water Recycling Centre (WRC).

Wessex Water's Engineering and Sustainable Delivery (ESD) team, delivering its AMP7 5-year-investment programme, is currently working on improvements to the Marnhull Common Water Recycling Centre in North Dorset.

The project has a number of environmental drivers:

- Recycling of existing assets and tanks resulting in increased storm storage capacity.
- Increasing the overall treatment capacity of the Water Recycling Centre
- Phosphorus/nutrient removal, helping to improve water quality in the river Stour

The Wessex Water team also sought to reduce their carbon footprint during the construction phase, and worked with pumping solutions specialists at Selwood to help achieve this.

During a later phase of the works existing humus tanks, which are used to remove suspended solids in the final effluent, also needed to be significantly modified. This resulted in this critical section of the works having to be over-pumped. This over-pumping allowed the construction team to safely convert the associated outlet pipework and enabled the site team to install level monitoring sensors compliant with the Environment Agency's Monitoring Certification Scheme (MCERTS).

Phil Ingleheart, Framework Manager and David Petford, Pump Solutions Manager at Selwood Pump Rental Solutions, worked closely with Amber McCrory-Apperley, Trainee Engineer and member of the Wessex Water Carbon Reduction Working Group at Wessex Water, to find a solution that minimises the environmental impact of the works.

Following a full site visit, the Selwood team specified two S150 solids handling pumps powered by HVO fuel, with ancillaries including pipes, fittings and stoppers delivered as a package.

The S150, Selwood's flagship solids handling pump, is fully compatible with HVO, which reduces greenhouse gas emissions by up to 90%, nitrogen oxides by up to 30% and ultra-fine particulates by up to 85% when compared to red diesel.

Selwood's pumps are fitted with auto-start and stop systems, so the pumps only operated when the flows were high enough to trigger them, also saving on fuel, cost and emissions.

These measures saved an estimated 2723 kgCO2e of emissions, 98.71% reduction to using red diesel, during the three weeks, the overpumping was in operation at Marnhull. Workers at the site commented on the difference it made to be working close to pumps with virtually no exhaust odour. The success of the project has led to Wessex Water choosing to continue to work with Selwood to use HVO as an alternative fuel.

This ties in with Wessex Water's route map goal to achieve net zero operational carbon emissions by 2030, and full decarbonisation of all aspects of its work by 2040, a decade ahead of the government's 2050 target.

Amber McCrory-Apperley said: "Using HVO, with the reductions in carbon emissions and improvements to air quality it brings, has proved to be one way we can massively reduce our environmental impact. In close collaboration with Selwood, we have trialled the use of HVO at Marnhull Common which proved highly successful and has paved the way for Wessex Water and Selwood to develop this approach going forward."

"Both businesses are currently heavily reliant on fuel, so there are huge benefits of using HVO as an alternative to power our site plant and equipment."

Phil Ingleheart said: "At Selwood we have underlined our commitment to becoming an industry leader on sustainability, both in the way we operate and in our work with customers and suppliers. Amber and the team at Wessex Water fully embrace this approach and I am delighted that we worked so closely together to deliver a project that has delivered significant improvements at Marnhull WRC in the most eco-friendly way possible."

www.selwood.co.uk

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Hoekerweg 1
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T: 0031 (0)38 4222009
E: verhuur@vdkamp.eu

Vanderkamp Service

Weihoek 7a
4416 PX Kruiningen

February 2022:
Industrieweg 29
4301 RS Zierikzee
T: 0031 (0) 1 13 34 88 67
E: service@vdkamp.eu

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Engineered temporary pumping solutions

Cost effective per capita consumption reductions

'By 2050 the UK water deficit is anticipated to be 4017 mega litres per day', was the stark announcement at the National Water Framework Consultation launch in January 2022. The plans to upgrade our water supply to meet this demand are reliant on the reduction in current usage levels. That means reducing Per Capital Consumption (PCC) to 110 litres per day from its current average of 150, is imperative if we are to meet future water demand.

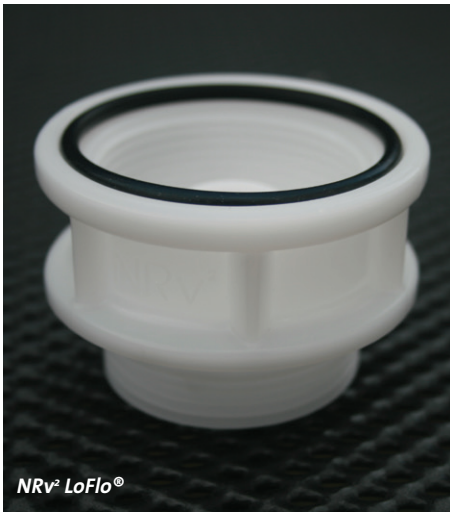
The challenge to water suppliers of achieving reductions in PCC is not only difficult, but potentially expensive. As a regulatory requirement there is the potential of financial rewards for success, and conversely hefty penalties for failure.

Despite the recent focus on educating the public on how to improve our lifestyle to minimise our impact on the environment, the general day to day use of water is rarely mentioned. Multiple bathrooms, automatic washing machines and even designer gardens can lead to unthinking daily usage, this has been exacerbated by the number of people home based over the last 2 years.

The cost of water is also relatively cheap, especially when compared to other utility bills. So, the consumers' mind is focused on energy reduction over water consumption.

Although the financial cost of supplying and cleaning water is relatively low, the environmental impact isn't - 40gm of carbon for each 1m^3, whether that's making it ready for consumption or to return it to the environment.

'Smart metering' has been shown to have some impact on domestic consumption. However, the cost and time scales of introducing a fully 'smart metered' network are prohibitive. An aging infrastructure with multi household supplies are amongst the many factors that ensure that mandated metering – let alone 'smart metering' is at best an expensive, medium-term objective.



NRv² LoFlo®

A simple solution at approximately £20 per household, fitted on the normal meter exchange/upgrade cycle could achieve in excess of 20% of our consumption target in 10 years.

Example 2019 Performance Commitment Levels (PCLs)

If a company has a PCC reduction 5 year profile commitment of:
Yr1 -0.1%, Yr2 -0.2%, Yr3 -0.3%, Yr4 -0.5%, Yr5 -0.9%
The baseline PCC at the start of the AMP was 142 person/litres/day
The Incentive Rates of Teir1 £-0.130 m/person/litres/day
with a "Collar" at 12.7%, followed by a Teir 2 rate of £-0.430 m/person/litres/day
and Outperformance of £+0.091 m/litres/person/day.

An out-performance example:

Actual PCC reduction in Year 1 of 0.213 litres/person/day
i.e. 0.15% reduction against Year 1 Target of -0.1%
Out-performance of 0.05%,
Out-performance reward 0.071 litres/person/day @ £0.091m/litre/person/day = £6,461

An under-performance example:

Actual PCC increase in Year1 of 5.5 litres/person/day
i.e. 7.81% increase against Year 1 Target of -0.1%
Under-performance of -5.6%, which is below the Teir1 collar of 12.7%,
Under-performance penalty of 7.952 litres/person/day @ -£0.130 m/litres/person/day = £1,033,760

Short term gains are possible.

Our water companies are regulated to provide a minimum level of water, but in many areas due to network structure and gravity fed systems supply is much greater. So, run a hose for five minutes at the bottom of the hill, and your lawn will be greener that the gardener that does the same at the top. These 'time controlled' uses, e.g. teeth cleaning, taking a shower, running a tap to rinse dishes could be standardised down if all households received the same acceptable, 'standardised' supply.

Defra's target is an average 33L reduction in PCC. Groundbreaker's NRv² LoFlo is a surprisingly simple method of working towards that target. Independent research carried out by WRc, showed a theoretical reduction of 2-4% of typical water usage. However, recent field trials by a major UK water company are showing reductions in excess of 37L per day per household (for one or two person households) – a saving in PCC in excess of 10%

NRv² LoFlo regulates the level of flow entering customer premises – regardless of network pressure, meaning a reduction in the level of water used by customers when 'variable use' appliances (i.e. showers, taps, hosepipes) are used. As the flow of water into the premises is limited, then the amount used by the customer is also limited – but without providing a degradation of service, and more importantly not requiring any intervention or behavioural change on the part of the customer, leading to 'natural' reduction in per capital consumption.

A number of flow modulation ranges are available which enable the perfect balance between usage reduction and service provision. As an added benefit, the NRv² LoFlo can also provide whole site protection against contamination by back flow.

The NRv² LoFlo can be easily and simply retrofitted to any meter installation, or meter exchange when upgrading or remediating underground meter chambers. Thus, allowing Water Companies to manage demand with little or no impact on consumers and at minimal cost to the water undertakers - effectively a 3 in 1 solution.

Groundbreaker products are compliant with all Regulations and defined criteria and are used extensively across the whole of the UK water supply network – whether that be North of Scotland or the Channel Islands.

Steve Leigh FIWater, Managing Director
Groundbreaker Systems

Groundbreaker Systems won the HBF's 'Utility of the Year' in 2018.

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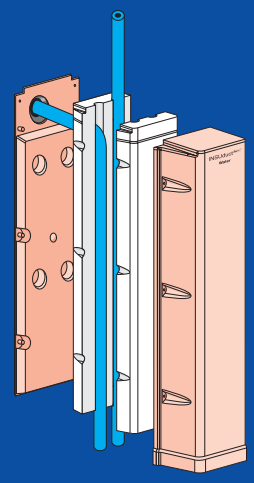


The innovative pipe replacement solution that minimises disturbance, time and cost.

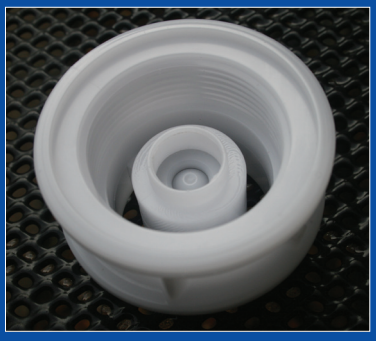
- Replace old, leaking or lead water supply pipes in under 2 hours
- No major excavations
- Minimal disruption

Groundbreaker®

The surface mounted water control management system, allowing metering where traditional installation would be impractical.

- Can be installed at any point to new or existing building
- Perfect platform for 'Smart Water Meters'
- Complies with best practice guidelines for jointless installation

NRV²LoFlo®



Reduce 'time controlled' waste use by modulating supply rates.

- Low-cost solution to water 'over supply'
- No customer interaction, mounted between the meter and manifold
- Variable flow rates available to maximise customer satisfaction

All Groundbreaker products are made in accordance with, or to exceed statutory regulation and manufactured using low impact, 'green' methods where practical. Our aim is to assist the industry and provide water to the community while minimising the impact to the environment.

Groundbreaker - helping the water industry towards Net Zero.

For further information on these highly effective systems and other products go to:

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Email: sales@groundbreaker.co.uk Tel: 01379 741993

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AFFORDABLE SOLUTIONS TO THE UK'S WASTEWATER POLLUTION CRISIS

'Spending a penny' could help us see through the £150bn smokescreen surrounding river spillages, says Adam Cartwright, Head of IoT Application, Siemens Digital Industries.

It's policy making sleight of hand to claim that the cost of preventing spills in UK rivers is more than £1,000 per household per year. What a scary number? What a false argument? There are clear steps now that the water industry can take to reduce its impact on our waters, and it starts out at 1p per person per year.

The first step is to make the most of the monitoring infrastructure on the network. In just 16 weeks, every measuring point in the UK could be connected to an Artificial Intelligence (AI) system that finds 9 in 10 blockages which cause the most polluting spills and has real-time reporting of performance and data quality. This could help water companies target the most polluting assets and give them time to fix the problems before any major polluting incidents. Once set up, the ongoing cost of the AI is 1p per person per year and some water companies are already making this happen on thousands of CSOs and manholes.

While monitoring AI will help prevent the worst incidents and help target offenders for a fix, it won't give the step change in the volume of wastewater flushed into rivers and lakes in high rain. That comes next.

The second step is to optimise the latent storage capacity in the sewer network – the actual volume in the pipes and the sewers. Valves and pumps are remotely controlled as a system to manage the flow through the network. OFWAT recently funded an innovation proposal for this type of approach in the UK. Since 2016 Germany introduced this prototype and it works. Models predict the inflow into the sewer based on the forecast rain. Advanced control routines investigate the future and run scenarios with multiple layers of potential failure and can either autonomously control or recommend what a human operator should do. The impact: an 85% decrease in the volume of wastewater released in light rain and a 10% reduction in heavy rain.

Adam Cartwright

If this is to work in the UK the quality of our automation infrastructure will need to step up. But the cost is an order of magnitude less than digging up the pipes.

Once you have advanced control algorithms reducing the volume released and AI finding the issues that cause your biggest pollution problems, you will also know where your problems are. With our ever-increasing knowledge of nature-based solutions these can be used to give the win-win of reducing pollution impact and risk, while improving the overall environment of the catchment.

Then is the time to look at replacement, not the whole network, but where the limited funds will have the greatest impact on the environment and the least impact on customers' bills.

Water Innovation 2050, the water industry's vision for the sector, had some fantastic ideas. But solving its problems is not just about developing new solutions but about using the innovations that already exists. Today's barriers are how water companies should focus and deliver a digital transformation of their sewer monitoring systems.

We need to accept this is an old Victorian system. If we were starting again, we would do things differently. But we should also accept that we are not powerless, and the tools are available now to deliver a step change from where we are today.

Water Innovation 2050, the water industry's vision for the sector, had some fantastic ideas. But solving its problems is not just about developing new solutions but about using the innovations that already exists. Today's barriers are how water companies should focus and deliver a digital transformation of their sewer monitoring systems.

Adam Cartwright, Head of IoT Application, Siemens

Creating a tide of productivity for the water industry

Water companies are under a tidal wave of pressure to innovate. The already looming challenges of population growth, net zero targets, water scarcity and deteriorating asset health were further compounded by the global pandemic that saw demand for water rise considerably and a workforce mandated to work from home.

But rise to the challenge they did. In its 2020-21 Service Delivery Report Ofwat praised most of the UK's water companies for stepping up to the challenges posed by Covid-19 and providing continuity of service to customers, whilst also working towards the price review's various stretching targets.

Key to this success has been innovation through digital technologies. Investment in more hardware and software and new processes helped to facilitate remote working. New cloud technologies are improving automation and consolidating processes. Data science and behavioural science based nudge techniques that utilise data from smart meters and self-service portals are improving customer engagement and the customer experience. And leak and pollution incidents have been reduced with the help of data from IOT devices in conjunction with digital twin technology, Machine Learning and Artificial Intelligence.

As the sector drives to digitise its operations and customer teams, the challenge is to ensure that the new technology enhances the employee experience, rather than having a negative impact on production levels, engagement and well-being.

Research reveals that companies with highly engaged workforces are 21% more profitable[1]. Conversely, disengaged workers had 37% higher absenteeism, 49% more accidents and 60% more errors and defects. What's more, workplace stress leads to an increase of almost 50% in voluntary turnover[2].

As the pandemic recedes, many organisations are accelerating their digital transformation strategies, which in turn has created a highly competitive job market. This, in combination with heightened employee expectations of employers and increased job mobility, means that the pressure to retain top talent at scale has never been higher. Organisations that take a human centric and data driven approach to how and where work is conducted will have enduring competitive advantage.

Adam Dooley, Digital Advisory Group Manager, Avanade believes that employee experience drives customer experience and better performance outcomes. He suggests the challenge is to transform the workplace to deliver seamless employee experiences. "That's where enabling technologies like Microsoft

Dynamics 365 and Microsoft Power Platform come in. Dynamics 365 unifies traditional CRM and ERP capabilities, empowering employees to efficiently deliver a consistent, personalised customer experience. And Power Platform can help accelerate business and innovation with rapid low-code solutions that analyse data, automate processes, build virtual agents, and create apps that solve business problems.

"Reducing mundane, repetitive tasks and inefficiency through process and workflow automation can be achieved by leveraging existing investment in Microsoft Teams and Power Platform. At the same time, holistic and comprehensive Microsoft security programs will provide guidance on how to address and mitigate cybersecurity risks, helping to meet compliance requirements and secure data set out by NIS Regulation."

When it comes to evolving your frontline worker experience, Adam believes this depends on a roll-out of new apps or devices. He comments, "It requires an end-to-end transformation, rethinking core work processes, renewing your employee experience and culture, and modernising your workplace technology ecosystem. At Avanade we call this Workplace Experience (WX) and when done right, it helps your organisation generate sustainable business value and harness the full potential from your frontline workforce."

Avanade's Workplace Experience (WX) framework brings together IT, HR, Facilities and Line of Business leaders to water companies generate sustainable value and become more people-centric, resilient and agile.

Adam continues, "A reimagined culture and employee experience can increase the productivity and engagement of your talent by creating enhanced employee experiences that have a direct impact on your customer experiences."

Turning your workplace into a business value engine with Avanade's holistic WX model delivers:

- **A modernised technology ecosystem:** Enhance and extend your workplace technology ecosystem to protect against attacks, support new ways of working and drive increased business value.
- **A reimagined culture and employee experience:** Create a personalised work environment and next-generation employee experience platform to inspire people to be their best, amplify human potential and drive enduring behavioural change.
- **Transformed business operations:** Reconfigure how work gets done and adapt work environments to sustainably improve customer experience (CX) and business performance.

Adam concludes, "Using the power of innovation our goal is to make genuine, positive human impact on your business, the water industry as a whole, the environment and your customers. We want to work together with water companies to shape the future of the water industry and the world, by accelerating change through digital transformation – with employees at the very heart of that transformation."

Visit **Avanade.com/utilitiesUK** for more details.

Source ref

1 *Gallup 2020 Q12 Meta-Analysis*

2 *Proof That Positive Work Cultures Are More Productive (hbr.org)*

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Creating a tide of productivity for the water industry

Rethink to renew and grow through continual change.

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Yorkshire Water expands AI use against pollution

Yorkshire Water is expanding its use of artificial intelligence (AI) to predict blockages within its sewer network and reduce pollution risks.

A successful pilot of a solution co-created by Yorkshire Water, Siemens and The University of Sheffield has been completed and will now be rolled out to Yorkshire Water's network of more than 2,000 combined sewer overflows (CSOs).

Combined sewers carry both foul water from homes and businesses as well as rainwater which falls onto impermeable areas such as paved areas, roofs and highways. As the weather can be unpredictable, CSOs are permitted on sewer networks to reduce the pressure on sewers during heavy rainfall events and stop the system from backing up and flooding homes and gardens by allowing heavily diluted wastewater to be discharged into watercourses.

The integrated sensing, communication, analytics and reporting solution works by using sensors to feed water level data into SIWA Blockage Predictor, an application on Siemens' cloud-based, open Internet of Things (IoT) operating system, MindSphere.

The performance of the sewer network is analysed in real time and predicts problems like network blockages before they happen, enabling Yorkshire Water to quickly investigate the predicted blockage and prevent them developing into sewage pollution in the environment.

Analysis of 21,300 days of data by the University of Sheffield found the blockage predictor can provide up to two weeks' notice of problems within the sewer network and identify 9 out of 10 potential issues - three times more successful than existing pollution prediction processes, while reducing the number of false positive alerts by 50%.

Heather Sheffield, integrated planning and central control manager at Yorkshire Water said: "Much of our network in Yorkshire is combined, taking both waste from toilets and sinks in home and surface water from rainfall. Periods of prolonged or intense rainfall can significantly increase the flows in our network and there is a risk of sewage flooding in homes, the environment, and the potential for damage at wastewater treatment works.

"This challenge is compounded by population growth, climate change and consumer behaviour which puts non-flushable items like wipes into sewers, causing or accelerating blockages.

"Reducing intermittent discharges from CSOs is a key priority for us and our partnership with Siemens illustrates Yorkshire Water's commitment to investing in cutting-edge technology to reduce pollution incidents by 50%, a key goal of our Pollution Incident Reduction Plan 2020-2025.

"Our customers expect us to use the latest technologies. This solution, developed in partnership with Siemens and the University of Sheffield, will change our visibility of the sewer network and improve how we identify and tackle blockages.

"Rolling out the solution to 2,000 assets across the entire county will have a significant role in reducing the number of pollution incidents, which can have a negative impact on the environment, as well as increasing our efficiency and providing improved value to our customers."

The innovative solution recently won the Data Analytics, Cloud and AI Project of the Year at the 2021 Water Industry Awards.

Steve Hanslow, head of water for Siemens Digital Industries UK, said: "The challenge of moving from a Proof of Concept to scale are considerable. Through partnership we have been able to develop a solution that is secure, scalable, cost effective and can be deployed at pace.

"Keeping sewers free from blockages and reducing river pollution is a wide-ranging and complex issue, and Siemens is happy to help the water industry to meet the technological challenge."

Siemens is now engaging with water companies to support the ambitions of Water UK, the trade association, to eliminate pollution incidents in the sewer network by 2050.

Adam Cartwright, Head of IoT Application Delivery at Siemens, added: "SIWA Blockage Predictor is a step change in how water companies can avoid pollution incidents.

"The AI can work on existing or new sensors in the network. Integrated reporting of spills and overflow events will support water companies as they rise to the challenge set by the Storm Overflows Taskforce for greater transparency and open data."

"Rolling out the solution to 2,000 assets across the entire county will have a significant role in reducing the number of pollution incidents, which can have a negative impact on the environment, as well as increasing our efficiency and providing improved value to our customers."

Heather Sheffield, integrated planning and central control manager at Yorkshire Water

Ice pigging significantly increases flow rates in rising sewers

A case study with SUEZ and Wessex Water

Ice Pigging is well established as an effective and low risk method of cleaning drinking water pipes. Not so well-recognised, is the significant benefits it can bring for wastewater applications, particularly in cleaning rising sewer mains.

Pumped sewer mains often become fouled with FOG (Fats, Oils & Grease), grit and other material, resulting in poor hydraulic performance. Most current mitigation methods focus on upgrading pumps, which can be ineffective and expensive, as well as increasing stress on the underperforming main.

When left unchecked, heavily fouled rising mains can lead to sewer flooding, environmental incidents, or the reliance on waste tankers to keep up with incoming flows.

The challenge

Wessex Water approached SUEZ to carry out Ice Pigging at three Sewage Pumping Station (SPS) sites where suspected build-up of deposits in the rising main had been causing low flow rates. Each rising main was small in diameter, at DN50 or below.

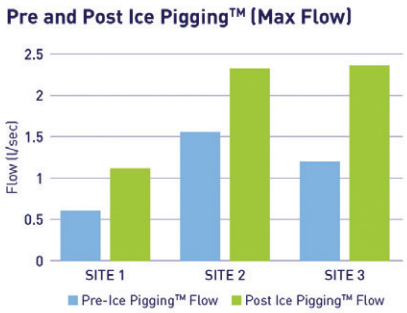
Due to the small diameters, very few options are available for cleaning the entire length of the main. At some locations a vacuum tanker had been attached to alternately vacuum and flush a short section of the pipe, but any improvement gained had been temporary.

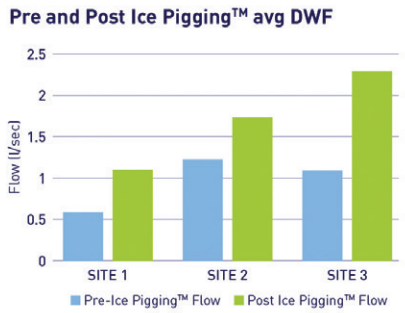
The solution

Ice Pigging was applied at all sites without requiring any permanent enabling works. Ice insertions took place via an existing Bauer connection or by adapting a fitting at the SPS. An Air Valve at the half-way point of Site 2 was utilised as a breakpoint, though it would also have been possible to clean the entire section in a single operation.

"We were really pleased with the results of these operations; the flow increases at each site means that we no longer need to run tankers from these stations during bad weather."

Ashley Pratt, Wessex Water





Results table

Location	DN (mm)	Length (m)	Start Max Flow (l/sec)	End Max Flow (l/sec)	% Improv Max Flow	Start avg DWF (l/sec)	End avg DWF (l/sec)	% Improv avg DWF
Site 1	40	580	0.6	1.13	88%	0.59	1.11	88%
Site 2	50	1400	1.57	2.34	49%	1.23	1.74	41%
Site 3	40	930	1.2	2.37	98%	1.09	2.3	111%

The results

Pre and post Ice Pigging flow readings were provided by Wessex Water's on site flow meters. Significant improvements were seen at all sites, both in terms of overall max flows and the average Dry Weather Flow (DWF). At Site 3 Ice Pigging activities coincided with pump improvements, so it is not possible to say how much of the improvement can be attributed to each task, however at Site 1 and 2 Ice Pigging was the only activity undertaken. *(See above).*

How it works

Ice Pigging is a pipeline cleaning process utilising a two-phase ice slurry which forms a semi-solid 'pig' within the pipe. The slurry is pumped into the main like a liquid, but when moving through the pipework it behaves like a solid material, detaching contaminants and fouling from the pipe wall and carrying them out of the pipe entrained within the ice pig.

The pig is pushed through the section at the network operating pressure, so the rising main is under no additional stress.

The process can be undertaken on all pipe materials, at diameters of up to 600mm and on sections several kilometres in length. Ice Pigging is fast, effective and incredibly low risk – in the unlikely event of the ice becoming stuck it can be allowed to melt and flushed out.

Differentiating factors

- Ice Pigging has the benefits of conventional pigging, but without any of the associated hazards
- The ice slurry is inserted and ejected using exiting existing fittings
- The ice slurry flows through complex pipework such as bends, diameter changes and butterfly valves
- In most cases the wet-well pumps are used to push the ice pig, so the downtime is minimal
- In the unlikely event of becoming stuck, the ice can be left to melt.

Future possibilities

The flow improvements seen on these mains highlight the effectiveness of Ice Pigging at increasing the hydraulic efficiency of rising sewers. Outside the Wessex Water trial, SUEZ have been carrying out a significant number of operations on waste water pipework, in 2021 a total of 28,000m of rising mains were Ice Pigged, with an average flow improvement of 50% per project.

Along with direct impacts such as reduction in tanker use, the improved hydraulic efficiency is likely to have wider ranging positive effects; such as reduced energy consumption, improved carbon footprint, increased asset life and reduced risk of sewer flooding.

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Protecting our water resources

by keeping your pipes clean and free-flowing.

Wastewater pipes need to be kept clean to operate effectively. **Ice Pigging™** quickly and efficiently removes fats, grits and other deposits from rising sewers to tackle poor hydraulic performance. Considering the flow improvements achievable, **Ice Pigging™** is normally the safest and most cost-effective solution for underperforming pipes.

Clean, free-flowing pipes significantly reduce the risk of environmental incidents linked to sewer flooding and help to ensure compliance with discharge regulations. Improved hydraulic performance will also lead to reduced energy consumption, along with extending the life of the asset. Across all rising sewers cleaned in 2021, the average post-**Ice Pigging™** flow was 50% above pre-cleaning levels. Find out more at **www.suez.com/en/uk**.

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IIoT radar sensors save costs at Canal & River Trust

The Canal & River Trust

Canal & River Trust are a national not-for-profit organisation who take care of over 2,000 miles of waterways. They ensure that 2,980 bridges, 1,580 locks and 335 aqueducts are open and ready for use all day, every day. Their work involves not only looking after our waterways, but promoting them widely across the UK, so that as many people as possible benefit from a free, accessible leisure and nature infrastructure.

Of course, water is the lifeblood of the network - water levels across canals, locks, reservoirs, pumping stations and flow rates need constant monitoring. The stations that provide this data give the Trust warnings if there are breaches or where people vandalise and let water out, so the Trust can manage our water resource more effectively. Peter Lau is the Principal SCADA (Supervisory Control and Data Acquisition) Engineer working for Canal & River Trust. He installs, manages and maintains these systems.

What instruments are used for water levels?

Historically Canal & River Trust have used hydrostatic pressure transmitters to measure the levels, along with ultrasonic level sensors both require careful positioning, mounting and protection from weather or damage. Over recent years they have standardised on the ceramic-based VEGAWELL pressure transmitters for their robust, stable yet accurate characteristics, with proven long-term, low drift performance. "More recently we have transitioned from ultrasonic to radar-based level sensors, not only for their better performance in all weather and environmental conditions, but also their simpler, more flexible mounting and installation needs," said Peter Lau. "The latest versions being the VEGAPULS C21 and C22 compact radar-based level instruments. They measure the water levels every five/ten minutes and the data is sent back via telemetry to a central server, so The Trust can keep track of how water levels are fluctuating. When these water levels are outside the operation band, it notifies regional water engineers," he added. To report and use this information, a kiosk *(shown in Figure 1)* is needed to house the telemetry outstation, and if power isn't available, a battery and solar panel, which powers the VEGAPULS C22 *(shown in Figure 2)* or VEGAWELL 52. A plinth is needed to support this kiosk. "The installation of this equipment is not cheap and takes around three months from planning, to purchase to installation," says Peter.

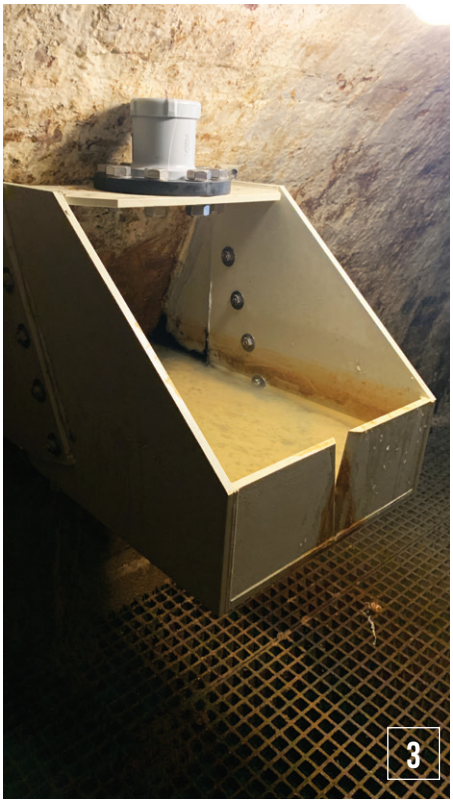
Where next for level measurement by the Canal & River Trust?

The Canal & River Trust is now utilising the latest in level technology combining radar level sensors with IoT technology using NBIoT, LTE-m or LoRa mobile radio data networks. VEGAPULS Air sensors are battery powered and can measure levels at ranges from 100mm up to 30m, with mm resolution. "Most importantly this removes the need for power, cabling and a kiosk, which means it takes less than a day to install and commission," continues Peter.

"In one application, monitoring the water level in a V-notch *(Figure 3),* it measures and records the level every 4 hours and transmits the data to the central system. A longer period can be used in these as these water levels tend to be monitored looking for longer term trends, they don't have insignificant changes in depth in five/ten minute intervals. The unit we installed is a VEGAPULS Air 42 *(Figure 3),* which does the same job as previous technology *(Figure 1 & 2)* with batteries lasting about five years before they need replacement. This system can be bought and installed for around one fifth of the traditional outstation/kiosk *(figure 1 & 2)* arrangement."

1 ***Figure 1 – Standard C&RT Telemetry Kiosk***

2 ***Figure 2 - VEGAPULS C 21 radar level sensor on V-notch connected to a telemetry kiosk in figure 1 above***



3 ***Figure 3- VEGAPULS Air 42 on a V-notch flow box***

Why do Canal & River Trust choose VEGA instruments?

"VEGA are a trusted partner and supplier for level devices to The Trust and we have used them for many years for conventional level monitoring applications. We have standardised on them now." He concluded; "As one of the first companies with IoT radar level devices, we chose to test and use this really new and innovative technology in these applications. Their technical and service teams have been closely involved in supporting us to get these first devices set up and operating properly."

VEGAPULS Air IoT technology is not just for water and other liquid levels, but it can be used for applications in waste, sludge and bulk solids silos as well. For more information on models for level sensing and an online battery-life calculator, go to **vega.com** and search VEGAPULS Air.

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Thames Water and HWM deliver ambitious Sewer Depth Monitoring (SDM) installation project, initially deploying almost 4,000 ultrasonic level sensors

Every day, more than 15 million people in London and the Thames Valley flush or drain 4.6 billion litres of used water. To cope with this huge demand, Thames Water maintains a complex 68,000-mile sewer network.

With such huge quantities of water to manage, it is critical that the sewer systems always remain functional. This is especially important as population growth, and more extreme weather patterns, are putting additional stress on sewer networks.

Water companies also face various problems associated with pipe blockages, so sewer maintenance is key.

On average, Thames Water spends £18 million every year clearing 75,000 blockages from its sewers, unclogging five house blockages and removing 30 tonnes of material from just one of its sewage works every day.

This is critical maintenance, as blocked pipes can result in the flooding and pollution of customers' homes and businesses.

"We get thousands of entirely avoidable blockages on our sewers each year when things like wet wipes, nappies or cotton buds are flushed down the loo, or when cooking fat from kitchens is poured down the sink.

"We'd urge everyone to help by only flushing the 3Ps – pee, poo and paper – as well as disposing of fat and oils in the bin, not the sink, which helps to keep the sewers flowing and to prevent them blocking and backing up into people's houses and gardens, or even into the local rivers," said Anna Boyles, Performance, Risk and Optimisation Manager, Thames Water

To help monitor their network through Sewer Depth Monitoring, Thames Water installed 3,700 SonicSens 3 ultrasonic level sensors last year, which saw it hit its yearly deployment target.

SonicSens 3 uses ultrasonic technology to measure the level of wastewater in a chamber, information which can provide an early warning of blockages within the network.

The benefit of using ultrasonic technology is that SonicSens 3 is installed within the chamber but avoids contact with its environment. This lack of contact with the contents of the sewer lowers the requirement for maintenance of the SonicSens 3 devices.

In this SDM programme, SonicSens 3 has been paired with our Intelligens WW data loggers for efficient data transfer. Intelligens WW is a truly flexible data logger with the versatility to be tailored for a variety of specific user needs.

As with our complete range of advanced data loggers, Intelligens WW delivers recorded data through advanced telemetry technology. Both LTE-M and NBIoT-enabled, but maintaining a 2G fallback, HWM data loggers are future-proofed for connectivity within a changing cellular landscape.

This efficient and dependable transfer of data allows customers to monitor their networks effectively and to react swiftly to any potential issues as they arise.

Intelligens WW was also chosen for this programme because it contains a long-life battery which powers not only itself, but also the SonicSens 3 sensor without the need for additional battery packs.

In choosing to install the combination SonicSens 3 and Intelligens WW, Thames Water has selected an effective early warning system. Should levels rise, the device will send alarms to Thames Water, drawing attention to a developing problem within their network and helping to avoid the damage caused by flooding and pollution incidents.

"These monitors are an important tool in our armoury in the fight against sewer blockages. The data they provide gives us a picture of what's happening in our sewers and helps us to nip blockages in the bud before they cause problems," said Anna Boyles, Performance, Risk and Optimisation Manager, Thames Water

The next phase of the SDM programme will see an additional 5,000 units installed, providing Thames Water with even more data with which to monitor their network.

Reducing the damage and pollution incidents caused by flooding is crucial and HWM is proud to continue to support Thames Water in this ongoing project.

www.hwmglobal.com

> *"These monitors are an important tool in our armoury in the fight against sewer blockages. The data they provide gives us a picture of what's happening in our sewers and helps us to nip blockages in the bud before they cause problems."*
>
> **Anna Boyles, Performance, Risk and Optimisation Manager, Thames Water**

SonicSens 3

ATEX-certified ultrasonic level sensor

SonicSens 3 is an intrinsically safe level sensor, developed for use in multiple applications, including sewer level monitoring.

Through the use of **ultrasonic technology,** SonicSens 3 avoids contact with its environment, reducing the risk of contamination and lowering maintenance requirements.

Intrinsically safe, SonicSens 3 is designed for deployment in challenging installation sites

HWM

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WASTE WATER

London's Changing!

How will you be affected?

By Bucher Municipal

This year, London was the site of many changes. With the Ultra Low Emission Zone expanding, the new Direct Vision Standard, and an update to the Highway Code, a lot has happened that could affect you. However, if you are operating a Bucher Municipal sewer cleaner these rules may not apply...

The Direct Vision Standard announced in 2021 means a HGV vehicle must meet at least a 1 out of 5 star safety requirement in order to be permitted within London, and going forward into 2024, 3 stars will be required in order to avoid a fine. These safety features focus on how much vision the driver has of the road, cyclists and pedestrians while inside the cab. If your vehicle does not meet the requirement, measures can be implemented in order to improve this field of vision. These include camera monitoring systems, sensor systems, driver alerts, and class V/VI mirrors.

This change is significant as in 2013 alone, HGV's were involved in over 60% of incidents leading to cyclist fatalities in London. HGV's make up only 2% of the vehicles on the road across Europe but are involved in 15% of fatal road collisions.

Sewer cleaners however are exempt from this new law. Being stationary while working and the necessity of sewer cleaners in cities means any sewer cleaner operating within these borders do not need to make these direct vision changes and will not incur a fine. They do still need to apply for a permit through the TFL website, but this is free and a very quick process.

As of the end of January this year, new Highway Code regulations were set in place to protect more vulnerable road users. All road users must follow these new laws. The change with the most impact on HGV's is the new road user hierarchy; the vehicle (or user) that could cause more damage in a collision, takes more responsibility. Another change is that pedestrians are given more right of way at junctions and crossings - with those waiting to cross having the right of way over vehicles turning into or out of those roads.

October 2021 saw the Ultra Low Emission Zone for London widen. Now, vehicles that do not comply with the new standards will receive fines of £12.50 a day.

The ULEZ was introduced as a way to improve air quality and health of those in the capital. Air quality is measured by analysing the concentration of certain pollutants in the air including Inhalable Particular Matter (PM10 and PM2.5). The main source of PM emissions is from internal combustion engines and dust. These settle on surfaces, then when driven over, the gusts produced from that movement cause the particulates to become airborne, mixing with the air and lowering the air quality. Consequently, exposure to PM10 and PM2.5 has been shown to have a detriment to lung and heart health and an increase in respiratory diseases such as asthma.

One study (Kumari Et al., 2020) showed that the significant reduction in air pollution during lockdown was due to lower levels of PM2.5, PM10 and NO2. This improvement in air quality was global, however it was proven to be temporary - once lockdown restrictions lifted, the pollution levels once again increased.

London is combating the air quality crisis by reducing the number of particulate-producing vehicles driving through the city... And it's working.

In an evaluation by the Greater London Authority, they found that although there was a "substantial and immediate improvement in air quality in recent years, significant work remains to bring London's pollution down to levels where it does not have a harmful impact on public health."

Similar to the Direct Vision Standard, sewer cleaners are also exempt from the ULEZ. Again, a permit is required for the exemption but this is also free.

London is leading the way in low emission and safety standards, changing rapidly for the better. For the time being though, the regulations are being introduced in a measured way with sewer cleaners being one of the exceptions to the rule.

buchermunicipal.com/gb/en/products/sewer-drainage

Bucher Municipal – Driven by Better

DFM 5.1 Sensor on a Dredging Pipe

Two technologies for flow measurement

Doppler and Transit-Time are two very popular types of flow meter for non-invasive measurement of flow in full pipes. We tend to confuse these technologies because they are both ultrasonic and both measure flow by using sensors clamped onto the outside of a pipe. In the real world, they work best in opposite applications. Success in your installation depends on understanding the differences making the right choice.

Ultrasound is sound generated above the human hearing rate – above 20 kHz. Both Doppler and Transit-Time flowmeter technologies are called "ultrasonic" because they operate far above the frequencies or sound range that we can hear.

At the heart of each ultrasonic transducer is a piezo-electric crystal. They are glass disks about the size of a coin. These crystals are polarized and expand or pulse a minute amount when electrical energy is applied to the surface electrodes. As it pulses the transducer emits an ultrasonic beam approximately 5° wide at an angle designed to efficiently pass through a pipe wall. The returning echo (pressure pulse) impacts a second passive crystal and creates electrical energy. This is the received signal in a Doppler or Transit-Time transducer.

Transit-Time transducers typically operate in the 1-2 MHz frequencies. Higher frequency designs are normally used in smaller pipes and lower frequencies for large pipes up to several meters in diameter. So operators must select transducer pairs/frequencies according to the application. Doppler transducers usually operate at 640 kHz to 1 MHz frequencies and work on a wide range of pipe diameters.

As the name suggests, Transit-Time flowmeters measure the time it takes for an ultrasonic signal transmitted from one sensor, to cross a pipe and be received by a second sensor.

Upstream and downstream time measurements are compared. With no flow, the transit-time would be equal in both directions. With flow, sound will travel faster in the direction of flow and slower against the flow. Because the ultrasonic signal crosses the pipe to a receiving transducer, the fluid must not contain a significant concentration of bubbles or solids, otherwise the high frequency sound will be attenuated and too weak to traverse the pipe.

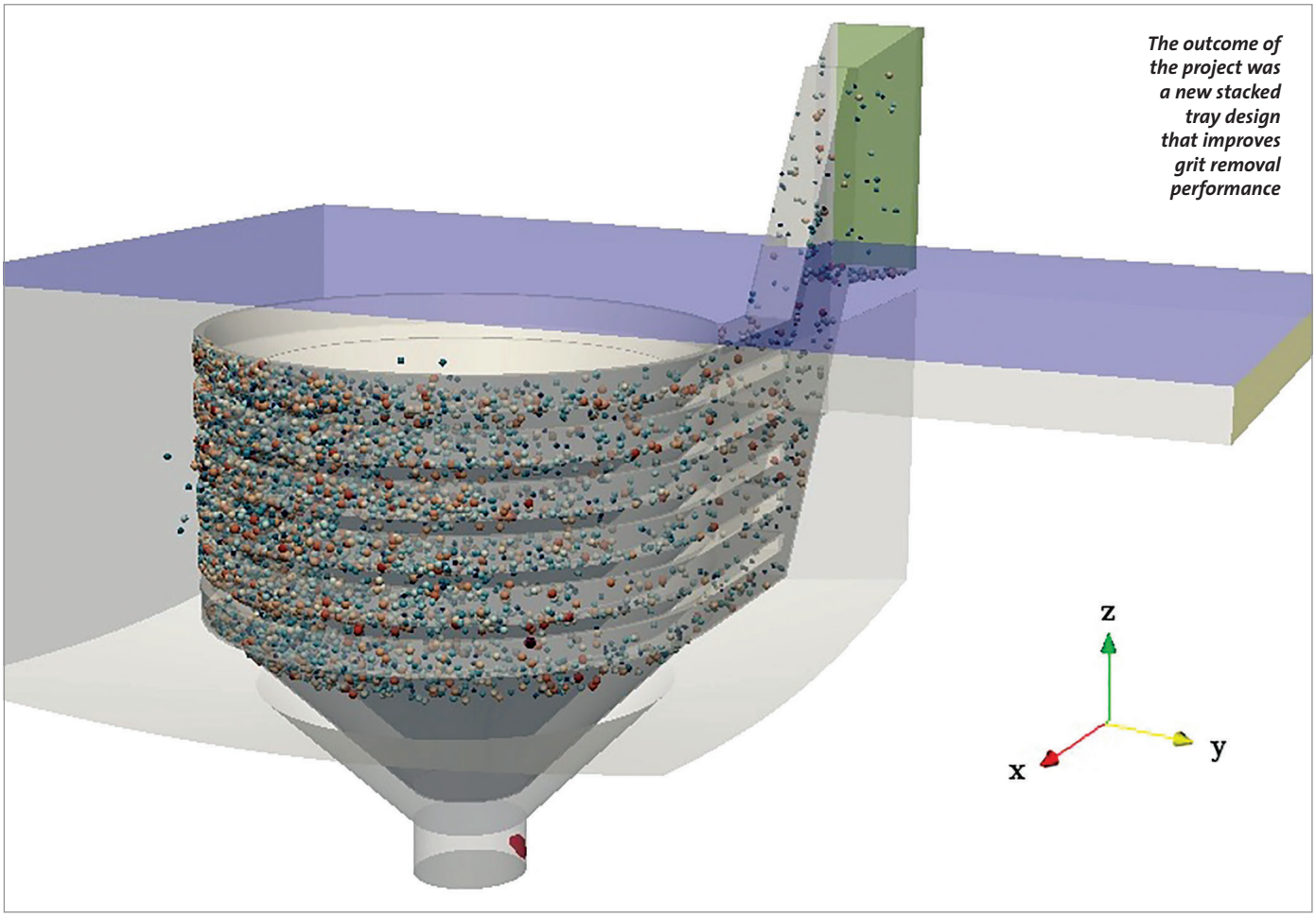
The Doppler effect was first documented in 1842 by Christian Doppler, an Austrian physicist. We all hear daily examples of the Doppler effect. It is the distinct tone change from a passing train whistle or the exhaust from a race car. We hear this tone change, or Doppler effect, only because we are stationary and the sound transmitter – the train or race car – is in motion. Doppler flow meters use the principal that sound waves will be returned to a transmitter at an altered frequency if reflectors in the liquid are in motion. This frequency shift is in direct proportion to the velocity of the liquid. It is precisely measured by the instrument to calculate the flow rate. So the liquid must contain gas bubbles or solids for the Doppler measurement to work.

Two technologies, one decision:

Doppler flowmeters work best in dirty or aerated liquids like wastewater and slurries. Transit-Time flowmeters with clean liquids like water, oils, and chemicals.

Contact Pulsar Measurement for specific advice and information on selecting and applying these technologies successfully in your application.

pulsarmeasurement.com



The outcome of the project was a new stacked tray design that improves grit removal performance

GROUND-BREAKING PROJECT LEADS TO ADVANCED WASTEWATER GRIT REMOVAL SYSTEM

An innovative two-year research project has been completed to optimise an advanced wastewater grit removal technology.

Suspended solids carried in water can cause a range of harmful effects in rivers, lakes and oceans, making the capture and removal of these solids critical for effective environmental protection. To address this problem, the project – between Hydro International and the University of Exeter – focused on optimising the stacked trays that remove high levels of suspended solids from wastewater.

By combining optimisation methods and computational fluid dynamics (CFD), the project was able to derive new designs for hydrodynamic solids removal components that would have been difficult or impossible to achieve using traditional engineering methods.

The research was part of a Knowledge Transfer Partnership (KTP), supported by Innovate UK, which ran until September 2021. It builds on years of collaboration between Hydro International and the University of Exeter in the field of CFD.

The core of the project involved the optimisation of stacked trays to remove high levels of suspended solids in wastewater, with the primary objectives being improved performance and reduced maintenance requirements. This was a complex, multi-objective, high-dimensional problem, so the team needed to adopt an unconventional approach in order to solve it.

The team coupled Bayesian optimisation techniques and CFD modelling, using a

This is the first time that Bayesian optimisation and CFD techniques have been applied in the water sector, which represents a significant step forward in product design excellence. In a sector that has been unfairly criticised for being slow to adopt new technologies and techniques, we've shown that there are teams out there willing to push boundaries in order to benefit utilities, consumers and the environment.

Dan Jarman, Hydro International's Group Technical Manager

Bayesian optimisation toolset originally developed by the world-renowned Machine Learning Group at the University of Exeter. Bayesian optimisation was selected as it can be an order of magnitude more efficient than alternative approaches, such as genetic algorithms, on such complex design problems.

The Bayesian optimisation toolset was then connected to CFD simulations, allowing the team to use computing power to automate the design and evaluation process. The team ran the CFD simulations using supercomputers in Exeter and Bristol, with each optimisation run modelling some 300 designs at a time. This would have been impossible to achieve using other optimisation techniques. The team was one of the first in the world to use these techniques on new GW4 Isambard supercomputing architectures,

The team subsequently corroborated simulation results through physical testing of prototypes in Hydro International's hydraulics laboratory in Clevedon.

The outcome of the project was a new stacked tray design that improves grit removal performance and enables the production of more compact systems that can handle higher wastewater flows and requires less maintenance—an excellent example of combining academic research with commercial incentives to address real-world challenges.

Although the project was focused on improving technologies that will be applied to future iterations of the HeadCell® advanced grit removal system, the findings are fundamental to Hydro International's core technologies, and will be applicable to other products that rely on the same hydrodynamic principles such as Downstream Defender® and First Defense®.

In addition, not only did the project apply methods for complex design optimisation already developed by the University of Exeter, but it also drove new developments in multi-objective optimisation and constraint handling, resulting in new advances in expertise and understanding.

Following completion of the project, Innovate UK assessed the KTP and awarded it a Grade A, or "Outstanding".

"We have a long history of investing in new science and new technologies to help our customers, and this project continues that tradition," said Dan Jarman, Hydro International's Group Technical Manager. "This is the first time that Bayesian optimisation and CFD techniques have been applied in the water sector, which represents a significant step forward in product design excellence. In a sector that has been unfairly criticised for being slow to adopt new technologies and techniques, we've shown that there are teams out there willing to push boundaries in order to benefit utilities, consumers and the environment."

"This project is an excellent example of what can be achieved when a KTP involves such a wide range of talent and experience," said Jonathan Fieldsend, Professor in Computational Intelligence at the University of Exeter. "To achieve its outcome, it has needed academics from the Computer Science and Engineering departments, specialists from industry, and support from a highly-skilled impact and business team. It has delivered significant enhancements for an important Hydro International product – in the crucial area of wastewater management – and has also led to advances in applied optimisation techniques and algorithms which have use more broadly in CFD-driven design."

South East Water Operations Director Doug Whitfield celebrates the opening of the Bray Keleher expansion works with the Rt Hon Theresa May, MP for Maidenhead.

Treatment site doubles pumping capacity

The multi-million-pound expansion to South East Water's flagship treatment site in Bray is now in service.

The site is now capable of pumping up to 68 million litres of water a day - a 50 per cent capacity increase and enough to fill 27 Olympic-sized swimming pools.

South East Water pumped more than £25 million into the expansion, which supplies top-quality drinking water to Berkshire, Hampshire and Surrey.

Bray Keleher treatment works first opened in 1996 with the vision that the site would need to expand as the community grew. It was initially capable of pumping up to 45 million litres of water a day to customer taps.

Construction started in 2018 and involved clearing out thousands of tonnes of earth before installing a series of gigantic tanks. They include a new Rapid Gravity Filter unit, which uses sand to remove pesticides from raw water and a brand-new sludge treatment system.

The largest tank, a Granular Activated Carbon tank, can hold up to approximately 500,000 litres of water at a time and uses carbon to remove unwanted odours.

Rt Hon Theresa May MP unveiled a commemorative plaque to mark the completion of the project, in similar fashion to former MP John Gummer when the site was first built in 25 years ago.

Desmond Brown, Head of Engineering at South East Water, added: "We have invested a significant amount into expanding our treatment works, highlighting our dedication to ensuring we continue to supply the community with top-quality drinking water as the population grows."

Intelligent control systems are the future

Stuart Rice of Te-Tech Process Solutions looks at improving the performance of wastewater treatment works.

Like all industries, wastewater treatment can do its part to become "greener" by increasing efficiency and reducing both energy consumption and reliance on chemicals. But the sector is challenged with highly variable influent streams, ever-tightening discharge consents and climate change. Extreme weather events and increasingly drier summers and wetter winters cause huge variations in flow and quality both seasonally and diurnally. Continuous optimisation of wastewater treatment assets can tackle these dramatic fluctuations in influent conditions and ensure that treatment works are operating at peak efficiency all the time. This can be achieved by using an intelligent control system.

Intelligent control systems are able to provide 24/7 management and optimisation of wastewater treatment assets. Learning from historical data and analysing real-time data feeds of process parameters, an intelligent platform can support or directly enact decisions to maximise process performance. Some systems are capable of predictive responses; they can anticipate changes in influent characteristics and prepare a response before they happen. Not only destined for new builds, intelligent control systems are able to improve legacy systems by optimising their performance and extending the life of existing assets.

Dealing with industrial effluents

The Aigües de Manresa municipal wastewater treatment plant at Sant Fruitós De Bages-Narvarcles-Santpedor in North East Spain has to deal with consented industrial effluents leading to variable high nitrogen inlet loads. The works consists of two plug flow aeration lanes with variable speed blowers and flow control valves. Historically control was by means of a fixed pressure set point in the main air manifold and a fixed dissolved oxygen set point in the aeration lanes. Under these operating conditions, the plant frequently failed to meet the 15mg/l total nitrogen discharge consent, especially during winter periods.

ACA, the Catalan Water Authority finances improvement projects such as this, and Aigües de Manresa decided to install a new control intelligent platform, with modules for aeration optimisation including denitrification cycles, sludge recycling and sludge age. As well as utilising existing instrumentation, they also added new ammonia and nitrate specific ion analysers and optical MLSS probes.

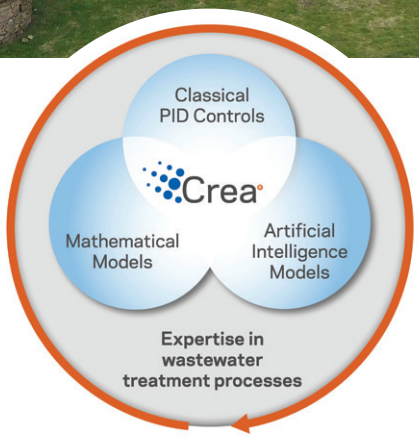
The intelligent control system has ensured not only that the treated effluent quality is always met, but has also allowed the works to handle an increase of 30% in total nitrogen load whilst using fewer resources and reducing carbon footprint. Since installing the system, the Sant Fruitós De Bages-Narvarcles-Santpedor works has reduced energy consumption by 15% per m^3 of raw sewage treated and 49% per kg ammonia removed.

Image © Aigües de Manresa

"The results of implementing the intelligent platform have gone over and beyond our expectations, allowing us to meet nitrogen discharge limits without the need to make any significant investment in the plant", says Antoni Ventura, Aigües de Manresa's General Manager. "All in all, this not only resulted in increased treatment capacity and energy efficiency, but also in optimal process stability and sludge quality."

The benefits to the water industry of asset optimisation using intelligent control are clear: ensuring compliance with effluent standards whilst improving sustainability and reducing costs. Not surprising, then, that wastewater treatment facilities around the world are turning to intelligent control systems.

The control system installed at Sant Fruitós De Bages-Narvarcles-Santpedor is the CREA® intelligent control platform. It provides real-time control and decision making, and improves plant efficiency and process reliability whilst ensuring compliance with consent limits. With modules to control aerobic and anaerobic biological processes, chemical dosing, sludge age, recycling and sludge thickening, dewatering and digestion, this platform is highly flexible and can be installed on any size of works, process configuration or aeration technology.



Te-Tech Process Solutions is offering the CREA® intelligent control platform as part of their end-to-end Asset Optimisation service for wastewater treatment processes, which includes system integration, installation of real-time data monitoring, intelligent control platforms, and in-house panel design and fabrication.

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- Methane is 28 times more potent as a greenhouse gas than CO_2
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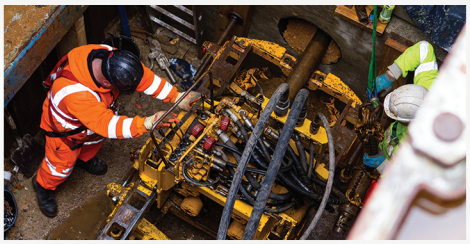

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SEEPEX SAI Technology enables Veolia's sludge cake handling system upgrade at Osberstown STF

The modernisation project for Osberstown STF managed by Veolia involved the upgrade from a very energy intensive thermal drying plant to advanced anaerobic digestion using their Exelys™ thermal hydrolysis process. The scope of supply also included a new dewatering plant with three belt presses and three sludge cake pumps to transfer the dewatered sludge into the THP feed silos.

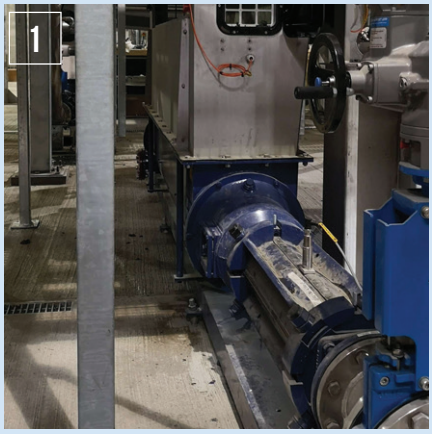
The modernisation project for Osberstown STF managed by Veolia involved the upgrade from a very energy intensive thermal drying plant to advanced anaerobic digestion using their Exelys™ thermal hydrolysis process. The scope of supply also included a new dewatering plant with three belt presses and three sludge cake pumps to transfer the dewatered sludge into the THP feed silos.

Compact, energy-efficient and flexible system for complex process

The upgrade project presented an immediate challenge: how to fit the new THP and dewatering plant into the restricted space of the existing building. The compact design of Veolia's Exelys™ process significantly reduced the installation space required for the THP.

However, due to the space restraints, using a conventional multi-stage pumping system required to transfer 18-27% DS sludge cake through a total of 50m including vertical pipework with long-radius 90° bends would not be possible.

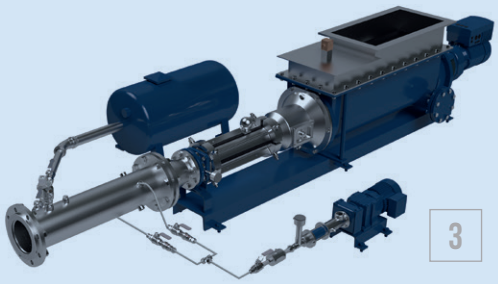
The dewatered sludge handling system needed to have the operational flexibility to accommodate a fully automated 24/7 operation with one, two or all three presses in operation at the same time, discharging into either of the two existing sludge cake silos through common discharge pipework.



1 ***SEEPEX open hopper pumps sit under the belt presses***

2 ***Discharge pipework from three sludge cake pumps joining a single common pipe***

3 ***SAI technology is an energy efficient solution for long distance pumping, proven to significantly reduce operational and total investment costs***



> *...I would have to say that the SAI installation has fundamentally changed how I would approach sludge cake transfer design / plant layout in future.*
>
> **Alan Whitty, Principal Mechanical Engineer at Veolia.**

Low energy and low discharge pressure solution for sludge cake transfer

Having worked together on many projects over the years, Veolia engaged with **SEEPEX** to explore how to install a sludge cake handling system within the reduced footprint. Upon consultation, SEEPEX's **Smart Air Injection (SAI)** was selected: a highly efficient system involving a progressive cavity pump and pneumatic dense phase conveying technology, able to transport 16-40% DS dewatered sludge with a significantly lower operating pressure requirement.

SEEPEX supplied and commissioned three **sludge cake pumps** with 2.5m custom-made hoppers to suit the dimensions of the dewatered belt presses, the associated BLI pumps as well as the SAI controls.

The compact SAI system offered considerable savings by allowing the new plant to be installed within the existing sludge dryer building. By using dense phase conveying, Veolia was able to lower the discharge pressure from 16-18 bar to 3-4 bar, enabling smaller cake pumps compared to the 4-stage pumps otherwise required for a conventional system.

The robust SAI system requires nearly 50% lower power compared to conventional pumping with subsequent energy cost savings. SAI has proven to have the operational flexibility required by the process and enables the pipework to be emptied when idle, eliminating the risk of cake line blockages; it is easy to operate and extremely reliable.

SEEPEX's engineered solution using SAI technology and their proven **cake pumping expertise** have enabled Veolia to upgrade their sludge cake handling system which feeds their THP process at Osberstown STF.

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Is grit a bigger problem than we think?

We all know that grit entering water treatment works causes massive issues with process efficiency and that the degree of grit entering the works is vastly underestimated.

The grit removal systems previously offered are seriously lacking in performance and are only removing approximately 30% of the grit entering the works, whilst 70% continually passes through the treatment works damaging mechanical equipment on its way, the rough surface of the grit particles allows other organic matter to bind resulting in clumps causing blockages and accumulation in digestors and primary tanks reducing the output capacity of the works dramatically. The cost associated with grit is in the region of £100,000 per annum. These costs have become accepted and form part of business as usual for most companies and maintenance budgets are burdened with excessive and avoidable costs.

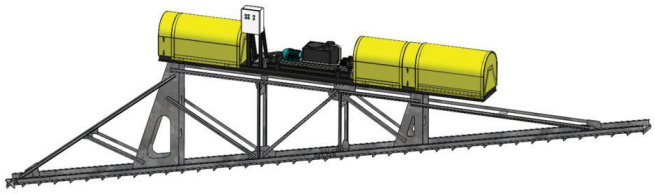
Conventional mechanical rakes are known to be highly inefficient and on average in optimum conditions only remove 20-30%. They are prone to frequent breakdowns and blockages which have to be removed by operator interference which introduces H&S risks.

Existing mechanical rakes consume on average 30,000 kW h per annum which generates around 4,000kg of CO_2. When we are all looking at carbon reduction this cannot surely be the best option going forwards and a more sustainable solution needs to be found.

EMS The Smart Solution

The HYDRAKE is an innovative hydraulic alternative to the conventional mechanical rake. The intelligent system detects the position of the rake and allows the operator to take full control.

In optimum conditions it can remove 95% of all grit particles with a diameter greater than 0.2 mm with a specific gravity of 1.2ms^{-1} outperforming all mechanical variants. This will lead to improved sludge quality, tank capacity and the reduction of wear to downstream plant.



The design features:

1. Adjustable speed and grit bed depth to suit individual site needs
2. Forward and reverse remote operation to allow removal of blockages without interference
3. Longer rake stroke maximising efficiency
4. Horizontally installed eliminating the need for steel support structures
5. Low-cost servicing
6. Rake angle and length can be adjusted to fit into existing civils works
7. Two-part rake assembly allows for uncomplicated installation
8. Only eight greasing points which can be accessed without major interference

The adjustable rake length and angle means the HYDRAKE can be installed in place of mechanical rakes without the need for costly civils works. It is installed horizontally and does not require steel support framework. The installation and commissioning can be completed in 5 days.

The variable speed control allows adjustment to match influent flow and a significantly lower operational RPM make the EMS HYDRAKE an energy efficient solution that will improve the grit capture and in turn improve process efficiency, reduce downstream maintenance costs and reduce the carbon footprint of the site.

HYDRAKE comparative performance data:

	EMS HYDRAKE	Comparison with mechanical rake
Grit removed per annum (tonnes)	264	97% Increase
Energy Consumption (kW h)	7,500	75% Reduction
CO_2 Emissions (kg)	1780	55% Reduction
Annual Maintenance cost (£)	498	90% Reduction

HYDRAKE

EMS HYDRAKE is the best solution for the removal of grit in the waste water treatment industry. It provides a cost effective and sustainable option which is proven to outperforms mechanical rakes. The EMS HYDRAKE is currently operational in several UK treatment works and is demonstrating its benefits.

Customer testimonials

"The system has performed beyond expectation by removing significantly more grit from the system compared to the previous conventional equipment. In the six months running there have been no breakdown, and the greatly increased grit removal has reduced wear on downstream equipment."

"Average emptying requirement frequency of approximately every two weeks. The Site Operative previously reported that when the old rake was in operation the skip was emptied approximately every month"

emsindustriesltd.com

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Yorkshire Water outlines £13m infrastructure investment for river Wharfe

Yorkshire Water will invest up to £13m in its wastewater network and treatment works, upstream of a stretch of the River Wharfe at Ilkley designated as an inland bathing water, to improve water quality.

The utility company has called on other stakeholders to take steps to tackle additional sources of pollution. The announcement comes as the UK's first inland bathing water at Ilkley is expected to be rated 'poor' by the Environment Agency.

In the year since the bathing water designation, Yorkshire Water has been modelling the catchment around Ilkley to understand the factors influencing water quality.

The modelling has indicated that, during periods of dry weather, the main contributors to background bacteria were from agricultural operations, local domestic waste patterns, misconnections, and treatment works at Beamsley, Draughton and Grassington.

Further modelling will take place in the future to increase available data and improve the understanding of all factors influencing water quality in the river.

Enhanced disinfection measures will be applied to the final effluent returned to the environment at Grassington, Draughton and Beamsley treatment works, much like measures taken on the coast, to reduce the impact on water quality.

Work will also be carried out to investigate misconnections in the catchment and a scheme to reroute the sewer network in some areas of Ilkley will be carried out to reduce discharges from storm overflows. A project is already underway to upgrade Rivadale CSO as part of this investment.

Ben Roche, director of wastewater at Yorkshire Water, said: "We're keen to play our part in improving water quality in the River Wharfe following the first Environment Agency classification of the inland bathing water at Ilkley. Our modelling indicates acting upstream of the bathing water, at our treatment works at Grassington, Draughton and Beamsley, will deliver the greatest benefit in terms of improving water quality via our assets. We are also assessing the pumping station at Addingham and considering green and sustainable solutions.

River Wharfe

"We have outlined up to £13m investment in our network that will help to reduce discharges into the river during prolonged spells of rain and reduce the impact of treated effluent being returned to the environment. This funding is over and above existing investment plans for the current five-year period.

"While our investment will help improve water quality, it alone will not guarantee an improvement in the bathing water classification. Our modelling indicates pollution is entering the watercourses from a variety of sources, including misconnections and agricultural land which the river and its tributaries run through. It is important other landowners and stakeholders take action to ensure water quality is improved in the future, with the ultimate aim of improving the bathing water classification."

Work is already ongoing, in collaboration with Bradford Council and the Environment Agency, to reduce infiltration of surface water into the sewer network from Ilkley Tarn. A smart wastewater network pilot for Ilkley will begin this year to trial using smart monitoring, analytics and control solutions to understand the sewer network from homes to treatment works and, once treated, discharges back into the environment.

It is hoped the pilot will offer real-time, end-to-end management and control of wastewater assets, reducing intermittent discharges from CSOs and sewer flooding, identifying areas for further investment and improving energy efficiency to reduce carbon emissions.

We're keen to play our part in improving water quality in the River Wharfe following the first Environment Agency classification of the inland bathing water at Ilkley. Our modelling indicates acting upstream of the bathing water, at our treatment works at Grassington, Draughton and Beamsley, will deliver the greatest benefit in terms of improving water quality via our assets.

Ben Roche, director of wastewater at Yorkshire Water

The most intelligent progressive cavity pump in the world

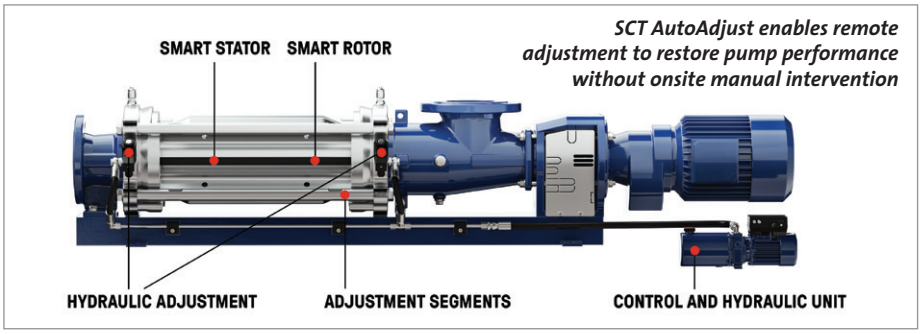
Through Industry 4.0 technology, SEEPEX has refined its range of progressive cavity pumps to introduce the pump generation of the future, today. The unique patented SCT AutoAdjust technology in combination with SEEPEX digital solutions enables remote adjustment to restore pump performance at the optimal operating point without onsite manual intervention.

SCT AutoAdjust is the next evolutionary step of **Smart Conveying Technology** (SCT), an ease of maintenance design launched over 10 years ago to simplify and speed up maintenance removing the need for dismantling the suction or discharge pipework. The design of SCT AutoAdjust maintains the same design features of SCT while incorporating hydraulic controls to restore and maintain pump performance.

Remote Adjustment with One Click

The integration of **SEEPEX digital solutions** with SCT AutoAdjust enables such adjustment to be made remotely from the pump, through the SEEPEX Pump Monitor and SEEPEX Connected Services. This reduces the need for onsite manual intervention and time-consuming trips to pumps installed in remote, inaccessible locations or large complex sites.

All with just one click and without the need for special tools or replacement of components, SCT AutoAdjust enables the pump's efficiency to be restored remotely and adapt to changes in process conditions. This translates into significantly improved uptime, longer service life of components, reduced need for spare parts and lower life-cycle costs.



SCT AutoAdjust enables remote adjustment to restore pump performance without onsite manual intervention

The Power of Digital

SEEPEX digital solutions incorporating the SEEPEX Pump Monitor and Connected Services enable predictive and forward planned maintenance to increase resilience, process and asset uptime, and facilitate on time spare parts availability.

The Pump Monitor transforms the progressive cavity pump into an intelligent field device that constantly monitors the status and performance, and immediately reports deviations to the user.

Advanced analytics provided by the cloud-based Connected Services, combined with SEEPEX application expertise, deliver process optimisation, improved equipment and plant efficiency, creating previously unimagined potential for increased equipment availability.

SCT AutoAdjust offers the ability to maintain both pump performance and efficiency remotely. The predictive and forward planned maintenance afforded by monitoring and advanced analytics increases uptime and spare parts availability. Maintenance becomes easy and simple and unplanned downtime is reduced.

Summary of Benefits

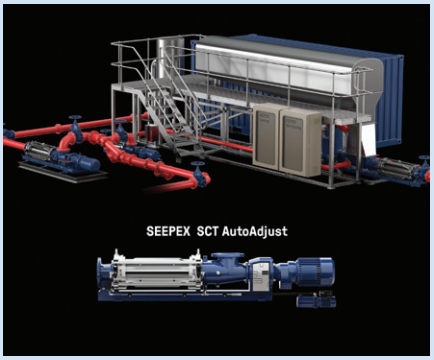
- Ability to restore pump performance and efficiency remotely
- Predictive maintenance through monitoring and advanced analytics
- Forward planned maintenance
- Reduced reactive maintenance
- Increased uptime

SEEPEX wins order from Thames Water for the most intelligent PC Pump in the world

The first order has been received from Thames Water's Maple Lodge WwTW for SEEPEX's unique patented SCT AutoAdjust pump technology combined with their Digital Solutions incorporating Pump Technology 4.0. Maple Lodge WwTW will be a showcase, setting new standards for future projects within Thames Water and the water industry.

Following the successful delivery by SEEPEX of a project at Thames Water's Mogden Lane WwTW for a sludge thickening process upgrade, incorporating Digital Solutions and the latest ease of maintenance technology for open hopper pumps, Thames Water approached SEEPEX with a new project with similar synergies at their Maple Lodge WwTW plant.

During consultation, the SEEPEX team carried out a full technical review with the key stakeholders to understand the challenges and objectives with the operation of the drum thickening process and associated pumps. A comprehensive, commercial and technical proposal was produced which included the most innovative state-of-the-art progressive cavity pumps in combination with Digital Technology.



SEEPEX SCT AutoAdjust, the intelligent pump of the future at Thames Water's Maple Lodge WwTW

The scope of supply includes the delivery and installation of SCT AutoAdjust drum thickener feed, discharge and back mixing progressive cavity pumps together with SEEPEX Digital Solutions - Pump Monitor, Connected Services and controls.

SCT AutoAdjust technology together with monitoring and cloud services enables remote adjustment to restore pump efficiency and, with advanced analytics, the implementation of predictive and forward planned maintenance as well as process optimisation.

MINIMISING WATER LEAKAGE WITH ACCURATE MONITORING

Pedro Barbosa, product owner at bp Launchpad company Fotech, looks at the current issues faced by water utilities and outlines how advanced distributed acoustic sensing (DAS) technology is helping operators to monitor and maintain their networks better.

Water is an extremely precious resource, yet huge volumes are lost worldwide. According to the World Bank, non-revenue water loss costs an estimated USD$15 billion per year[1]. Water companies in the UK are committed to delivering a 50% reduction in leakage from 2017-18 levels by 2050[2] and the race is on to achieve this. One factor that will have a significant positive impact on reducing leakage is effective monitoring and maintaining the integrity of the water pipeline networks.

Problems facing pipelines

In the UK, 3,113 million litres of water are lost each day – enough to fill 1,245 Olympic-sized swimming pools[3]. There are a few reasons that typically cause loss: aging pipelines are more susceptible to failure, and if made from steel, could experience corrosion that results in leaks; mechanical damage can cause ruptures; or water can be stolen by being siphoned off.

Leaks are traditionally detected using internal based monitoring systems, which infer the presence of a leak. For example, mass balance and real time transient modelling (RTTM) systems use computational pipeline monitoring (CPM) to calculate different operational conditions. But they tend to have very low sensitivity to small leaks and long detectability times. As such, leaks are often missed or alarms are only raised after large quantities of water have already been lost.

Alternatively, external based systems – such as Fibre Optic Sensing – take direct measurements of different response dynamics associated with the leak, such as the noise produced by the leak. This provides a quicker detection of smaller amounts of water leakage.

The advantages of DAS

One technology that can monitor pipelines accurately for both leak detection and disturbances related to attempted theft is Distributed Acoustic Sensing (DAS). DAS technology essentially turns a fibre optic cable running alongside a water pipeline network into thousands of vibration sensors, able to detect any disturbances along the length of the pipeline.

The technology sends thousands of pulses of light along the fibre optic cable every second and monitors the fine pattern of light reflected back. When acoustic or vibrational energy – such as that created by a leak or by digging – creates a strain on the optical fibre, this changes the reflected light pattern. By using advanced algorithms and processing techniques, DAS analyses these changes to identify and to categorise any disturbance. Each type of disturbance has its own signature and the technology can tell an operator, in real-time, what happened, exactly where it happened and when it happened.

If the source of a leak is a tiny opening, it could easily remain undetected or it could take days for the location of an incident to be identified with traditional CPM systems. In the time it would take to locate such a leak, many thousands of litres of water could have been

lost. DAS has proven that it can detect leaks as small as 20 litres per minute, raising the alarm in just 90 seconds, by which time only 30 litres will have escaped. This speed is significantly faster than existing technology. DAS can also identify water leaks from many different sized holes, even as small as 1mm.

Enhancing network integrity

Maintaining pipeline network integrity and protecting against leaks are vital priorities for water companies due to the efficiency improvements that can be made and resulting cost savings. By gaining real-time visibility of the integrity of their entire network, water companies can protect against water loss, and can safeguard their assets and bottom-lines while reducing risk.

For more information visit **fotech.com.**

Reference:

1 *Reducing Water Loss in Developing Countries Using Performance-Based Service Contracting (worldbank.org)*

2 *Leakage - Ofwat*

3 *https://discoverwater.co.uk/leaking-pipes*

New tool for improved customer experience

Northumbrian Water has introduced a new tool to help to reduce leakage and save water across the region.

The water company has developed an online leakage portal, which will make it easier for people to report leaks as soon as they are spotted.

Water workers across the North East operating areas already fix around 10,000 leaks a year. The new portal aims to offer customers a slick user experience, and will send automatic email updates once a leak has been reported and repaired.

To use the portal, the customer needs to enter their postcode and they will be able to see exactly what is going on in their area.

Jim Howey, Head of Water Networks at Northumbrian Water, said: "We fix thousands of leaks a year, and our teams are very responsive when it comes to carrying out repairs.

"However, we can only repair leaks that we know about, which is why we are urging our customers to use the new leakage portal and help us by reporting any leaks they spot.

"As part of our ambitious goal to provide world-class customer service, we have ensured that the leakage portal is incredibly user friendly and easy to use.

"We all have a role to play when it comes to saving water, and by using the new leakage portal customers are helping to reduce the demand for water in our region."

Sewage-borne litter problem needs national consensus and strategy

The industry at large is very much aware of the operational costs, ecological damage, and public angst over the scourge of sewage-borne litter in the environment. Dr Peter Matthews, C.WEM, CEnv, CChem., FIWO, highlights the urgent need for a more holistic approach to the problem.

The source of the litter may be water borne, but the environmental impacts are much wider. It is time this problem is tackled in a holistic way – and it should definitely be considered by Defra in its Call for Evidence on commonly littered and problematic plastic items, particularly wet wipes.

I've written a longer essay on sewage-borne-litter-activity which is being used to underpin submissions to Defra from water sector bodies. The essay acknowledges Defra's consultations on the proposal that wet wipes should not contain single use plastics. However, this Call for Evidence fails to recognise that not all of the questions raised will be adequately addressed by the one strategy. These questions apply to other criteria which should be addressed in a separate official strategy for ***all*** used care products.

In short:

- We need to move away from the mindset of 'out of sight out of mind', whether it's toilet or bin disposal.
- We need to think of the sewers as a transit system for our waste, not simply abdicate responsibility to the authorities, water companies and environmental regulators.
- We need to stop thinking that the water company has to take whatever we throw (or should I say flush) at it, and then blame it when things go wrong. (It would be like applying a philosophy of restrictions on what can be posted in the mail system to protect public safety).

Solving the problem is not just the responsibility of our water companies: they are facilitators. In correlation, we need a set of policies and practices which mirror, but don't mimic, the controls exercised for trade effluents.

Using a medical analogy, there should be a holistic approach in which the symptom (wet wipe pollution) is not dealt with in isolation, but as a visible part of a condition (lack of integrated management of used care products).

In fact, the approach should be part of a much bigger picture of sustainable water

management, in which all sewage contents are recovered and recycled. A national problem needs a national solution, involving everyone in the process – including bathroom and toilet product suppliers and designers – to facilitate

more acceptable approaches to bagging and binning.

So, what could a national strategy for dealing with used care products look like?

- It should be driven by a national consensus group representing a much wider range of interests than the water and woven fabric industries, and must include behavioural scientists.
- The solution must be recognised as not just the water industry's responsibility. It should no longer be a case of 'out of sight out of mind' and controls must be exercised over what goes into the sewerage system.
- Proposed solutions should interface with the strategy for eliminating single use plastics.
- The principle must be based on ease of product use, but still care about the consequences.
- All used care products must be bagged and binned. Designated products must meet standards of degradability and biodegradability. Used products will still be flushed away from time to time so products must meet these standards to minimise problems (also relevant to ultimate disposal of solid waste). This builds on the principles of the Water UK report of 2017 and follows the advocacy of City to Sea.
- Some products will be exempted 'pro tem' from the standards because of the lack of alternative material, for example condoms. But the presumption will be that research should be directed at removing products from the exempted list.
- Designated products will be regulated using a recognised system drawing on the experiences of REACH, possibly using a BSI kitemark.
- All products will be labelled very clearly 'bag and bin' under the appropriate Regulations to help consumers, but designated products will carry the kitemark.
- Monitoring compliance would probably lie with Trading Standards.
- The strategy will build on the foundations laid by Water UK, but the terms 'flushability' and 'fine to flush' should be dropped.
- 'Nudging' tactics should be employed to encourage 'bag and bin'.
- Biodegradable disposal bags should be made readily available, including with the retail products (for example, see **fablittlebag.com**), or even with water bills. Suppliers should be involved to ensure facilities enable the proper disposal of used care products.
- More needs to be done to encourage good practice in toilet and bathroom facilities outside the home.
- Messaging is very important, for example in national print and social media, on coping with day-to-day issues of environmental change and possibly a Code of Practice.

Hopefully, these suggestions could help inform an integrated Used Care Products Strategy, and act as a 'straw man' for debate. It remains to be seen if there is an appetite for implementation.

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Scotland's increasing drought risk prompts social impact research

*The Centre of Expertise for Waters **(CREW)** is funding research from Heriot-Watt and the University of Edinburgh to investigate how people might be affected by droughts in Scotland.*

Scotland experienced water scarcity in **2018, 2020** and **2021.** Droughts and water scarcity are expected to increase due to climate change, alongside extreme rainfall. This could affect private water supplies to communities and businesses.

The project will investigate the social and environmental factors that impact how people are affected by drought and produce policy recommendations.

Kerri McClymont, a PhD student in Heriot-Watt's School of Energy, Geoscience, Infrastructure and Society will lead the project.

Kerri said: "Scotland is really good at assessing flood risk, we know what we're doing. But when it comes to droughts, we just don't have the same information available.

"We're going to use the knowledge we already have on the factors that control the underlying social vulnerability to floods and look for commonalities to adapt it for droughts, which are becoming more frequent.

"The focus will be on the social and environmental factors that affect people's ability to respond to or recover from a hazard event like drought. This will cover everything from people's access to insurance, how isolated they are and what access they have to emergency supplies."

The water levels at Loch Vaa dropped by over one metre in 2019

Kerri will work with Professor Lindsay Beevers from the University of Edinburgh on the project.

Lindsay added: "In Scotland, lots more people have a private water supply than in the UK as a whole, especially in rural areas. This will pose a problem as droughts increase, as it makes resilience planning more complex.

"Our project will provide policymakers with the necessary knowledge to communicate more efficiently with the people in Scotland who are exposed to more frequent droughts."

Dr Katya Dimitrova-Petrova, project manager for CREW, said: "We are very excited to have the McClymont and Beevers team as part of an innovative CREW policy pull programme where Scottish researchers drive the research to address current gaps in environmental policy. The team has chosen a very relevant topic, given the pressures climate change and droughts are already posing on communities."

The policy paper will be published on the CREW website in spring 2022.

Thames' double honour for digital transformation work

Thames Water's digital team won two awards: 'Data science project of the year' and the 'Digital transformation project of the year' at the UK IT Industry Awards in London.

The awards, organised by BCS - the British Computer Society – set a performance benchmark in IT, recognising exceptional people, projects and technology innovation.

Thames Water currently has a £249m digital programme underway to support its customers and the environment.

Data Science Project of the Year

A suite of data science products was developed as part of Thames Water's 'smart water' programme which provides intelligent, data-driven analytics to make better real-time decisions about the operation of the water network. The goal of the project is to reduce the number and duration of supply interruptions experienced by customers.

Digital Transformation Project of the Year

The 'workforce management'(WFM) programme is replacing 18 different systems with a single end-to-end contact, planning, scheduling and field mobility solution to 7,000 staff across Thames Water operations. Benefits include being able to prioritise work more effectively, and a reduction in the number of phone calls and repeat contacts.

Two other Thames Water finalists were highly commended: Armna Iqbal ('Rising star of the year') and Andrea Norris ('IT service and support professional of the year')

Mike Potter, Thames Water's digital transformation director, said: "With 15 million customers, we're on a mission to transform the way we work through technology.

"Our £249m digital programme from 2020 to 2025 is galvanising the business and revolutionising the way we engage with customers and users of technology.

"We're committed to working with our customers and front-line staff to co-create the apps and digital tools we need to ensure that our network is working efficiently.

"Being nominated as finalists in no less than seven categories in the UK IT Industry Awards – and coming away with two awards and two highly commended – is a huge acknowledgement of the hard work of the team, the leap the organisation has made to new agile ways of working and the high quality of the apps we've been developing, and the tools at our disposal."

Wessex commended for customer service excellence

Wessex Water has once again retained its Customer Service Excellence (CSE) quality mark from the world-leading independent inspectorate SGS.

The water company became the first of its kind to achieve this coveted award back in 1996 and is currently one of only two water companies in the UK that are recognised as CSE holders.

The SGS assessment report highlights several areas of good practice at Wessex Water, including how the company:

- gains a better understanding of the needs and preferences of different customer groups
- works with providers and partners to offer and supply coordinated services for customers
- regularly reviews and improves its complaints procedure by listening to customer feedback.

The report reads: "Wessex Water is regarded as one of the best managed and most successful water companies in the country, delivering some of the best quality services in the UK according to the industry regulator Ofwat.

"They are recognised as the most efficient in the industry and one of the top performing companies in Ofwat's new measure of customer experience (C-Mex) which analyses the service and delivery performance of water companies.

"During the five-year regulatory period ending 31 March 2020, Wessex Water was consistently rated as one of the top water and sewerage companies for service, efficiency, standards and environmental performance."

The report also highlighted how Wessex Water is one of the top performers in the water sector for customer service and has the lowest number of complaints of all the water and sewerage companies.

Wessex Water's group director of communication and community Marilyn Smith said: "We have once again received some extremely positive feedback from SGS, and their report recognises that we continue to put customers first and find new ways to help them."

The water and sewerage company also retained its ServiceMark with Distinction accreditation from the Institute of Customer Service (ICS) for a further 18 months towards the tail end of last year.

Distinction is the very highest level of ServiceMark accreditation that can be achieved, and Wessex Water is one of only 18 companies in the country to hold it.

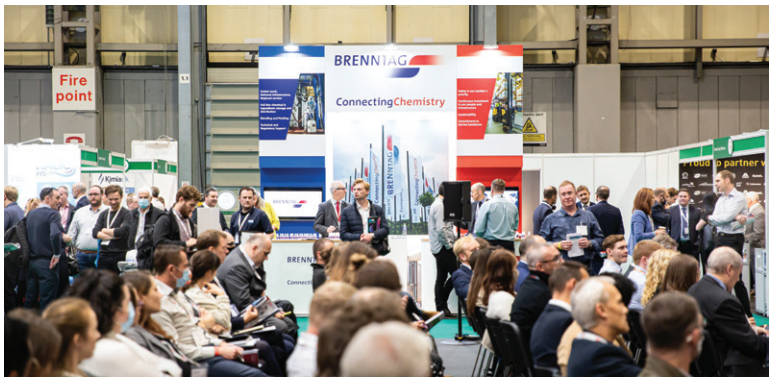
> *We have once again received some extremely positive feedback from SGS, and their report recognises that we continue to put customers first and find new ways to help them.*
>
> **Marilyn Smith, Wessex Water's group director of communication and community**

CHEMUK 2022 presents 'The Chemical, Process & Plant Engineering Show' & 'The Chemical Industries Supply Chain Show

The CHEMUK 2022 EXPO returns on the 11th & 12th May 2022 at the NEC in Birmingham. The event, now established as the UK's only major expo for the UK chemical industries, will showcase 300+ specialist exhibitors and 100+ expert speakers across two co-locating shows; 'The Chemical, Process & Plant Engineering Show', and 'The Chemical Industries Supply Chain Show'.

Show organiser, Ian Stone, comments: "CHEMUK is deliberately set out to be a total industry meeting point, creating a fusion of cross-sector energies, inputs and connectivity, however we also recognise the contrasting needs of attending 'engineering & plant technical management' and the wider 'industry supply chain' focused attendees, on themes such as supply chain chemicals & ingredients, logistics & outsourcing, HSE, regulatory compliance, R&D management and more....

Separating into two complimentary yet contrasting exhibition shows can only help to get attendees locked into discussions with their primary targets quicker, as well as providing an easy 'under one giant roof' experience to take in the broader trends of the sector"



The Chemical, Process & Plant Engineering Show

The Chemical, Process & Plant Engineering Show will showcase latest technology and specialist services to attending UK plant, process, control & engineering professionals across the chemical and wider process industries embracing:

Process Plant / Chemical Unit Equipment / Process Ancillaries & Consumables	Mixing, Agitation & Dispersion
CHEMICAL 4.0 / Digital / Automation	Metering & Dosing
Plant Energy Management	Chemical Processing Tanks / Storage Tanks
Catalysis & Reaction Engineering	Conveying/Feeding / Materials Handling
Heat Exchanger technology / Thermal transfer innovation	Industrial dryers
Control Valves & Actuators / Digital & Automation	Bio-Chemical Process Engineering
Pipes, Hoses, Tubing & Fittings	Process Design / Modelling, Scale-up & Pilot Plant
Flow Technologies	Predictive Maintenance / Condition monitoring / Asset management
Filtration & Separation	Plant Safety Systems
	Process QA / QC ...and more

Current Exhibitors already booked into the show include; FESTO, Schenk Process, Endress+Hauser, Applied Scientific Technologies, GEMU Valves, Moody Direct, Gericke, APEX Pumps, Atlas Copco, AVT Pump, Carbis Filtration, CDR Pumps, Elaflex, Falck Fire Services, HRS Heat Exchangers, VEGA Controls... and many others.

Partners supporting the show include GAMBICA, BPMA - British Pump Manufacturers' Association, BVAA – The British Valve & Actuator Association, Process Intensification Network, NEPIC, Chemicals Northwest and the Tank Storage Association... to name a few

Show Feature: CHEMICAL 4.0 Stage – The Digital Opportunity

Reflecting the tectonic shift towards digitized operations, CHEMUK 2022 will present a dedicated speaker programme covering Digital Adoption Strategies, Process Automation & Robotics, Big Data & Process Data Management, AI & Deep Learning, IIoT/VR, Digital-driven sustainability, and lots more.

The Chemical Industries Supply Chain Show

The Chemical Industries Supply Chain Show will showcase specialist exhibitors to attending Product Development, R&D, Supply Chain, Operational and Logistics teams from across the chemicals, chemical products & chemicals-dependent industries, covering:

Chemicals, Raw Materials & Ingredients	Toll / Contract / Outsourcing/ White & Private Label Services
Chemical Logistics & Transportation	R&D/Laboratory, Analytical & Testing
HSE Management & Regulatory Compliance	Skills, Training & Recruitment
Specialist Chemical Labelling	Business & Operational Support

Major names already booked into the show include: BTC Europe, Brenntag, Surfachem, Robinson Brothers, Kimia UK. Cod Beck Blenders, Airedale Group, Briar Chemicals, Libra Specialty Chemicals, NCEC, AirSea Containers, Knoell, RAS Risk & Hazard Management, Lakeland Laboratories, Rutpen... and many others.

Partners supporting the show include the CBA – Chemical Business Association, BCMPA – The Association for Contract Manufacturing, Packing, Fulfilment & Logistics, BIOVALE, Chemicals Northwest, NEPIC, CATCH, Royal Society of Chemistry... to name a few.

Expanded Sustainability & Circular Economy agenda at CHEMUK 2022:

New for 2022 is the dedicated **'Sustainability Stage',** hosting panel sessions and feature presentations embracing critical themes such as chemical recycling & sustainable chemical processing, together with 'green chemistry' innovation and transition to bio-based products.

Also new for 2022 will be the **'Bio-Based Chemicals & Processing INNOVATION ZONE',** showcasing breaking innovation start-ups, university spinouts etc, with exciting concepts.

Show Feature: 'CHEMLAB' Programme

CHEMLAB will showcase specialist exhibitors providing Laboratory solutions & services, embracing Research & Development, Testing & Analysis, Process Design & Optimisation through to QC/QA Laboratory testing, serving the industrial chemicals & chemical products industries.

DATES FOR THE DIARY

CHEMUK 2022 takes place on Wed 11th & Thu 12th May 2022

Venue:
NEC - National Exhibition Centre, Birmingham, B40 1NT

Opening Times:
Day 1: 9.30am – 5.00pm

Day 2: 9.30am – 4.00pm

Registration for CHEMUK 2022 is now open.

Register for your FREE entry badge at www.chemicalukexpo.com

South-East water companies join forces to address climate change and water shortfalls

The scale of the future water security challenge facing the South East has been unveiled with the publication of the first ever regional water resources plan.

The emerging regional plan sets out the action that could be needed to avoid a potential 1 billion litre per day shortfall in water supplies within the next 15 years (around a fifth of the total amount of water currently provided each day by the six water companies operating in the region). This could rise to 2.6 billion litres per day by 2060.

Prepared by Water Resources South East (WRSE), the plan looks beyond the boundaries of individual water companies and considers the future water needs of all customers, water users and the environment across the South East.

By 2040, the combination of climate change, population growth, higher levels of protection to the water environment and increasing resilience of supplies against drought, could require long-term investment of around £8 billion to avoid a shortfall. This could rise to £17 billion by 2060.

The plan will consider how water companies could further reduce their reliance on sensitive sources, such as chalk rivers and groundwater, that are vulnerable to climate change. It identifies the options, including alternative sources and ambitious and sustained reductions in water usage and wastage.

Between 2025 and 2040 this includes:

- Around £5 billion of investment by water companies to reduce leakage and help customers use water more efficiently. Government needs to act to reduce water use across society
- The development of three new reservoirs in the region
- Schemes that will enhance the treatment of wastewater so it can be returned to the environment from where it will be abstracted and used again
- More than 200 nature-based schemes that would see water companies working with environmental groups to improve the region's rivers and streams.

Beyond 2040 the emerging plan identifies additional options that could be needed, including moving water from different parts of the country and additional reservoirs, water recycling and desalination schemes.

Chris Murray, Independent Chair of WRSE, said: "The South East faces the most severe pressure on its water supplies of any region of the country. It is warmer, more densely populated and is the home of more of the iconic chalk streams that we are seeking to preserve than any other part of the country.

"The climate emergency is and will continue to have a profound impact on our water environment, so this plan aims to mitigate that through a long-term programme of investment that prepares us for the years ahead by changing how we use water and where we source it from.

"This plan is a huge step forward in regional water resource planning and in developing it we have considered thousands of options that have resulted in an emerging plan that shows the potential for more connectivity than we have ever seen before. The degree of collaboration in getting us to this point is beyond what has we have previously witnessed, and I am grateful to those who have engaged with us so far.

"It responds directly to the assessment made by the National Infrastructure Commission for the need to take a twin-track approach that will both reduce demand for water and boost supplies to avoid the far-reaching consequences a serious drought would have on the region's economy, environment and wider society. This consultation is an important part of our journey to develop a regional plan that not only provides enough water for future generations but delivers wider benefits to people and places."

To find out more about WRSE's emerging regional plan and respond to the consultation visit **wrse.org.uk.** Responses to the consultation will be used to develop the draft regional plan produced later in 2022. The six WRSE water companies will use the draft regional plan to derive their individual draft Water Resource Management Plans that will be published in Autumn 2022.

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