BIG IDEAS

As Ofwat tries to #Sparkinnovation this month, global water innovation expert Paul O'Callaghan advises companies to catch the wave of pan-sector biotech, digital and advanced material science trends – and not to neglect to keep an eye out left field.

By now, you will have noticed that Ofwat is leading a charge for innovation this month. It's Spark! campaign, appropriately delivered through digital channels including weekly programmes on YouTube and a concerted push on social media, is designed to showcase innovation from other sectors and inspire water companies to open their minds to the possibilities. While this is a logical move from the regulator, given innovation is one of its four PR19 themes, not to mention a useful narrative as the industry's legitimacy battle rages, Ofwat is to be praised for giving the theme such profile and for bringing a wide range of voices to bear.

Companies have embraced the campaign, or at least taken the hint, not least by providing a succession of innovation related posts on Twitter and elsewhere, using Ofwat's #Sparkinnovation hashtag and its derivatives. Many are showcasing innovation going on in their companies, which rather suggests they were doing it anyway, but no doubt the regulatory spotlight on the issue will stir industry minds to consider what might come next.

Drill a little deeper and the campaign poses a number of pertinent questions. Perhaps the most obvious one, for companies who will need to deliver real efficiencies, service improvements and resilience advancement at PR19 rather than just tick the innovation box when their business plans are assessed, is where should their innovation efforts be targeted? Innovating for innovating's sake is unlikely to meet business needs. Useful to know then what is going on globally in this space: where are the likely big wins, and what are the likely best bets?

From 'magpie' to systematic

Enter Paul O'Callaghan, chief executive of BlueTech Research, a company whose raison d'être is to scan the globe – and the horizon – for water technology intelligence and to package this up as need-to-know information for its clients. "We are a water technology intelligence firm, but specifically we identify technology to meet industry needs," he explains. "We scan the horizon and map what we find to company pain points." O'Callaghan details that BlueTech's service offering comprises both an online intelligence platform to which companies can subscribe and access at will, and bespoke work for individual companies – for instance, to identify global best practice in an area of interest to the client, to benchmark the client's current performance and to map a path to improvement.

These clients are typically "Fortune 500 organisations, globally" O'Callaghan says – including international water operators and huge industrial users. Here in the UK, Severn Trent is one of BlueTech's clients – interestingly a company which last year held a special stakeholder event purely to showcase digital and technology innovation in its water, wastewater and retail operations.

Considering the UK water sector's approach to innovation in the round, O'Callaghan identifies a positive shift. "The approach and thinking in the UK is maturing. It's becoming much more needs driven, moving from a 'magpie approach', looking for shiny objects, to a more thoughtful systematic approach where companies look at what they need to do – be it for compliance, or regulation, or service or cost – and from there look at what will help them to meet that need. There's more looking at where they are today, more baselining and more benchmarking which is very much in line with our analytical approach at BlueTech."

He points out too that water companies here are increasingly turning their attention to more developed ideas that can be more readily implemented. "Five or six years ago, they were looking for new, exciting ideas, often looking at start-ups. Now, while they are still watching the early stuff, they are focusing on the stuff that's further along, say five to ten years along and that has been demonstrated."

Fourth industrial revolution

So where does O'Callaghan think the biggest opportunities are for UK water companies on the hunt for innovation that will deliver tangible results? His answer is to identify three global trends – biotechnology, digital and advanced material science – the message being that the key is to identify where water could tap in to much bigger picture developments to make substantial advances, rather than to think in terms of incremental, sector specific progress. Together, says O'Callaghan, advancement in these three areas will amount to "the fourth industrial revolution" and impact all disciplines, economies and industries – unsurprisingly, water included.

He provides some practical examples of water innovations to watch that are emerging from the three global trends.

- Biotechnology: Advances in metagenomics – the study of genetic material recovered directly from environmental rather than cultivated samples – offer the desirable prospect of major cost savings from minor capital outlay, according to O'Callaghan. "Costs have fallen by six orders of magnitude in the last ten years" in this space, he says. Without dwelling on detail, metagenomics offers the ability to reveal the previously hidden diversity of microscopic life, and could change our understanding of the living world. Applied to wastewater treatment processes, it could significantly boost productivity. "That holds real prospects in terms of eating into that £25 bill saving Ofwat wants to see," O'Callaghan says.
- Digital: Examples in the digital and Internet of Things space are many and varied. O'Callaghan picks on work done in Melbourne, Australia. Across sizeable suburbs of the city, rainwater harvesting tanks have been installed on rooftops. The water utility can remotely control the tanks and ahead of forecast intense rainfall events, the tanks are automatically drained, so when the rain falls the tanks act like a distributed stormwater attenuation system. The city takes a similar approach with wastewater, using storage tanks in the network to even out loading across the day, similar to peak lopping in energy. This ability to use control to even out stormwater and wastewater load on the network, helps to reduce flooding risk and be efficient with peak infrastructure treatment capacity requirements and plant upgrade needs.
- Advanced material science: O'Callaghan points out what asset managers everywhere will know: that buried infrastructure is very costly and difficult to maintain. Increasingly, smart tools can be used to detect leaks but that is only half the battle. Pioneering advanced material science work by 3M, the company behind Scotch Tape, has led to the production of a new durable coating for pipes which involves the bonding of two chemicals in sequence, administered by drones. O'Callaghan believes this innovation has the potential to support the UK water industry in reducing leaks to match regulatory PR19 expectations.

Where to look

BlueTech is an expert water technology innovation tracker. Where does it look for the next big idea, and where should UK water firms keep an eye out? O'Callaghan says global water markets are an obvious starting ground, but that this must extend to emerging economies as well as developed ones. "Developments in emerging economies often find their way across the world," he observes. Other sectors too must be watched, as must the cross cutting fields of biotech, digital and material science already flagged.

But there are also broader sources of innovation intelligence that BlueTech tracks. A good example is that decentralisation is finding favour at the moment in multiple sectors and is making a variety of impressions on water trends. Some examples: necessity is driving emerging economies such as those in Africa to choose off grid and micro grid based solutions; in San Francisco, all buildings over 250,000ft^2 are obliged to reuse water onsite – a trend that is likely to be rolled out across California and beyond; direct potable reuse is on the ascendancy; and here in the UK, sludge and organic waste processing by water companies is breeding energy self-reliance.

O'Callaghan comments: "Bill Gates said if you think about one year ahead, you overestimate change but if you think ten years ahead, you underestimate it. We compared the number of energy neutral wastewater treatment plants in 2007 and 2017, and found that while each development proceeds bit by bit, in the round you find critical mass. Where will we be in the next ten years?"

Water user behaviours are also a source of insight, O'Callaghan says – a strand that fits well with Ofwat's promotion of customer co-creation as a valuable pool to tap as companies design and deliver services. The BlueTech boss offers an unexpected example: a movement in the US for raw water. "Some customers in California want unfiltered, untreated, unsterilised water and are willing to pay a premium for this because they feel it is 'living water' containing pro-biotics and minerals, and does not contain chlorine and fluoride. At the other end of the spectrum, there is the point of use treatment fringe, where consumers install designer water filters in their home to carefully control all aspects of taste and quality.

He believes this is in part down to "an erosion in consumer confidence in drinking water" driven by factors which include wider consumer health awareness; the increasing availability of consumer technology capable of measuring drinking water quality indicators in ever more sophisticated degrees; and high profile incidents like the Flint case which have sparked ongoing coverage of water quality stories from the likes of thought leading papers like the *New York Times*. "Yes it's a fringe movement today, but today's fringe is tomorrow's mainstream. Utilities would do well to watch this development."

Wastewater treatment plants are a hub for the transfer of antibiotic resistance genes.

Finally, O'Callaghan says you mustn't neglect the left field. He offers the example of antibiotic resistant bacteria. This is a big focus in the Netherlands right now, with emerging research showing wastewater treatment plants are a hub for the transfer of antibiotic resistance genes. "Well, you couldn't really think of a better breeding ground," he mulls. Clearly this could have major consequences for future treatment and sludge management practices.

A similar issue surfacing here in the UK on the back of commitments to reduce plastic pollution is the presence of microplastics in sludge, with potential consequences for the main sludge disposal route to land. Only last month Conservative MP Anne Main submitted a written parliamentary question to ask what assessment the government has made of the contribution of wastewater treatment plants to tackling the problem of micro plastics. Water minister Therese Coffey said and investigation is underway and "will inform future consideration of measures to reduce micro-plastics at source and the potential for plastic capture technology at water company wastewater treatment plants."

These issues and more will be up for discussion at the next BlueTech Forum, taking place in Vancouver, Canada on 6-7 June - see https://www.bluetechforum.com. The theme of this year's event is 'Managing water risk in the circular economy'.