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May 2022

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Improved monitoring means less spills

Almost nine in ten storm overflows now have monitoring devices providing vital information about their use to hold water companies to account and drive environmental protections, data published recently shows. The data was published on the same day that the government launched new targets to deliver the 'largest' programme to tackle storm sewage discharges in history, with a consultation now live.

Under the proposals put forward in the consultation:

By 2035, the environmental impacts of 3,000 storm overflows (75%) affecting our most important protected sites will have been eliminated;

By 2035, there will be 70% fewer discharges into bathing waters;

By 2040, approximately 160,000 discharges, on average, will have been eliminated (40% of the total); and by 2050, approximately 320,000 discharges, on average, will have been eliminated (80% of the total);

Water companies will be encouraged to accelerate these timelines wherever possible while preventing unnecessary costs for consumers.

Some 12,400 monitors (86%) have returned data for the 2021 Event Duration Monitoring release published by the Environment Agency. This is up from 8,276 in 2019 and follows Environment Agency action to ensure water companies install monitors on the vast majority of storm overflows by the end of 2020.

All storm overflows will have monitors by the end of 2023, supporting the Environment Agency and Ofwat in holding water companies to account.

Two thoughts - 2035 is a long way off; however, if all that is planned is achieved, it will signify very real progress. **Philip Alsop**

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News in brief

SAVECO Environmental will supply key components, bridges, piping and telemetry to a leading international engineering and construction contractor as part of the Beckton sewage treatment works project which is set for completion in 2024. SAVECO is supporting the works upgrade by delivering a 'reimagining' of traditional bridge design requirements including: 3 x 57m total length with 5m maintenance zone; a rotary lobe pump on the bridge to replace the standard submersible pump; a travelling suction pipe which will raise and lower by means of a level change device - keeping perfect suction; level sensors to constantly monitor the level of grit; implementing a cable chain system.

People with declared disabilities now make up 15% of the workforce in the energy and utilities sector, according to new diversity and inclusion analysis from Energy & Utility Skills.

The Rivers Trust has released its updated Sewage Map, plotting the location, frequency and duration of untreated sewage discharges into English and Welsh waterways in 2021. The map aims to help the public understand the local relevance of data released by the Environment Agency and Welsh Water recently.

Evoqua Water Technologies has been selected by United Utilities and its design and construction partner, Advance Plus, to supply Evoqua's BioMag® ballasted clarification system to reduce phosphorus at both the Horwich and Burnley Sewage Treatment Works in Lancashire.

Scottish Water has extended its contract with m2 for the provision of Technical Consultancy Support Services.

British Water (BW) and the Water Industry Forum (WIF) have announced that the merger of the two organisations is now complete.

Research from digital workflow leader Intoware, has found that 76% of water and power companies post-pandemic, are relying on legacy systems and spreadsheets to get tasks done, believing this inflexible, often out-of-date, disconnected data is sufficient to support corporate decision making.

CIRIA has appointed Stantec and the Rivers Trust in a partnership to develop high level guidance and principles for the asset management of Blue-Green Infrastructure. The guidance will provide a common and consistent approach to the collection and analysis of data about the performance, value, costs and risks associated with Blue-Green Infrastructure measures.

South West Water has teamed up with satellite data analysts ASTERRA to use satellites to help find water leaks underground to help reduce leakage levels across its network.

Severn Trent has launched Wavemakers, a brand-new annual ideas challenge that's seeking to nurture talents and create innovation in the community. The project, that's been especially created to find unique and innovative ideas in the world of water, will turn to local talent to help develop new ideas that could be rolled out across the Midlands.

Report calls for collaborative, data-driven decision making

CKDelta and Northumbrian Water Group call for cross-sector collaboration to tackle existing and emerging industry and environmental challenges.

As organisations in the water, gas, and electricity industries commit to transitioning to net zero, a new report, Pioneering cross-sector change and collaboration, calls for greater collaboration in the utilities sector, to fulfil its climate ambitions.

Combining insight from water services provider, Northumbrian Water Group, and data specialists CKDelta, the report examines how the utilities sector can address four key challenges facing the industry today – including leak reduction, shifting patterns of usage, and the emergence of a new energy economy – by deploying open-source, data-driven models.

The report comes at a time when electricity, gas, and water companies are coming under increasing regulatory and consumer scrutiny and the sector is driving forwards with ambitious environmental targets. The water sector, for instance, has committed to delivering net zero emissions by 2030, while the government has committed to decarbonising the electricity grid by 2035.

Highlighting shifting patterns of energy and water usage as a core challenge to achieving these targets, the report states that we need integrated solutions that can accurately accommodate and predict both emerging and static trends. It identifies predictive data models developed from machine learning with high-frequency data as one such solution, noting that these models could also play a key role in optimising existing systems and networks.

The report goes on to suggest that companies and their investors should rethink their approach to effectively address the challenges posed by delivering a low carbon future, adopting whole systems models to gain visibility of competing aims across networks. These models empower organisations to holistically assess alternative energy and investment needs against other commercial targets, such as cost reduction.

CKDelta conclude their report with four recommendations, which are designed to foster an environment of collaboration and change, transparency and openness, and deliver on the sector's net zero ambitions. These recommendations include putting the consumer at the heart of organisational decision making, using integrated data sources at all stages of the value chain, and keeping whole systems models at the forefront when deploying new infrastructure on the network.

Geoff McGrath, Managing Director of CKDelta, commented, "The utilities sector is at a watershed moment. The eyes of consumers and regulators are firmly fixed on electricity, water, and gas providers across the UK. Cost, environmental impacts, and consumer satisfaction are changing the way the sector delivers for customers.

"To help redefine the long term vision of the utilities sector, we need the right tools and platforms to deliver for customers, investors, and the environment. We do not have long to get this right. Data-driven collaboration within the utilities industry and between cross-sector stakeholders has a significant role to play. The potential to integrate data across the value chain means we can re-conceptualise how we think about, and deploy, systems with both embedded and adaptive intelligence to optimise system performance without compromising on our net zero ambitions.

"Fundamentally, data-driven models will empower the utilities sector to identify innovative, cost-efficient solutions to its core challenges, delivering net zero alongside better services for the public and a positive return on investment for companies."

Nigel Watson, Chief Innovation Officer at Northumbrian Water Group, said: "As we near the halfway mark on AMP7, we are now starting to shape and share what our plan will be for AMP8. We have already set our own ambitious target to reach net zero by 2027. What is becoming clear is the need to collaborate on how this is achieved and how we understand and utilise the tools that will deliver on our bold environmental ambitions. The insights offered from open data are ultimately what will help us to drive the systemic responses to these challenges and help enable the transition to net zero in our industry."

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Majority of customers are satisfied with water company services

But many don't think they are acting in their best interests.

While two thirds of people are happy with the water services they receive, only around a third of customers would trust their water company to fix a problem quickly and just over a quarter think companies act in the interests of people and the environment, respectively.

Ofwat and CCW have recently published joint customer research exploring issues such as understanding and awareness of water companies, affordability and trust.

The research found that customers' priorities are focused on the core services –providing clean safe drinking water and preventing sewage from entering homes and rivers.

Many customers have little contact with their company and have low awareness of the support that companies offer, or the range of things companies do.

The report also found:

More than a third of customers (34%) struggle to pay bills fairly frequently, yet only 4% of bill payers reported receiving financial help from their water company over the past year.

Just over 7 in 10 (71%) people said they would recommend their water provider to a family member or friend. This is in line with the proportion who would recommend their electricity provider (71%) and gas provider (72%).

Knowledge of the water sector was found to be mixed, with most people (83%) reporting that they know who provides water to their home, but fewer than 4 in 10 are aware they cannot change their water provider.

Engagement with water companies was found to be fairly low, with 44% of those surveyed stating they have never contacted their water company, and an additional 19% saying they have not contacted the company within the last three years.

A minority of people think companies act in the interests of customers (27%), the environment (27%) and the local community (29%).

On water efficiency, many customers realise there's more they could do to save water and recognise the role individuals can play. However the research also suggests that even customers who feel they're playing their part, could be doing more. 48% of people feel they are already doing as much as they can to save water in the home despite some of these people not taking straightforward actions such as using a washing up bowl.

Customers do not tend to see reducing water use in the home or garden as a priority activity for achieving net zero or climate change. Only 9% of those familiar with the term net zero ranked this as a priority compared to higher rankings for activities such as recycling, suggesting there is still work to be done in the water sector to encourage more water saving behaviours.

Overall, the research suggests that some customers are generally happy with the service they receive, with no need to contact their company. However, low customer engagement is a cause for concern as it may mean that customers in need of financial or priority services support are not aware that support is available for them. Lack of engagement with companies could also mean customers are receiving limited information and knowledge on how they can do more to save water and engage in positive environmental behaviours.

David Black, Ofwat interim Chief Executive, said: "When it comes to the delivery of core water services, this research suggests many customers are satisfied with the service they're getting. However, it is concerning that there is low confidence and trust that water companies are acting in the public interest, and not enough awareness of support for those in need.

"As times get tougher, and concerns mount about water companies' impact on the environment, companies need to do much more to build trust and to demonstrate that they are acting in the public interest."

Emma Clancy, Chief Executive of CCW, added: "While it's encouraging that customers are broadly satisfied with the services they receive, these findings underline just how critical it is for water companies to strengthen their relationships with the communities they serve."

"One of our priorities is making sure everyone values water as pressure mounts on our resources and that depends on water companies raising their game and providing greater transparency on their environmental performance. Our review of water affordability has also set out a clear path to strengthening the support for those facing financial hardship."

This is the first time Ofwat and CCW have conducted a comprehensive audit of household water customers' knowledge, satisfaction, trust, priorities and behaviour.

This data provides a benchmark for future years and Ofwat and CCW will continue to collect this data.

'As times get tougher, and concerns mount about water companies' impact on the environment, companies need to do much more to build trust and to demonstrate that they are acting in the public interest'

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Route to a greener dram

An innovative new project is 'distilling' residues from Scotland's famous whisky industry into sustainable, green energy.

The successful trial involving Scottish Water, SEPA and major distiller Chivas Brothers saw distillery residue brought into Aberdeen's Nigg Waste Water Treatment Works for the first time, with promising results.

A process called 'co-digestion', means that the residues from distilleries and breweries in the area can be added to sewage sludge processed at Nigg, as part of a system which produces biogas - an alternative fuel used to heat the site's boilers.

The facility already has a process to turn sludge produced during waste water treatment into biogas - this is then used on site instead of oil or diesel. Since October 2021 the sludge treatment centre has trialled co-digestion - in other words, processing residues brought in from Chivas Brothers' distilleries and breweries alongside the sludge - and this has noticeably increased the amount of biogas being produced.

Scottish Water's Chief Scientist Elise Cartmell said: "The team at Chivas Brothers approached us because the various residues created as part of the distillery process are often rich in energy, and they were keen to find alternative outlets to capture and use it. Fortunately this aligned very well with Scottish Water's existing ambitions to investigate co-digestion, extending work we had already begun with SEPA, so we decided this would be the perfect opportunity to try out this process.

"It's turning out to be a win-win for both parties: the distilleries are provided with an outlet for treatment which helps this key regional industry become more sustainable, while we at Scottish Water benefit from a boost in production of green energy at our site, which reduces our reliance on fossil fuels and helps our journey to net zero."

With the addition of the distillery and brewery residues, the plant saw a saving of 58 tonnes of carbon over the 12-week trial period, which equates to 250 tonnes per year - the same as 250 return flights from Paris to New York.

Chief Scientist Elise Cartmell said: "We're very pleased with the findings which show that the trial boosted biogas production and significantly reduced the site's need for oil to power its on-site boiler. Just as importantly, there was no adverse impact on the operation of the site or on the quality of the biosolids that are also produced for recycling to land.

"We believe there is excellent potential for this approach to be used at Nigg in the future and for it to be rolled out to other sites across Scottish Water."

The trial was made possible by close collaboration between the industry, the Scottish Environment Protection Agency (SEPA) and Scottish Water. It was led by the publicly owned water company's commercial subsidiary, Scottish Water Horizons.

Through collaborative working and close monitoring throughout the Nigg trial, the teams involved have laid the groundwork to explore further opportunities in the future to support businesses and green energy production across the country through co-digestion.

Chivas Brothers' Environmental Sustainability Manager Ronald Daalmans said: "The trial with Scottish Water has shown that residues from our effluent treatment process still have an energy value that can contribute to a more circular and sustainable economy and provide an alternative outlet for distillery residues when other routes are full.

"We hope the trial will open up further opportunities for collaboration between the Scotch Whisky sector and utility operators."

David Harley, SEPA's Interim Chief Officer, Circular Economy, stated: "Against a backdrop of climate and nature emergencies, there's a real environmental imperative for us all to act. But more than that, innovative partnerships like this between SEPA, Chivas Brothers and Scottish Water are real economic and social opportunities.

"The Nigg trial is an excellent example of that collaboration in action, driving sustainability in Scotland's food and drink sector, and making a tangible contribution to a circular economy and a Net Zero society."

'The distilleries are provided with an outlet for treatment which helps this key regional industry become more sustainable, while we at Scottish Water benefit from a boost in production of green energy at our site'

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Pilot scheme introduces green energy generation to Scottish reservoir

A renewable energy scheme is unveiled as part of upgrades to a Scottish reservoir. Torishima Service Solutions Europe Ltd, using an ABB generator and regenerative drive on its turbine, has provided a scheme producing green energy which is returned to the grid.

A hydroelectric generation solution, comprising a reversible-pump turbine, generator, and regenerative variable speed drive (VSD), is installed at Lower Glendevon reservoir's compensation measuring house, in a pilot scheme involving Torishima Service Solutions Europe Ltd (TSSE), Scottish Water and ABB. The installation produces enough renewable electricity to power some 100 homes in the local area, while fulfilling the reservoir's primary purpose of providing the statutory minimum flow to the River Devon.

"In the first three months of operation, we have generated over 113,000 kWh of electricity, which we have been able to return to the grid and puts us on course to save at least the equivalent of 93 tonnes of carbon dioxide annually," says Tom Coutts, Senior Project Manager for TSSE.

When the reservoir at Glendevon is at full capacity, water spills over into the River Devon, via a spillway. A 15" outlet pipe is sized to deliver the desired minimum compensation flow of 242 litres per second (l/s), directly to the river, as stipulated by the Scottish Environment Protection Agency (SEPA).

The 15" pipe passes into the compensation measuring house where it connects to a reverse-pump turbine from Torishima Japan, which in turn powers an 85 kW ABB asynchronous generator. When reservoir levels are high, a secondary 24" pipe becomes active, providing additional power generation capability. A 90 kW ABB

regenerative VSD converts the generator's output into electricity suitable for transfer to the grid. The drive was supplied by ABB Value Provider EDC Scotland, who also offered considerable engineering and commissioning support during the installation, while the panel was built by Kilmarnock-based electrical engineering firm Aird Walker & Ralston.

If the grid no longer needs additional electricity or a connection is lost, a separate brake chopper and resistance bank can be activated to divert the generated power and dissipate it as heat. Without them, a lost connection could cause the turbine and generator to accelerate to around twice their normal speed, which would then send surge waves back up upstream potentially damaging the old pipeline.

"A regenerative drive is the ideal solution for capturing energy and feeding it back to the grid, allowing flexibility on the variation on flow." explains Jim Dow. "The drive requires simplified cabling which makes the installation quick. There are fewer components which improves the drive's reliability and provides a smaller footprint, which helps optimise space."

Scottish Water is benefitting from the integration of remote operation and monitoring at the facility. Previously, the team here faced 90-minute journeys to the site, which is in a remote location, so being able to control the valves and monitor real-time data around flow levels, temperatures and power generation remotely has proved to be beneficial.

Torishima's solution, combined with ABB's technology, is helping Scottish Water achieve its own Net Zero target by 2040. "Work began on the project in 2017 with a feasibility study, looking at many potential sites for hydro schemes. The installation at Lower Glendevon was effectively a trial and has proven the concept, which gives us the confidence to look at other sites where we can introduce this technology," says Coutts. Currently, around 69 percent of the organisation's carbon footprint is created through its electricity demands and it has identified 25 sites where renewable energy schemes can help off-set its energy usage.

"These schemes are, by their nature, weather-dependent so it can be difficult to accurately predict performance into the future," adds Coutts. "We have been impressed with what we have seen so far though, which has given us confidence to start identifying other facilities where we can look at introducing renewable power generation."

Jim Dow, Regional Sales Manager (Scotland) for ABB, adds; "The project at Lower Glendevon is a good example of how existing infrastructure, in this case the reservoir's compensation measuring house, can be utilised to contribute towards Net Zero targets. While the scheme itself is relatively small, it proves the concept and highlights how ABB's drive and motor technology can play an important role in the journey towards decarbonisation."

'A regenerative drive is the ideal solution for capturing energy and feeding it back to the grid, allowing flexibility on the variation on flow'

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Solving pipeline pressure challenge

Trials with Watson-Marlow's new Conveying Wave Technology (CWT™) pump at a water treatment plant in north-west France proved it was ideal for meeting abnormally high pressure constraints, explains Philippe De Miranda, industrial sales engineer, Watson-Marlow Fluid Technology Group, France.

The Villejean water treatment plant near the city of Rennes in Brittany faced a structural challenge in adding sodium hypochlorite to a drinking water storage reservoir due to the unusually long length of the pipeline transporting the chlorine.

Watson-Marlow Fluid Technology Group (WMFTG), which is the world's leading manufacturer of peristaltic pumps for water treatment, has worked with most of the water treatment plants in the Collectivité Eau du Bassin Rennais (Rennes Basin Water Authority) for several years. The Authority manages the entire local water system from abstraction to tap, with responsibility for maintenance, monitoring and repair for 11 treatment plants. These assets include a 5,000m³ drinking water storage reservoir, which serves around 500,000 people in the region, distributing an average of 25,000m³ of water through the network each day. This reservoir is fed by both the Villejean plant and the Rophémel plant, which is nearby, and the water requires chlorination at 0.3mg/litre.

The plant already employs a number of Qdos pumps, each fitted with a ReNu pumphead optimised for sodium hypochlorite, sulphuric acid and hydrogen peroxide applications, with discharge pressures up to 4 bar.

The use of Qdos pumps for both sulphuric acid and hydrogen peroxide at the plant enabled fast, simple and safe maintenance compared with the diaphragm pumps deployed previously. Replacing ReNu pumpheads requires no tools, specific training or maintenance technician intervention.

However, the discharge pressure for the 15% sodium hypochlorite dosing when being added to the storage reservoir remained a concern and a priority for improvement.

For structural reasons, the sodium hypochlorite tank is located inside the Villejean plant, with chlorine distributed to various injection points throughout the facility via pumps at an adjacent location. However, the linear pipe run that brings chlorine to the water storage reservoir is 80m long and along this length chlorine degasses in the pipeline, raising the discharge pressure beyond 7 bar and causing pump accuracy problems.

WMFTG's Qdos CWT (Conveying Wave Technology) chemical metering pump, launched globally in 2021, was initially introduced at Villejean on a trial basis in December 2020. It proved ideal in meeting the abnormally high-pressure constraints of the installation. The Qdos CWT™ pump offers all the advantages of a standard peristaltic pump, but with a significantly longer service life.

To achieve the peristaltic pumping action, the Qdos CWT pump incorporates an EPDM element rather than a tube, which acts against a PEEK track. The element in contact with the fluid is subject to very low stress levels, which means that the Qdos CWT pump offers significantly longer service life than a conventional alternative, even at high pressure.

In addition, Qdos CWT pumps allow the dosing of chemicals, including sodium hypochlorite for post-chlorination cycles, with high precision and regularity over the entire life of the pump. This means overdosing practices often required by other technologies to achieve a constant level of accuracy are avoided.

The Qdos CWT pump runs at 2 litre/hr on average, with a 4-20 mA input signal. The pump has already reduced the frequency of maintenance interventions at the Villejean plant, which produces 7-11 million m? of drinking water per year, by 75% since its installation in December 2020.

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Huge savings made at leachate treatment plant

At a landfill's leachate treatment centre, where floating biomass was reducing the plant's throughput, the introduction by Viridian Systems of a new mixer has created annual savings on chemicals of around £85,000.

From sludge taking well over two hours to settle (with unnecessary amounts still floating), it has now been reduced to less than 30 minutes. With the plant set up for two batches per day, this potentially adds back three hours of treatment time per day, which equates to more than 14,000m3/year of leachate that no longer has to be tankered off site; equating to a further annual saving of £285,000.

As Viridian Systems' Managing Director, Roger Dixon explains, the new mixer (made by Landia) has now completely eliminated the problematical filamentous bacteria.

"To solve the problem for the leachate treatment plant", he said, "we believed that with the correct type of mixer; suitably positioned, powered and timed, the right amount of agitation would disperse the floating layer to allow solids to settle much more quickly".

He adds: "Undesirable filamentous bacteria, which is one of the main causes of floating biomass, is detrimental to SBRs, but working closely together with Landia, who have vast experience in mixer applications, the sub-surface liquor is now degassed; meaning no more floating biomass".

As the plant began to produce far less unwanted foam, Birkenhead-based Viridian Systems asked the plant operator to gradually reduce dosing with de-foaming agent (antifoam) until the consumption rate falls to around 1-2 drums/month, instead of 2-3 drums/day, which will not only save around £70-100k/year, but will also reduce the dissolved organics (measured as chemical oxygen demand C.O.D.) in the treated effluent.

Furthermore, the installation of the Landia mixer has also enhanced the reliability of the plant's Dissolved Oxygen (D.O.) (optical) probe, because there is less foam to blind it. With the probe now working as it should, there is better control of the blower speed, reducing its energy consumption, which in turn, offsets some of the power consumed by the mixer.

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Adding 10 years to a critical asset, saving £7.8 million

Delivering wastewater safely back to the environment is a complex operation. Done correctly, it returns clean, treated water to rivers and converts methane by-products into sustainable energy.

When assets fail, however, the process presents serious pollution hazards.

When surface cracks appeared on the roof of a sludge digester at their sewage treatment works, the client needed an environmentally sound solution that didn't require days of downtime.

If left untreated, the damaged sludge tank could potentially release harmful, highly combustible methane gas. Replacing the digester would cost in the region of £8 million and cause prolonged disruption to the treatment plant's round-the-clock operations.

A comprehensive asset inspection was undertaken to evaluate general structural integrity, the health of the digester's surrounding components, and working conditions for onsite crews. Experienced consultants provided specialist guidance on methane containment and pollution risk reduction and a targeted three-week plan was created to prepare the site, repair, and future-proof the asset, and limit disruption to one day.

Adler and Allan's team worked with subcontractors and staff to establish a safe working environment. This involved scaffolding provision to access the site, which sat within a controlled area, and bypass pipework installation to minimise pressure in the digester during preparation and treatment.

Tailored repair plans for the roof and surrounds featured AdlerCoat™, a high-tensile, high-elongation, high-build, and fast-set elastomer. Its fast-setting formula makes the product an ideal solution to quickly treat damage to the plant's key asset, while minimising costs and operational downtime.

Once safe access had been established, refurbishment took a four-step approach – with environmental risks and service continuity managed at every stage.

The digester's roof and surrounds were shotblasted to remove contaminants and prepare surfaces for coating. Cracks and visible defects were repaired using conventional civils techniques. Stainguard primer was applied to maximise adhesion and existing assets were primed with a Rallithane jointing compound. Qualified engineers then coated the roof and surrounds with Adler and Allan's specialist polyurea AdlerCoat™ lining. The fast-drying elastomer is specifically formulated to build a tough, long-lasting surface bond, creating a flexible and resilient monolithic membrane with water and chemical resistance. After being coated, all surfaces were validated using a dielectric testing method to provide a 100% warrantied containment solution.

This cutting-edge lining treatment extended the digester's life by a minimum of 10 years – at a fraction of the cost of replacement – and ensured continuity and compliance for the client.

The project achieved the following savings:

- £7.8m Savings achieved by Adler and Allan's refurbishment programme
- £200,000 Adler and Allan project costs
- £8m Cost to replace damaged sludge digester

Added benefits:

- Reduced insurance premiums
- Expert protection against pollution and environmental harm
- Asset life extended by 10 years
- Full operations resumed within 24 hours
- 100% compliant and warrantied solution

Ongoing cooperation and liaison throughout the three-week project period ensured that all deliverables were met safely, efficiently, and on time. The client breathed new life into a critical asset while saving millions on replacement, compliance breaches, and future environmental fines.

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Marsh Industries becomes member of British Safety Council

Being in an industry where health and safety of employees is of utmost importance, UK manufacturer, Marsh Industries, has joined the British Safety Council in their continuous effort to provide a safe and healthy environment for all employees.

The British Safety Council, one of the world's leading health and safety organisations, is a charity that provides access to up-to-date resources, online training, and expert advice through paid subscription. Being a government-regulated awarding body, it must comply with a wide range of conditions set by the regulator to guarantee rigour and consistency in the awarding of qualifications.

Marsh Industries' Health and Safety Manager, Paul Sales, said "Becoming a member of the British Safety Council shows that we are committed to improving the safety and wellbeing of our workforce, and the industry as a whole."

In addition to British Safety Council membership, Marsh Industries is a member of British Water, Achilles UVDB, NBS Source and SpecifiedBy, and holds QMD ISO9001 and ISO14001 Management Certification.

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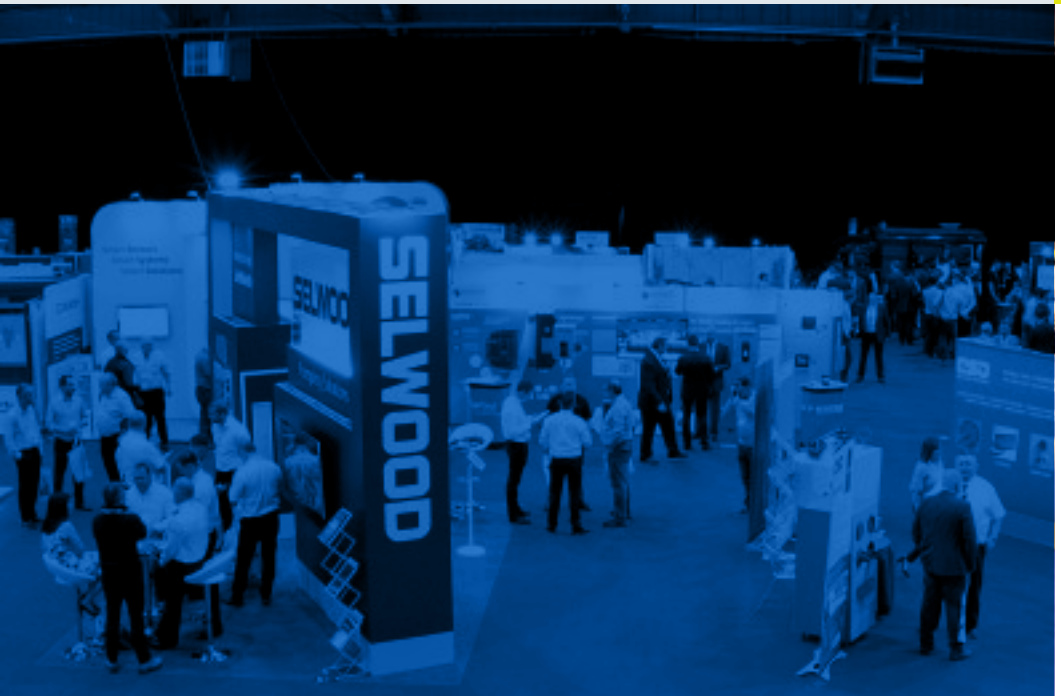

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The Water Equipment Show is the leading event for those operating within the Water and Wastewater Industries, showcasing the wide range of equipment and services that are available from many of the leading manufacturers, suppliers and contractors. The technical conference and breakout sessions reflect this year's theme of driving to Net Zero - Opportunities for all.

It's free to attend and as the leading event of its kind, it's not to be missed.

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Join the conversation **#WES2022**

The drive to Net Zero: Water Equipment Show returns

The Pump Centre will again host the Water Equipment Show at The Telford International Centre on May 11th 2022, returning in person after being held the previous year digitally.

This highly anticipated water and wastewater industry event will host over sixty exhibitors and over thirty experts speakers. On show will be a wide range of equipment and services available from many of the UK's leading manufacturers, suppliers and contractors. The technical conference and breakout sessions also reflect the show's considerable impact on the UK water industry.

The event offers a unique opportunity to discover the latest thinking on innovative approaches to reducing water industry issues and stay informed through a technical conference and specialist training sessions. Also on offer will be in-depth discussion workshops on industry-leading themes, browse the exhibition featuring many of the UK's leading water industry manufacturers and suppliers, and opportunities to find new solutions and strategies for tackling the water industry's leading challenges.

John Howarth, Pump Centre Manager, said of the event: "This is a great opportunity for our industry to gather in one location again. After a very successful digital event, it'll be interesting to network, discuss issues and discover the latest technology in the water and wastewater industry in person.

"We're looking forward to hosting this very special event and seeing how the industry has progressed and adapted to a post-covid working environment. The future of water in the UK is a hot topic, and this exhibition will show exactly how that future is taking shape."

This year's conference theme is: "The drive to Net Zero – Opportunities for all". The conference will review opportunities to achieve net-zero by 2030, how innovative and resilient solutions contribute to achieving this and water company/supply chain partnerships that have already begun the journey.

The range of products and services covered will be diverse and include high technology products and systems to reduce energy consumption, products with integrated energy and efficiency monitoring and control and products and services that reduce water leakage and consumption.

A wide range of presentation topics will also be available concerned with this theme. There will be a review of existing water companies' achievements, modus operandi, and supply chain partnerships on the journey to net-zero. Also available will be a talk on energy-saving products and services that reduce emissions and products with integrated intelligence that deliver higher efficiency and energy savings.

Visitors include attendees from the UK's utility and water supply companies, the Environment Agency and a wide range of senior decision-makers from across the water and wastewater industries with an interest in mechanical and electrical equipment and associated services.

There will also be an opportunity to celebrate young industry talent at the Young Engineer

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Awards and conference dinner, hosted at Telford International Centre on 10th May. This event acknowledges the vital contributions young engineers make in the industry and offers a fantastic platform to show off young talent in front of over 1,000 water industry professionals.

The three categories are Professional Young Engineer, which celebrates the exceptional work of nominees 28 years of age or younger with a formal qualification in an engineering or related subject.

The Apprentice Young Engineer recognises nominees 22 and younger who have proven engineering experience related to their field of work. They will work primarily in the workshop or the field on hands-on based tasks.

The final award commemorates Derek Jackson, an incredible engineer and once committed member of the Pump Centre Council who passed away in 2006. The Derek Jackson Award recognises a candidate whose outstanding achievements warrant recognition, and any shortlisted candidate is eligible.

The Pump Centre will also raise funds for Action For Children UK, an organisation that offers foster, adoptive and modern residential services to find children and young people safe and loving homes. Attendees can contribute to the chosen charity via a raffle held at Water Equipment Show dinner. Companies attending the exhibition have donated raffle prizes. The raffle has raised over £40,000 for causes in previous years.

Delegates will receive free entry to the conference and exhibition, including access to all technical and training sessions. Many prestigious industry members have served as silver and gold sponsors of the conference; please visit the Water Equipment Show website:
www.waterequipmentshow.com

(Information accurate as at 20 April 2022).

SuDS tips #3: Designing low maintenance solutions

A qualified civil engineer, Stuart Crisp has been at the forefront of construction and a specialist in drainage systems for over 35 years. He has contributed to the development of numerous British and International Standards and industry specifications, and was a member of the project steering group for CIRIA C753 The SuDS Manual. In this regular series of articles, Stuart considers the different challenges facing designers and installers of below ground SuDS attenuation systems. This month covers the subject of inspection and maintenance.

When designing a stormwater attenuation system, sometimes too little attention is paid to cleaning and the costs of ongoing maintenance. System maintenance is essential to ensure that the intended performance is retained throughout the service life, and that the risks of flooding and pollution are avoided.

This vital part of asset management can be overlooked at both the design and procurement stages, as the choice is often based on the incorrect assumption that all below-ground attenuation systems are equally easy and low cost to maintain.

However, this is not the case. For example, because of their structure, stormwater attenuation crates are difficult to get access into the body of the tank for cleaning, and require upstream silt removal to prevent a downstream build-up of material within the tank body. Whilst large diameter pipes are easier than crates to access, they too require upstream intervention for silt and hydrocarbon removal.

Above: The ADS StormTech stormwater attenuation system needs cleaning on average once every 3 – 7 years with standard sewer cleaning equipment;
Below: The unique Isolator Row removes >80% of TSS making ADS StormTech a genuine low maintenance solution

Both pipes and crates are therefore dependent on the additional expenditure and maintenance of an upstream silt separation and removal system. If silt gets into the storage tank, it can compromise the flow path and reduce the storage volumes – eventually causing the whole system to fail.

But that's not all. Silt particles can carry pollutants and if these get into the storage tank, they may flush downstream and result in water quality breaches, pollution, and fines.

Crates and pipes, therefore, depend heavily on expensive upstream pre-treatment systems which, together with the attenuation tank, require regular inspection and maintenance. Conversely, the ADS StormTech stormwater attenuation system may not require additional upstream pre-treatment, therefore reducing capital and operational costs.

This is because ADS StormTech is engineered to provide an efficient, durable, low maintenance solution for commercial, residential, industrial and infrastructure installations. A key part of this is the unique Isolator Row, a 'free' built-in water quality treatment device designed to remove silt, sediment and polluting material flushed off the surface during rainfall. Isolator Row is "sacrificial", meaning that other StormTech chambers within the system are protected from solid particles and pollutants in the runoff entering, and they will not require any cleaning during their service life. This keeps maintenance to a minimum. Furthermore, Isolator Row has been independently tested by universities and respected industry bodies, including NJCAT and validated to remove over 80% of Total Suspended Solids (TSS) plus metals, hydrocarbons, phosphorus, nitrogen and other surface water pollutants. Isolator Row, as an integral part of the StormTech system, is recognised by many authorities as a water quality treatment device.

After many years of successful use in over 40,000 installations worldwide, Isolator Row has been proven to need cleaning on average once every 3-7 years, depending on the nature of the installation, using standard sewer cleaning equipment, saving asset owners both time and money in stormwater system maintenance.

Stuart Crisp is UK Manager for Advanced Drainage Systems (ADS). ADS is America's largest manufacturer of thermoplastic corrugated pipes and a specialist in water management systems. StormTech has a long and successful track record with over 40,000 system installations using in excess of 2.5m units.
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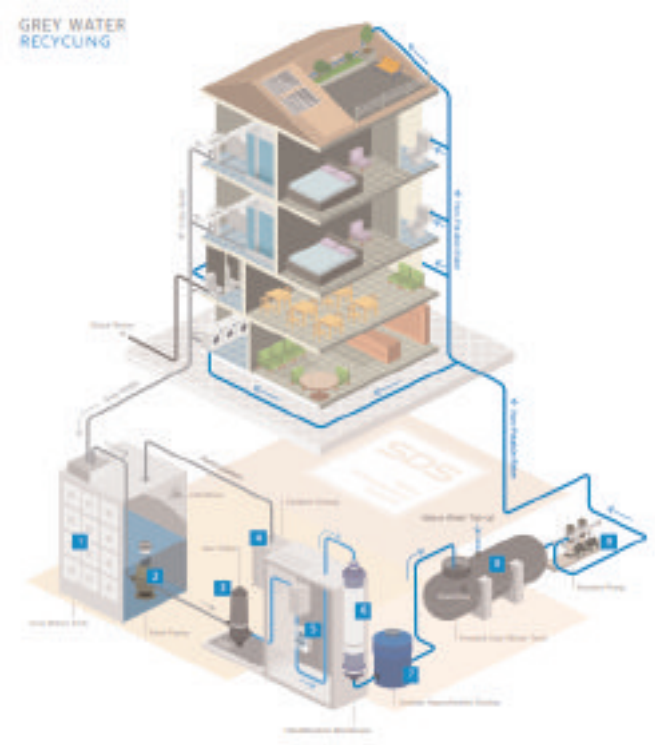
Grey water steps up to meet demand challenges

England is on a trajectory to start running out of treated mains water within 20 years. By 2050, the deficit is predicted to reach 3,500 million litres per day. And yet, we flush a third of our high-quality mains water down our toilets at home every day. That's before we even consider that up to 60%(1) of the drinking water supplied to commercial buildings, such as office blocks or hotels, is used where high-level treatment is simply not needed. By Sam Burgess, Water Reuse Manager, SDS Limited.

Personal water demand must be reduced from the current 140 litres per day average. Water UK – the body that represents Water Companies – has told the Government that a maximum 2050 target of 85 litres per person per day is feasible by 2050(2). Current planning regulations for England and Wales require a 125 litres per person daily limit, but the Environment Secretary George Eustice has said he will encourage local authorities in the 14 most water-stressed Water Company regions to adopt an optional 110 litres per person daily(3). This lower limit is already applied through The London Plan, leading to much greater take-up of grey water schemes in new buildings in the capital.



Turning to Technology

Grey water technologies have responded to help meet planning challenges and deliver favourable returns on investment, especially where water can be reused in commercial, industrial and multi-occupancy residential buildings.

So what is grey water? It is usually waste water harvested from baths, showers and hand-basins, which is filtered, treated and then reused for non-drinking purposes such as toilet flushing, laundry or garden irrigation. Grey water systems are best suited for installation in new buildings because a separate network of additional pipework is required through the building.

Now, advances in grey water technology using a new 'on-demand' process are providing a more responsive and cost-efficient process that makes the Return on Investment more favourable. The new technology is also offering early adopters of grey water systems the opportunity to replace legacy high-maintenance Membrane Bioreactor (MBR) systems with more efficient and cost-effective systems.

On-Demand Technology

SDS's grey water on-demand recycling systems are supplied as package treatment plants. The 'WaterBank®' large scale system uses a sequence of cutting-edge disc filtration and ultrafiltration processes unique to the UK. In one of the first residential installations in the UK, this system was successfully installed in a high-class apartment development in Holland Park, Kensington, one of London's most exclusive addresses. Despite the extremely high-specification bathrooms, the building's water usage was calculated to reduce by at least 15% to an average of 90 litres per person per day, more than meeting the planning requirements.

In 2022, SDS also launched a ground-breaking, smaller scale rapid greywater treatment system that is especially suitable for buildings with lower usage, for example hotels with between 50 and 150 bedrooms. Its first installation has been completed at the new 84-bed Premier Inn development in Faversham, Kent.

Alternative to MBR

In the past, MBR systems have been the technology of choice for grey water reuse, but the smaller footprint of on-demand systems together with their ability to provide quality recycled water whenever needed, makes them capable of significantly-improved investment payback.

MBR systems use a biological treatment process and a flat membrane which filters water at a much lower pressure than the new on-demand technology. For example, the SDS Grey Water Recycling systems treat grey water at 1m3 per hour, compared to 0.5m3 a day for a traditional MBR reactor.

Because the new GWR technology can be so quickly replenished, only about a quarter of a day's supply of treated water needs to be stored at any one time. An on-demand system can also be more easily scaled up to match an expansion in requested supply. The only way to expand an

Grey water steps up to meet demand challenges

MBR system is to add more reactor tanks.

An on-demand system has a much quicker start-up and shut-down procedure compared to MBR, so it can be easily switched off during periods of low demand, for example in a commercial building at the weekend. It can then be restarted immediately when required by the building services operator or a facilities management contractor.

Furthermore, as MBR systems depend on building up a biomass of live bacteria, if grey water is not used at a sufficient rate, the bacteria can die, stopping the treatment process. MBR systems need a coarse filter before water enters the first collection tank, which the on-demand system does not. The MBR membranes can clog, also leading to smells, and may require more frequent replacing. So MBR systems require more maintenance and, if they have to be shut down, then it would be necessary for the supplier or manufacturer to reintroduce the bacteria and recommission the biological operation before the system could be brought back into use.

On-Demand Greywater Recycling – How it Works

In the SDS WaterBank® Large Scale Grey Water Recycling System, waste water from a building's baths, showers and hand-basins is directed into a collection tank. A submersible macerator pump feeds the water at high pressure to a disc filter, which uses a patented process to pass water through a disc stack with a centrifugal action to remove particulates > 100 microns. The disc filter provides a highly-efficient filtration process which avoids clogging. An automatic self-cleaning backwash process periodically cleans the discs to keep the filter running at optimum efficiency.

In the second stage of the process, the water is fed to a state-of-the-art ultrafilter, which is packed with hollow polymer fibres which ensure all contaminates > 0.05 microns are consistently removed. This is small enough to include bacteria and viruses and achieve near-potable water quality. The ultrafiltration membranes are also automatically cleaned using pressurised air and water.

The addition of sodium hypochlorite for chlorination and oxidation is kept to a minimum throughout the fast-moving process, before the water is given a final dose to ensure high-quality water is ready for onward distribution around the building.

The complete system is supplied with a control cabinet and HMI screen. In addition, an SDS SYMBiotIC™ data-logging and uplink device enables values from a wide range of input sensors to be recorded and visualised with a cloud-based dashboard. Remote monitoring of the on-demand system not only assists system maintenance by operators, but the SDS service team can also identify any requirement for maintenance visits in real time, so continued supply is assured.

The SDS Grey Water Recycling SS system is designed along very similar treatment principles, except that the two-stage treatment process uses cartridge filters followed by nanofiltration, and intelligent chlorine dosing using dry block calcium hypochlorite.

Rapid Payback with Low Maintenance

The SDS WaterBank® Grey Water Recycling Systems can can pay back in as little as seven years, although actual return on investment will depend on the size of the system and the local Water Company charges.

A key study commissioned by Waterwise, and conducted by Ricardo (4), outlined the UK policy changes and incentives that could be implemented to maximise the potential of water reuse and help bridge the gap between supply and demand. Waterwise has said the savings could amount to 630 million litres a day by 2050. New grey water technologies can make a key contribution by helping developers and building operators to meet regulations while reducing their water bills.

Tel: 01934 751303
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Sources:
(1) Thames Water: Non-Potable Water Reuse as a Demand Management Option for WRMP19
(2) Water UK, Response to Consultation on Reducing Personal Water Use , October 2019
(3) Rt Hon George Eustice MP Written Statement. "Reducing Demand for Water", 1 July 2021;
(4) Waterwise / Ricardo, "Identifying Policy Options for Incentivising Rainwater Harvesting and Grey Water Recycling Systems in the UK", 4 September 2020.

'A key study commissioned by Waterwise, and conducted by Ricardo, outlined the UK policy changes and incentives that could be implemented to maximise the potential of water reuse and help bridge the gap between supply and demand. Waterwise has said the savings could amount to 630 million litres a day by 2050'

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Effective water network management

Smart metering and network analysis will have to be used together to achieve the improvements necessary to meet the challenges facing the water industry today. By Carl Wordsworth, Head of Water Sector at TÜV SÜD National Engineering Laboratory, a world-class provider of technical consultancy, research, testing and program management services.

Currently, the estimated daily personal water consumption rate in the UK is on average 142 l/day (as per 2020) equating to an estimated total usage of 14 billion l/day. By mid-2041, it is estimated that the UK population will rise to over 72 million people, increasing this demand further. It is expected that the estimated population increase is likely to occur in areas of the country where water scarcity is likely to already be an issue i.e. the South East. This coupled with climate change is going to have a significant impact on the volume of useable freshwater available, and by 2025 it has been estimated that two-thirds of the world's population may face water shortages.

Action is required now to reduce demand, increase supply and apply the principles of a circular economy to meet future freshwater requirements. There will be enough water to meet the world's growing needs, but only by dramatically changing the way water is used, managed, and shared.

Water companies must also manage changing customer expectations. It is common for customers to only be aware of their water supply when something goes wrong. For example, if there is a hosepipe ban due to a water shortage, or when the supply is temporarily cut off. Customers' perceptions are also impacted when they are sent a substantially increased water bill caused by necessary on-going investment in infrastructure, such as pipes and water meters.

Flow Measurement

Flow metering is essential for measuring water usage and managing water supplies. Most water meters around the world are small and primarily used to record domestic water consumption. However, larger meters, whilst smaller in number, measure an equivalent volume of water and are key to managing both resource and demand. It is principally through the use of larger meters that we quantify how much water is being abstracted from underground aquifers, rivers, and other water bodies to provide clean water supplies to our cities. Both small and large meters are therefore essential for effective, economic, and sustainable water management.

The need for accurate measurement on large diameter transmission (trunk) mains is of vital importance to the global water industry, to optimise water resources, accurately estimate leakage and calculate the water balance across the water distribution system. A significant proportion of modern flow meters rely on assumptions about the flow profile in the pipe. Bends, valves, and other pipe components upstream of the measurement device will affect the assumed flow profile and the accuracy of the meter. For example, swirl in the flow will impact the rotor of a turbine meter and, depending on the direction of the swirl, will cause an under or over-reading.

Uncertainty is the degree of doubt about a measurement. Undertaking an analysis of the uncertainty of a measurement involves identifying the main influences that affect the result of the measurement, such as the swirl mentioned previously. This will result in a number which represents the "margin of error" in the measurement. Applying this across the network gives an uncertainty in the water balance; that is, a margin of error within which the mass balance should lie. Identifying the main contributors to this figure can ensure that capital expenditure is targeted to areas in the network where it will produce the most benefit.

With flow monitoring becoming an increasingly important part of a water company's business, it is therefore crucial that:

- Good measurement practice is followed at all times
- Established procedures and processes are used and regularly updated
- Staff training and competence is recorded and regularly verified

This helps to ensure that the data obtained from the metering network is reliable and can be used in demand forecasting and strategic planning. These data will heart of their network monitoring procedures.

In the oil and gas industry, uncertainty analysis is integral to the business. This is driven principally by the high value of the product and companies simply cannot afford inaccurate flow measurement. Accounting for uncertainty in flow measurement allows them to see the 'bigger picture' – enabling them to calculate financial exposure and make strategic decisions.

Therefore, the water industry would gain real benefits from adopting the practice of the oil and gas industry, by applying rigorous uncertainty analysis at the also act as inputs to a range of numerical analysis techniques such as gross error detection, uncertainty analysis and data reconciliation. These techniques are cost-effective methods of improving the effectiveness of network monitoring and are now being frequently applied in the water industry.

Modern digital analysis techniques:

In the last few years, the availability of inexpensive computing power and measurement databases has enabled the development

of powerful data analysis techniques that allow metering networks to be monitored daily. Such techniques can give operators details about meter performance and leakage and are much more effective than the traditional water balance calculation over the distribution network. The most appropriate techniques that may be applied over an inter-connected network of measurements include the following methods.

Condition based monitoring techniques that use the diagnostic data that modern electronic flow meters generate to determine the health of the flow meter and to verify that the meter is reading correctly.

Data reconciliation techniques that undertake network analysis and use statistical techniques to identify the flow meters most likely to be responsible for imbalances, allow water companies to target maintenance to where it is most required. Data reconciliation is a calculation technique that is increasingly being used by water companies to monitor the quality and reliability of flow measurement data acquired from trunk mains. It performs a network self-check to ensure that all the measuring devices are consistent with each other. Using this technique, engineers may quickly identify which meters are reading outside their uncertainty bands and take appropriate remedial action. It can also be used to determine the level of leakage in a network.

Fault prediction analysis - by making use of historical data and using machine learning techniques it should be possible to predict where leakage is likely to occur in the water networks.

Combining multiple data analysis techniques such as these should allow modern software techniques to be developed that will enable water companies to:

- Verify the performance of modern electronic flow meters
- Perform network analysis and identify leakage on their networks
- Predict where leakage events may happen in the future

Data is the most valuable asset

Optimising data utilisation is an operational imperative, especially to water companies under environmental, regulatory and resource pressure. Failure to protect significant metering investments, by not complementing it with modern and cost-effective data analysis techniques, risks increased capital and operational expenditure through poor targeting of effort.

Smart metering and network analysis therefore will have to be used together to achieve the improvements necessary to meet the challenges facing the water industry today. This will give water companies much more confidence in their data, alongside their investment decisions and operational expenditure levels. The application of these techniques, along with the recent advances in electronics and computing power, will give water companies the tools to meet the challenges facing them in the 21st Century.

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Clamp-on, contactless flow sensor

NIVUS GmbH has introduced a new clamp-on sensor for contactless flow metering in full pipes.

The manufacturer is expanding its range of clamp-on sensors to include another variant that works on the basis of the ultrasonic transit time difference. Due to the measuring frequency of 500 kHz, these sensors are suitable for large pipe diameters or for pipe wall materials such as asbestos cement, GRP or a multilayer structure. The new sensors also excel in pipes with wall thicknesses of up to 30 mm. Compared to the 1 MHz version also offered, the new version can detect higher flow velocities even better. Another advantage is the increased acoustic penetrability through the fluid. The signal is not so strongly attenuated, e.g. in the case of solids, gas bubbles or deposits on the inner wall of the pipe.

The clamp-on sensors are mounted on the pipe from the outside and measure without contact. This eliminates the need for drilling or similar mechanical stresses on the pipe. An interruption of the process for installation or maintenance is therefore also not necessary. In addition, this technology allows compliance with the highest hygiene standards due to the lack of contact with the measured medium. The high degree of protection of the sensors according to IP68 enables their use even under the harshest conditions. For example, the sensors can be permanently buried in the ground with the help of suitable devices. Special polymer pads ensure a permanently reliable acoustic coupling between the sensor and the pipe.

For the use of the sensors, the measurement technology manufacturer offers permanent transmitters for classic installation in control cabinets or indoors. NIVUS GmbH also provides robust and battery-operated transmitters for temporary or permanent use in harsh environmental conditions. In combination with the NIVUS solar solution, it enables permanent measuring operation even at measurement places where there is no power supply. All systems allow for data access via an online measurement data portal.

Typical applications for the new clamp-on sensors are: drinking water pipelines with large nominal diameters or special pipe wall materials, corroded and incrusted pipelines, monitoring of water inflows, monitoring of pressure pipelines, recording of turbine efficiency or recording of cooling process water demand, as well as recirculation pipelines with a high solids content.

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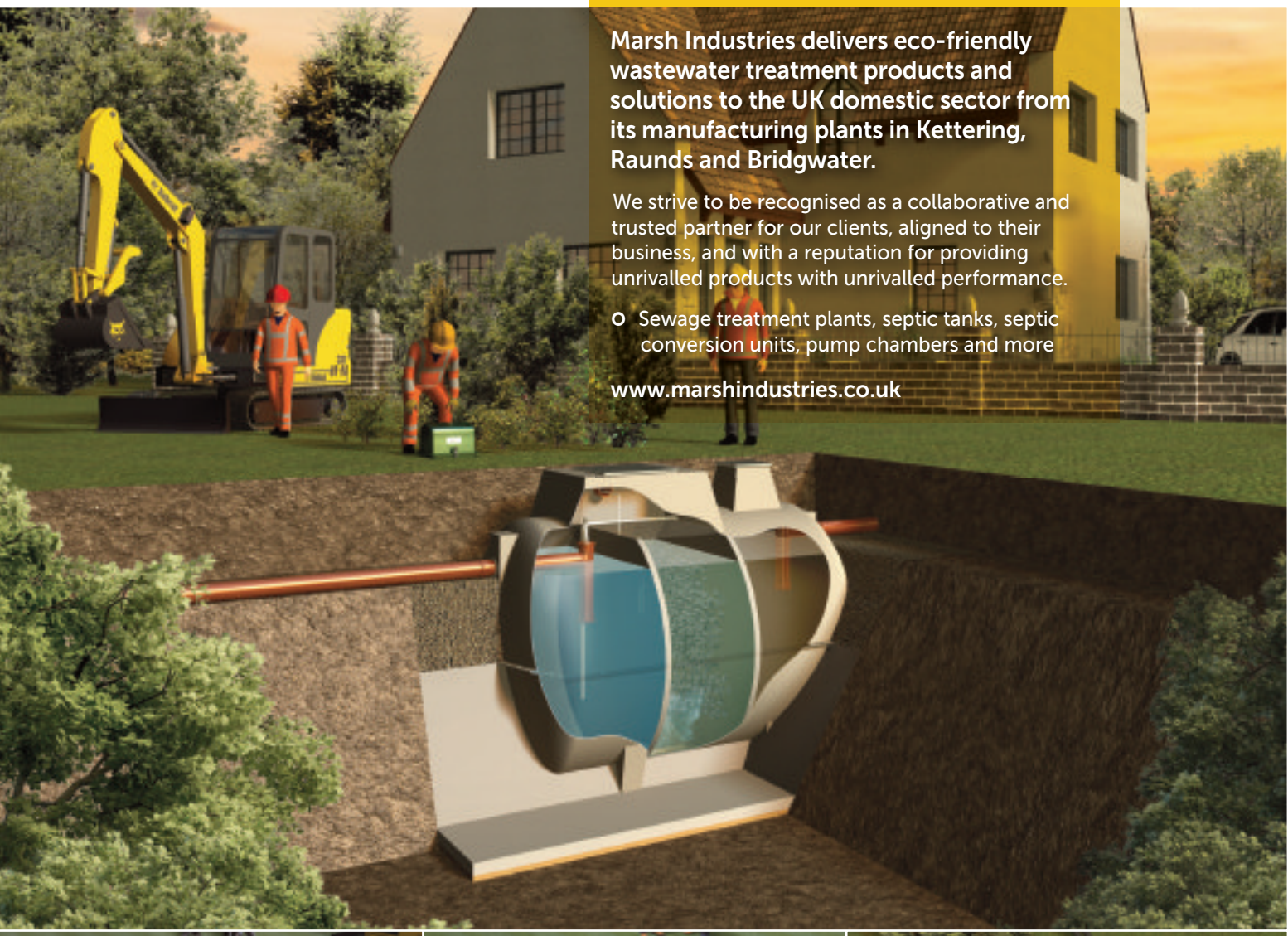

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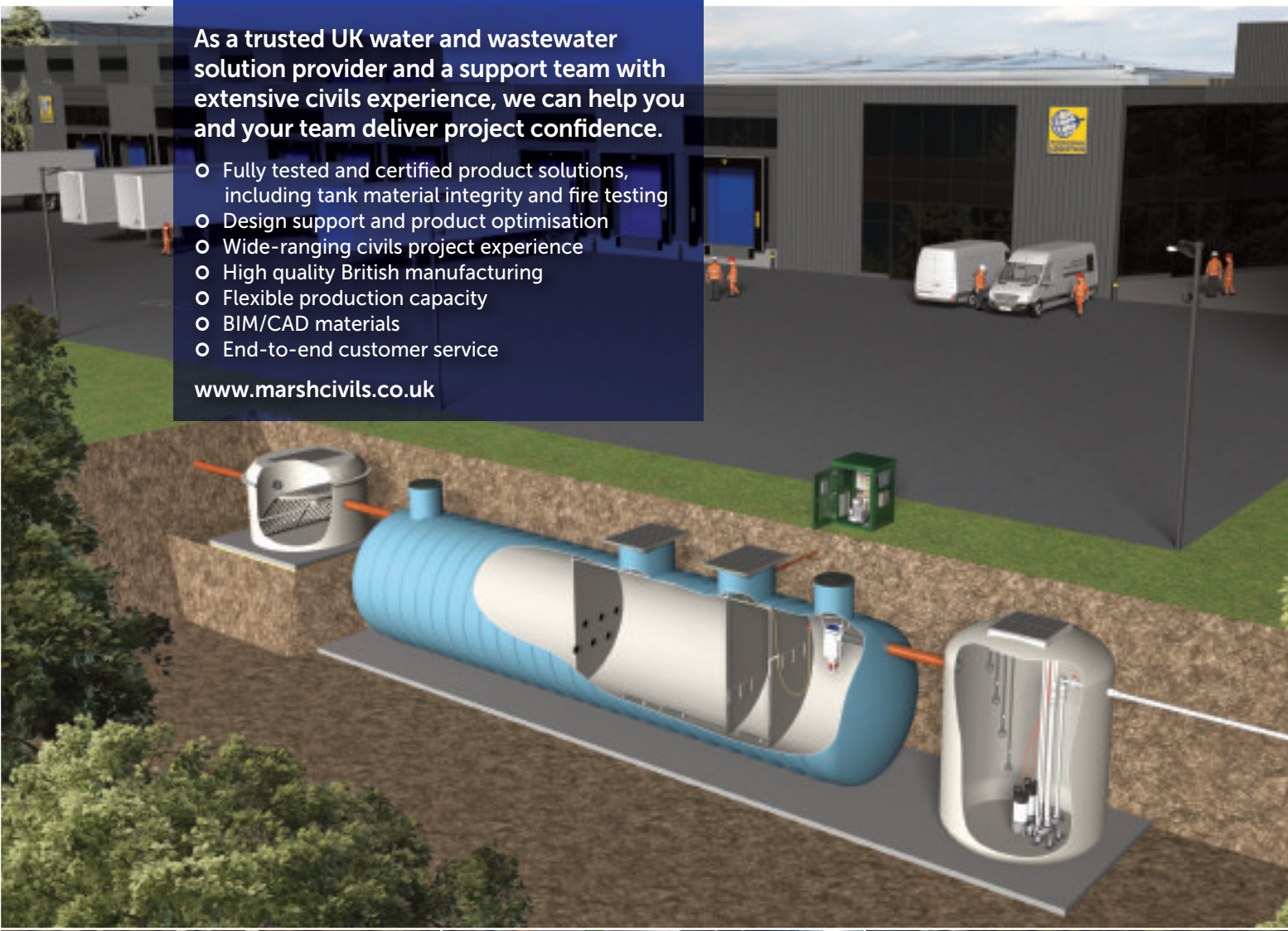

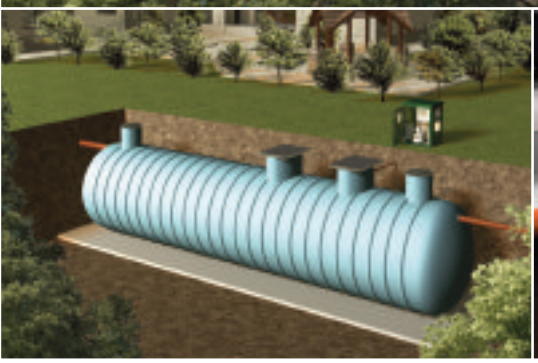

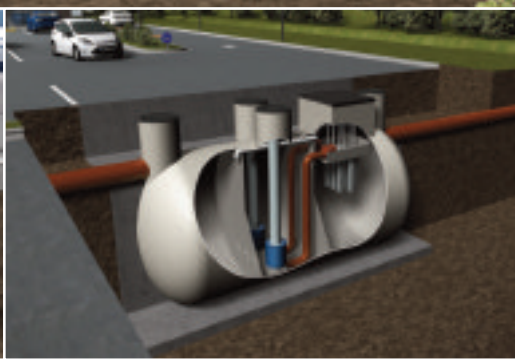

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The benefits of real-time, dynamic data

Flexim's MD Andy Hammond takes a look at some of the challenges involved in large diameter distribution input and trunk main & reservoir metering.

2025 is the deadline for water companies in England and Wales to meet their PR19 Outcome Delivery Incentives during AMP7, needing on average to reduce leakage by 16% and supply interruptions by 41%.

Until now, water companies have tended to focus on smaller diameter District Metered Area (DMA) pipelines for leak detection and fixes. Nevertheless, it is possible that far more significant leaks will be experienced from the larger distribution trunk main pipelines that primarily supply water abstracted from the environment.

The benefits of real-time dynamic data

It's impossible to effectively manage leakage if you're reliant on outdated or unproven network flow models. And more often than not, there's no existing flow measurement available where you need it, when you need it. That's where real-time dynamic data from in-situ flow meters comes into its own.

The problem of escalating costs

When potable drinking water is extracted from places like rivers, aquifer bore holes and reservoirs, it is usually delivered via large diameter

pipes carrying the Distribution Input (DI) raw water to the treatment plant where the water is then treated and disinfected. The water is pumped to the local distribution system through a network of large diameter trunk mains before splitting into smaller diameter DMA pipes.

Traditionally, large diameter trunk main pipes meant that very expensive inline flow measuring systems were needed, comprising large diameter electro-magnetic flowmeters, bypass lengths of pipeline, expensive large bore isolation valves and substantial civil costs to create underground chambers of sufficient size to house everything. Such projects can rapidly escalate to hundreds of thousands of pounds in costs.

There is a cost-effective alternative.

Thankfully, not only do FLEXIM FLUXUS WD Series clamp-on ultrasonic flow meters cost significantly less than their large diameter inline counterparts, but they can also be retrofitted during normal operation, without any interruption to supply. And a huge additional benefit is that the considerable extra cost of civil engineering work and pipework modification is also eliminated.

A truly simple retrofit

When replacement work is needed for failed inline meters, water companies utilising reservoir water sources often struggle to shut off supply to the network. This is when the retrofit of a FLEXIM WD meter is a truly simple solution. Sized appropriate to the pipe type and condition, transducers are securely fixed to the pipe with 304ss or 316ss fittings, depending on the installed environment. In fact, they're so secure you can even stand on them without decoupling transducers from the pipe.

IP68 transducers are also available for reservoir pipes in flooded chambers.

Preventing potentially catastrophic leakage with virtually maintenance-free meters

It's an unfortunate fact that extensive large diameter trunk main networks have the potential for devastating leakage events. Network modelling can help, but real-time dynamic metering at point of flow is a much better solution. FLEXIM Fluxus WD Series meters are already installed on significant water aqueduct pipelines supplying raw water to treatment works at some of the UK's major cities. Once fitted, with no measuring parts within the flow stream, the meters are essentially maintenance-free and are easy to check via Advanced Meter Verification™ software at set intervals.

FLEXIM worked with one major UK water operator, where Distribution Input (DI) flow within 2 pipes, 1.8m and 1.5m diameter was of such crucial importance to an important urban area, it was agreed that for peace-of-mind, the improved uncertainty of 4-channel metering per pipe was justified to deliver the best possible leakage detection.

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Non-invasive liquid flow measurement in pipes - keep calm and clamp-on

As one of the biggest users of process instrumentation, the water and waste treatment industry also presents some of the biggest challenges. There are all the usual requirements – flow, level, temperature etc, but often in remote areas, or as part of a secure network, and for potable water, in hygienic conditions. It is also a critical service and the process can only be interrupted in an emergency. Katronic is an experienced and established supplier to the UK water and wastewater treatment industries, with hundreds of successful installations to our name.
By Martin Hardwidge, Global Sales Manager, Katronic Technologies Ltd.

Katronic KATFlow 150 clamp-on flowmeters with Profibus PA outputs making critical measurements on tricky RAS and SAS lines

Where flow measurement in filled pipes is required, operators have many options, but the fundamental technological choice lies between 'invasive' and 'non-invasive' technologies. Fundamentally, are you cutting the pipe to measure the flow? When considering the technology approach, it's important to consider in detail the costs of making that hole! Invasive flow measurement instruments, unless installed as part of a new-build project, involve additional installation costs, for example breaking into the pipes and interrupting the process, so there may be issues possibly including having to move sewage by tanker or, on the clean water side, making other arrangements to maintain a water supply. In the wider sense, there may be a requirement for civil engineering and traffic management considerations. What about maintenance? Once you've made the hole in the pipe, you may need to make subsequent holes to clean biofilm or other contaminants off or to service the equipment.

A clamp-on, non-invasive flowmeter offers an alternative with some significant advantages. Firstly, non-invasive, clamp on flow measurement using ultrasonic techniques provides a method to measure reliably and repeatably without interrupting the process and without compromising the cleanliness of the pipe. The simplicity of installation means that the cost of a clamp-on meter is largely limited to the purchase cost of the meter itself and, especially as pipe diameters increase, they are cost-effective compared to magnetic flowmeters or other invasive technologies.

How does non-invasive clamp-on measurement work?

Regardless of whether the flowmeter is fixed to a wall or is a portable, battery-powered unit, flow is sensed by a pair of compact, stainless steel transducers, which are fixed to the outside of the pipe by clamps or chains. The transducers pass an ultrasonic signal through the pipe walls and the liquid. Each transducer both sends and receives the ultrasonic 'echoes' that reflect across the pipe, which are then analysed within the transmitter. Advanced signal analysis compares the signal in each direction and calculates the flow velocity.

Particularly on a small pipe, the difference between upstream and downstream times can be a matter of nanoseconds, so the flow meter system considers a number of reflections, or 'passes' to increase the confidence in the measurement. The flowmeter analyses the reflected ultrasonic pulses, taking into consideration the effect the pipe material has on the flow. A good, modern clamp-on flowmeter will include built-in tools that help to optimise the installation – Katronic's is known as the Audible Positioning Assistant and gives an immediate and dynamic indication to the operator of the accuracy of the transducer position.

The flowmeter is making a direct measurement of flow velocity which is then converted, based on the set up of the unit, into any other flow parameter required within the process, for example cubic metres per hour. Measurable flow velocities range from 0.01 metres per second all the way up to 25 metres per second with a 100:1 turndown.

When selecting a flow measurement approach, the first question should always be 'what are we

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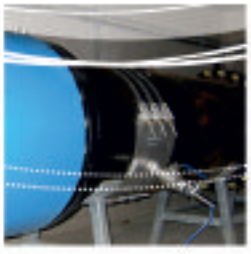

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Non-invasive liquid flow measurement in pipes - keep calm and clamp-on

trying to achieve?'. A clamp-on flowmeter offers a typical accuracy of ±2% of flow velocity with repeatability of around 0.15%, although this figure is dependent on commissioning. There may be critical measurements where the operator will have to accept the inconvenience and cost of an invasive approach. For the majority of applications within a process environment, however, a couple of percent accuracy is adequate.

Typical water/ wastewater applications

As long as we are trying to measure flow in a filled pipe, almost all measurements encountered in the water and wastewater industries can be successfully measured. Here are just a few examples of recent projects undertaken by Katronic.

Pump performance monitoring

Clamp-on flowmeters are available in both fixed and portable forms, portable versions providing opportunities for temporary process monitoring, for example to verify pump performance, allowing service and maintenance to become predictive and management of the assets to be more effective. Some pumps will have run for many hours, others for far less, and the wear on the pumps may have been affected by the process conditions when they were on duty. With a simple clamp-on measurement, individual pump performance can be determined directly, so maintenance priorities can be decided on the basis of actual repair and service requirements rather than time.

Fixed flowmeter verification

Verification is a common theme, and it is surely good practice that any fixed flowmeter be checked regularly for accuracy using a secondary meter, and a non-invasive technique makes that process simple. At Katronic, we have made life easier for the user with the introduction of an audible positioning assistant that helps make sure that transducers are positioned precisely, and a variety of easy-fix clamping options so that mounting and removal of the transducers takes a matter of moments.

Top: Accurate sensor positioning is vital, and Katronic's unique Audible Sensor Positioning Assistant helps the operator by giving a direct visual and audible indication of signal strength, signal confidence and precise sensor position; Below: Katronic KATflow 200 hand-held flowmeter measures to the same accuracy as their fixed units, for consistent performance across the range

Digester sludge flow measurement

Although the majority of use in the water industries involves the measurement of water/wastewater, other fluids are also monitored. Increasingly, monitoring organisations require the flow from digesters to sewage treatment plant inlet works to be measured. Although, typically, magnetic flowmeters will be installed as part of the original equipment, they need to be verified annually, so a portable, battery powered clamp-on flowmeter is an ideal solution, and Katronic equipment such as the hand-held KATflow 200 has proven reliable and accurate, even when measuring a relatively viscous sludge with intermittent flow.

Network improvement survey delivering significant cost benefits

Network surveys can be undertaken using clamp-on systems with extended battery life, such as Katronic's KATflow 210. In a recent example, a network survey was undertaken over several weeks to test whether a reduction in pipeline bore would affect flushing efficiency, and whether that bore reduction would lead to the flow breaching velocity limits. By using a clamp-on meter with long-life, rechargeable lithium batteries and weather-proof enclosure, the engineers showed that the flow, even at peak times, would remain within velocity limits, and successful flushing operations increased from 26% to 86%, significantly reducing water usage. A six-figure saving was projected, by reducing leakage losses and because the smaller bore pipework can be pulled through the existing pipes, avoiding the need for expensive and time-consuming earthworks.

Comparison of influent flows

Increasingly, and to aid long-term planning as well as immediate treatment works performance, measurement is required for both dry weather influent and also 'passed forward' storm flows. Even for works that are serving relatively small populations, the pipework involved can be wide-bore and accessible only via relatively small pits. The amount of civil engineering involved in installing a fixed meter such as a magnetic flow meter would be difficult and the cost would be prohibitive. A clamp-on meter, ideally one that can simultaneously measure and log two separate flows, provides a perfect solution. Flow in pipes up to 6,500 mm diameter and of virtually any material can be successfully measured.

Heat metering

Higher specification clamp-on flowmeters are able to accept a second pair of transducers, along with a pair of temperature sensors. Flow and temperature measurements can therefore be integrated to directly measure heat flow. By comparing heat flow 'in' with heat flow 'out', energy usage can be directly measured, logged and tracked to identify opportunities for energy savings.

Clamp-on, non-invasive ultrasonic flowmeters are clean, easy to install and use, and versatile. Water 4.0 and Industrial Internet of Things (IIoT) technologies means that process instrumentation that can be easily incorporated into an existing process is becoming more and more essential. The clamp-on flowmeter is set to be an important part of that growth.

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ABB launches ABB Ability™ Smart Solution for Wastewater, a digital solution which addresses the un-precedented challenge faced by wastewater treatment plant operators to achieve both the lowest energy use, and the highest operational standards.

The innovative solution is composed of two main pillars, advanced process control (APC) and digital twin and simulation technology to forecast future operational needs. It will help wastewater treatment plants reach optimal operating conditions by reducing process variability and stabilizing operations through continuous monitoring and automation. This enables constant, incremental operational adjustments and gains, reducing energy consumption and chemical usage, alongside increasing profitability.

According to the International Energy Agency, global electricity consumption in wastewater treatment reached 222 TWh in 2020, with electricity usage across the sector predicted to increase by 80 percent by 2040. This is in part due to the increasing demand for treated wastewater, which is now considered a valuable potential resource.

Marco Achilea, Global Segment Manager, Water & Infrastructure, ABB Energy Industries, said: "This new product leverages our long-standing expertise in advanced process control, performance optimization and digital twin technology. With the demand for treated wastewater rapidly growing around the world, our goal is to continue to develop sustainable solutions that reduce energy use whilst improving water quality and operational efficiency."

Developed with hydraulic modelling intelligence from the Danish water environment specialists, DHI Group, the ABB Ability™ Smart Solution for Wastewater creates a more stable treatment process by predicting wastewater inflow together with environmental factors such as weather patterns, reducing risk of overflow and fines. ABB Ability™ Smart Solution for Wastewater will be the first in a family of smart solutions for the water industry. Building on the experience and solid performances of ABB's Optimax® and APC, this first offering is designed to make wastewater treatment plants safer, smarter, and more sustainable.

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Upgraded transmitters for hazardous monitoring

Machine protection and condition monitoring specialists SENSONICS has added IECEx and UKEx intrinsically safe certification, alongside ATEX certification, for their range of Senturion X DNX803 series of transmitters. These upgraded shaft vibration and axial position transmitters are approved for installation and use in hazardous areas with potentially explosive atmospheres (gases) or dusts.

The DNX8031 (shaft vibration) and DNX8033 (shaft position) proximity probe transmitters are suitable for above ground applications when used in conjunction with Sensonics intrinsically safe range of XPR eddy current type proximity probes and XEC cables.

These 4-20mA loop powered modules provide easy integration with either the local machine PLC or a plant wide DCS since it's powered through the safety barrier measurement loop. All signal processing is carried out within the unit providing an output current proportional to either peak-to-peak shaft vibration or relative position to the probe face. The module permits the adjustment of both gain and offset for ease of calibration to suit the application.

Smaller pumps, centrifugal air compressors, motors and fans will particularly benefit from the upgraded DNX803 series. When combined with Sensonics range of compact machine mounted housings, the upgraded transmitters provide a very cost-effective solution for critical operational measurements, with the benefits of a

straightforward interface that requires no local power supply.

The transmitter offers selectable system lengths of 5m, 7m or 9m, with a front panel green LED for indicating the selected option. A gap voltage monitoring socket is also provided. The cable system incorporates snap lock connectors which require no torqueing and provide a shake-proof solution which is important for heavy industrial applications.

The double screened cable offers robustness combined with high immunity to interference while the option of stainless steel convoluted armour is available for applications and environments where cable protection is paramount.

Ideal for many OEM applications, the transmitter also provides a raw buffered output of the vibration signal that can be utilised through portable analysis equipment for a more detailed picture of the dynamic performance of the machine. ENDS

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River level monitoring lowers bridge scour risk

Engineers at Transport Scotland have investigated the potential for water level monitoring systems to help mitigate risks where transport infrastructure interacts with moving water.

The trial was conducted at a bridge over Vales Burn near Hawick in Scotland, and the monitoring equipment was provided by OTT HydroMet. OTT's Wendy Strain says: "The system was set to deliver alarms at pre-set water levels, which enhanced the timing and efficiency of site inspections."

Climate change is increasing the frequency and severity of extreme weather events such as storms and floods. This presents a growing threat to structures that could be susceptible to scour during periods of high water flow. The trial was therefore established to determine whether access to remote water level measurements could enhance the protection of critical transport infrastructure.

Background

The stability and integrity of structures such as bridges, culverts and walls can be compromised by 'bridge scour' which is caused by fast-flowing water that removes material from around the footings of bridge abutments or piers.

There are three main types of scour. Local scour is caused by the faster water flow that occurs around piers and abutments. Constriction scour is created by water accelerating through a narrow opening, and degradation scour can lower a river bed over a longer period, both upstream and downstream of a structure.

The effects of bridge scour can be disastrous. For example, during a flood in 1987, the Glanrhyd Bridge in Carmarthenshire partially collapsed, causing a train to plunge into the River Towy, killing the driver and three of the passengers. In 2009, failure of the Malahide Viaduct in Dublin, Ireland was caused by foundation scour. Two commuter trains packed with hundreds of passengers were just seconds away from disaster when a 20-metre section of the viaduct collapsed after they passed over it. Nobody was killed, but travel chaos ensued.

Today, highways and rail authorities conduct regular inspections in order to asses scour risk.

Bridge scour in Scotland

Transport Scotland is split into four operational regions, and Jim Brown is South East Unit Bridge Manager. Prior to this position, Jim spent 42 years as a civil engineer with Network Rail, 13 years of which he headed the geotechnical discipline in Scotland – so it is fair to say that Jim knows a thing or two about bridge scour. "The most important objective is the early detection of increased risk," Jim explains. "Once we have established which structures are more vulnerable during flooding, we are able to implement different levels of mitigation.

"Much research has been undertaken in an attempt to be able to monitor scour, but this is obviously problematic because potential scour takes place at times when it is not possible to see the river bed and certainly not possible to deploy divers," Jim adds. "For this reason, the continuous monitoring of water level is not the perfect solution, but may be the best and most practicable."

Water level is already used as a risk factor by the inspection teams where the 1 in 200 flood level is shown on structures by a fixed marker. However, Transport Scotland have to monitor 700 structures which are over or adjacent to water, and site inspections are costly; both financially and in resources. The inspection system could therefore be more efficient if it could be informed by remotely available water level data, especially if the data enables faster, more efficient implementation of mitigation measures.

If a structure is determined to be high risk, a hydrological assessment is undertaken. This may prompt a requirement for strengthening of the structure itself, as well as measures to protect or fill potential scour zones, and/or to alter water flow and disrupt vortices. In extreme cases, when a potentially vulnerable structure is exposed to high water, it may be necessary to close highways or rail lines until the level of risk can be lowered.

Vales Burn trial

In light of the potential for live water level data to inform the bridge inspection process, OTT HydroMet was invited to propose a monitoring system that could be evaluated at a culvert on the Vales Burn. "Our solution was comprised of an OTT ecoLog 1000 water level logger in a stilling well, with cellular data connection to Hydromet Cloud; a

Bringing solar power to reservoir monitoring

The technology behind simple and cost-effective remote monitoring.

Remote monitoring has brought about many benefits for utility mangers, but how can telemetry devices be used to monitor sites that have no power infrastructure? Here Ian Loudon, international marketing and sales manager for remote monitoring system manufacturers Omniflex, discusses how solar powered wireless telemetry systems are a cost-effective, secure and reliable solution for remote reservoir monitoring.

Whether it's a single water tank or a large water dam, powering a monitoring system on a remote site, several kilometres away, with limited access to grid infrastructure is challenging. Often, these sites go unattended for long periods of time and vulnerable to overfilling. Because these systems are critical to ensuring continuity of supply and the preventing overfill and waste, water utility mangers often must fund costly infrastructure projects to support installation.

Because manual inspections cannot be feasibly carried out regularly on a remote reservoir, utility managers will feel caught between a rock and a hard place when it comes to balancing cost, security and efficiency. So, what is a suitable solution?

Simply solar

It's a misconception that all solar powered devices require an infrastructure. Yes, it was once the case that solar panels, battery chargers, back-up power supplies and telemetry devices were fitted separately in costly and complex installation projects. However, with a growing reliance on automation and the need for monitoring devices to protect assets, new solar powered telemetry systems have been developed that are cost-effective and easy to install.

Device manufacturers are now making programmable RTUs with integrated solar charge regulators in small footprints. These RTUs have terminals that directly plug in to the batteries, so all the system requires is for the device to be connected to a solar panel and a back-up battery.

Water utility managers can save considerable costs in upgrading the existing infrastructure by using devices such as Omniflex's Teleterm S3 Series, weighing just 350 grams. Being solar powered, the device does not dissipate as much heat as mains powered electronics. This, coupled with its compactness, allows it to sit comfortably in a secure, weather-proof IP 67-rated enclosure with its backup battery.

Considering the concerns

It's understandable that reservoir managers will have concerns over the efficacy and reliability of solar powered devices. Power budgeting for batteries is a particular design constraint and battery selection is made considering worst case scenarios. For example, on days where there is less sunlight, panels can't produce charge at maximum capacity and the batteries must take up the slack for repeated charge and discharge cycles. However, modern batteries have advanced quickly and now have greater tolerance for deep discharge cycling. This allows more technology to be deployed in these power constrained applications.

Battery life concerns have been considered by device manufacturers. For example, the S3's power consumption is low, at just 35 milliamps at 12 Vdc. To save power, the devices are programmed to store data locally and only transmit intermittently on a cyclic basis. On a reservoir you might want to know the usage profile over a 24-hour period. The S3 series can be programmed to take a reading every hour, but report back every once every24 hours, saving power. All data is backed up and secured on a SD memory card, and power is used sparingly making the Teleterm S3 the ideal deployment for reservoir monitoring.

To avoid uncertainty when power is low, an internal backup battery is provided for the processor, to power the real-time clock and keep synchronisation. If the external main batteries were to fail, the backups allow the device to shut down gracefully without corrupting any stored data. When communication comes back on, this data can then be securely transmitted back to the control room either via a cloud-based Data2Desktop network or license-free band radio.

Solar powered devices will continue to push the boundaries of what remote monitoring systems can offer. For remote locations where power is limited, safety is critical and cost-effectiveness is desired, water utility managers can be rest assured that their system remains reliable and secure in any eventuality.

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River level monitoring lowers bridge scour risk

web-enabled platform for processing, displaying and storing hydrometeorological data," explains Wendy Strain. "Data were set to be transmitted routinely every 6 hours, but two alarm levels were set to prompt SMS alerts, when necessary."

The monitoring system was installed in September 2021, and Jim Brown says: "The trial is a great success; we utilise the Scottish Environmental Protection Agency (SEPA) flood alert warnings to monitor flooding and it has been our experience that the highest water levels generally occur about one or two days after a storm, so one of the main objectives of the trial was to determine the best time to despatch inspection staff.

"The monitors did issue alerts during the trial, but these were when levels met the lower alarm level, and in these cases, further interventions were not required. With the benefit of water level data, we will therefore be able to optimise the deployment of the inspection teams and mitigate risk," Jim adds.

Summary

Bridge scour is a long-standing problem for transport infrastructure, so the deployment of remote water level monitors/alarms that can be accessed via PCs or a mobile App offers rail and highway authorities an opportunity to optimise their scour assessment activities, prioritise countermeasures, improve transport resilience and protect safety.

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Emergency engineering: going above and beyond

Trant Engineering recounts the rapid delivery and installation of UV units at a Water Supply Works in response to water quality issues.

Southern Water detected water quality issues at one of their Water Supply Works in Hampshire on 10 November 2019, which threatened to impact the supply of water to 300,000 customers in the county. Within 24 hours, Southern Water's Emergency Recovery Team had formulated a plan to install a temporary ultraviolet (UV) disinfection system on site and assured the DWI that it would be operational in early January 2020. With short delivery times for UV equipment, winter working conditions and Christmas holidays, this was going to be a tall order. On 14 November they awarded the contract to Trant Engineering.

"Trant were already on site, and we knew they would be able to understand the challenge and rise to it", says John Evans, Southern Water's Head of Project Delivery. "Aware of the criticality of fast tracking, they assigned one of their Directors to head up the contract." Trant teamed with SNCL Atkins as design consultants. Key to completing a fast-track project is assembling and motivating a team of Client, designers and suppliers. Ashton Dewey, Trant's Client Manager, takes up the story: "The next day we had our first weekly meeting with Southern Water's Operations and Engineering teams, our in-house engineers, SNCL Atkins and the key supply chain. Due to the geographical spread quite a few people joined virtually and this continued throughout the project."

Intercepting and Diverting the Water Supply

Together they formulated a plan to intercept the existing treated water delivery main and divert the water through a new UV plant and then return it to the delivery main. The works would be based around Design for Manufacture and Assembly (DfMA) modules fabricated off site while the construction team was laying the foundations. These modules included fully fitted sample kiosks, electrical panels with SCADA and telemetry links and pipework for the UV units. All would be tested prior to delivery. To ensure that the units would fit together on site, the team prepared a 3D BIM model which was also used for the planning application.

With the plan made, all that was required was the execution. "We had to think outside the box," says Ashton Dewey, "so that we could design, plan and construct as we went along." While Trant's construction team started to lay down the concrete, the process engineers agreed a design envelope for the UV units, the longest delivery equipment. It was then a question of procuring the UV units, and Xylem were able to offer a short delivery. This meant that the pipework design could be completed and purchase orders placed. The piping designers worked out a sequence that would allow the diversion through the UV system and return to the delivery mains to be completed in a single eight-hour shutdown using hot tapping.

Specialist sub-contractor, Pipeline Services (UK), supplied a pre-fabricated double tee with a spectacle blind to allow commissioning. As the pipework was being installed ready to accept the UV units, a modular steel frame building with a retractable inflatable roof was being erected around it. In the meantime, Trant's internal Automation Control Technology team were developing a functional design specification, writing software and building the control panels to be ready for factory acceptance testing prior to delivery.

Round-the-clock Engineering

The BIM Model was continuously updated as design changes were made to progress the project and it also allowed rapid safety inductions of the site team, which peaked at over eighty. They worked 24/7 except for Christmas Day and New Year's Day to compete the project on schedule in January 2020. The temporary emergency solution envisaged by Southern Water's Emergency Recovery Team was designed to be easily modified to become a permanent installation.

The DWI visited the site just five weeks after the project kick-off and were reassured to find that the UV reactors were already on site, pipework installation was well advanced and the building partially erected. The last word goes to John Evans: "A project like this would normally take over a year, but we completed it in only eight weeks. It's the power of the team coming together that makes that possible."

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'A project like this would normally take over a year, but we completed it in only eight weeks. It's the power of the team coming together that makes that possible'

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Accurate gas dosing and the ability to control the feed to match changing conditions are vital for water treatment applications such as pH control using CO2 or removing iron with oxidation. From the outset, the system requires accurate sizing and, combined with precise control enabled by automation, this will ensure product quality as well as a cost-effective process in the long term. Greg Wainhouse, Industry Account Manager for Water Applications at Bürkert, explains how to ensure an accurate and cost-effective gas feed system.

Accuracy is a key requirement for feeding gas in a water treatment process. This ranges from applications that require neutralisation of pH levels with carbon dioxide, removing iron or manganese to create process water, or oxygenating wastewater to assist the bacterial breakdown process. Imprecise gas insertion can result in reduced process performance and a lower quality end-product. Moreover, excess gas use can significantly increase process costs over the long term.

Achieving an optimal gas feed requires accurate and responsive control, and this starts with accurate sizing of the metering and control system. The fundamental requirement for measurement of gases present in water is a precise calculation of inlet pressure, referred to as P1, outlet pressure, referred to as P2, as well as the flow rate. Together, these values are used to accurately size the system's mass flow meter (MFM) and control valves.

'As well as pressure and flow rate, it's also vital to understand the precise gas volume to achieve the desired results for a given application'

Sizing the system

Within a mass flow controller, the gas flows through a control valve orifice with a smaller diameter than the main pipe. This creates a pressure drop as the flow rate becomes proportional to the downstream outlet pressure, following Bernoulli's principle that states an increasing fluid speed creates a corresponding decrease in static pressure. This explains the importance of clarifying either the P1 (inlet pressure) or P2 (outlet pressure) to determine the potential flow rate.

Confirming the accuracy of these values is as important for optimising an existing system as it is for specifying a new application. It's not unusual for a customer site to use a mass flow meter or controller that hasn't been correctly sized at the outset and is therefore inaccurate and unable to achieve the required flow rate. Usually, the site's engineers know the inlet feed pressure, though rarely the outlet figure, but a flow control specialist will be able to assist with accurate sizing and required flow rate calculation.

As well as pressure and flow rate, it's also vital to understand the precise gas volume to achieve the desired results for a given application. With this understood, a flow control partner can also support the calibration process to confirm accuracy of the sensors specific to the gases involved.

Controlling the gas feed

Assuming the ability to accurately measure gas flow, precisely controlling the feed is the next step. If gas pressure, flow rate and temperature are constant, fixed manual control of gas flow can be sufficient. However, this situation is a rare occurrence. Taking a CO2 infusion application, for example, as the gas is fed in and volume of CO2 in the host container decreases, inlet pressure also decreases, impacting flow rate accordingly. Opening the mass flow controllers orifice will increase flow rate, but maintaining accuracy across this control process requires automation to achieve the required precision.

Even more basic applications with a lower dependence on gas feed accuracy require human knowledge of mechanical valve control. However, this places greater reliance and time requirements for

Royal visit to 'world-first' water treatment process

His Royal Highness The Prince of Wales visited Carlisle's water treatment works to see how ultraviolet LEDs are making ripples in the field of low energy water treatment. Developed by Penrith firm Typhon, the technology is the only one of its kind capable of disinfecting drinking water supplies on a large scale.

Tested and developed with water company United Utilities, the technology has been scaled up and now the world's first ever municipal UV LED disinfection system is in operation at the site.

His Royal Highness met employees from both Typhon and United Utilities and discussed how the award-winning system, with its advantages of superior safety, energy efficiency and low running costs, could help address safe access to water globally.

Typhon CEO Matt Simpson said: "We were honoured that His Royal Highness was interested to come and learn more about this hugely important leap for UV technology in the water industry. It was wonderful to be able to share the story of how a small local firm and the local water company have worked together to take the idea all the way through from demonstration scale to a marketable industrial application right here in Cumbria.

"We explained how the process works, the challenges involved in developing such a unique disinfection solution, and the potential future benefits for the water industry globally and for high skilled employment opportunities in the North Lakes area."

United Utilities' Head of Innovation, Kieran Brocklebank said: "United Utilities is proving to be quite a force for innovation in the UK water sector thanks to our Innovation Lab programme, where we identify and incubate the best emerging technologies. Our relationship with Typhon is a real success story and we were delighted to help showcase what can be achieved when industry fully invests in the next generation of talent and ideas."

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Improved gas feeding in water treatment

on-site operation by engineers, as opposed to time saving, automated control.

Managing flow also depends on the changing gas levels in the water. Controlling pH, for example, can require precise adjustment based on feedback from a probe. Accurate and repeatable results rely on a rapid control response according to the changing conditions, which can only be achieved without impacting throughput by an automated process.

Automation also enables faster and more accurate documentation, removing the time requirement and potential for inaccuracies in reporting. Applications in food and beverage, for example, demand frequent data recording with evidence of accuracy from calibration records to meet national standards. While an automated system ensures a robust process, it also reduces costs in the long term, compared to human data logging.

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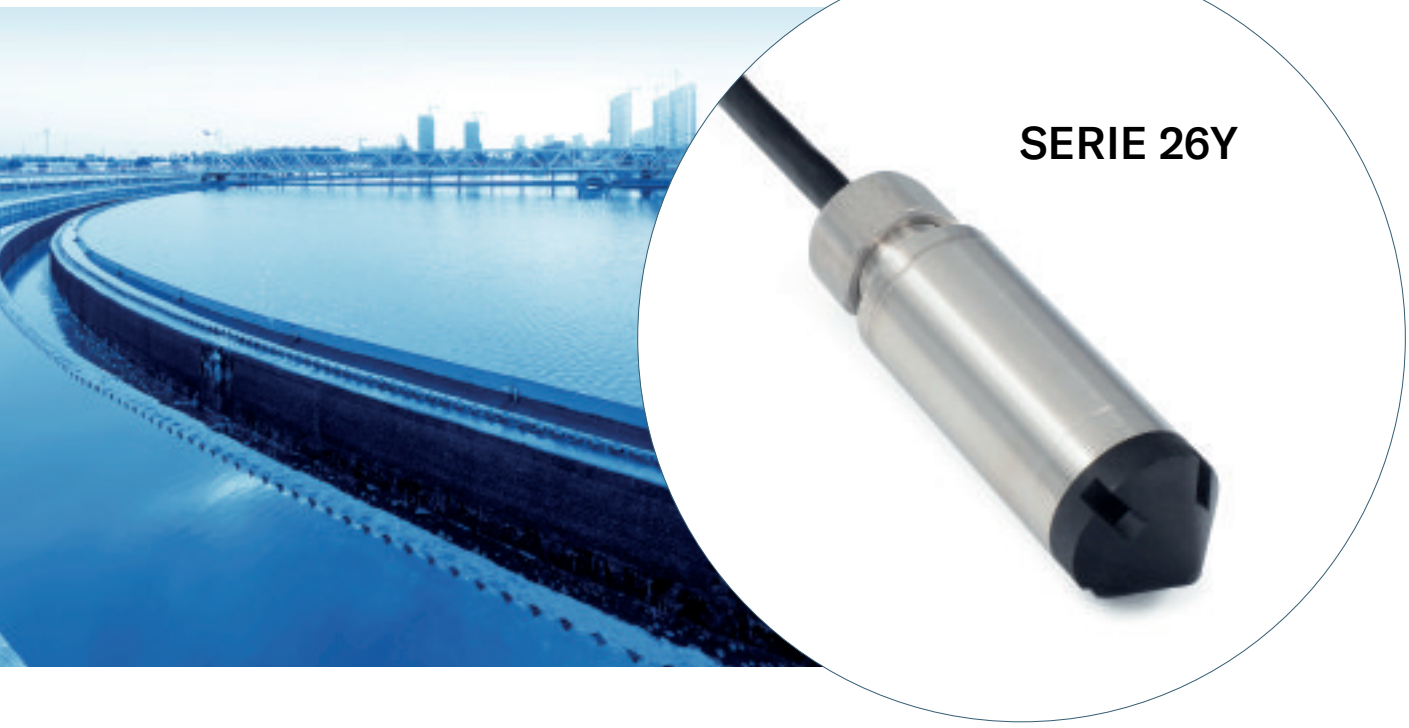

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