FWR NEWSLETTER
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August 2017

Summer Newsletter

Initial findings from the collaborative *National Phosphorus Trials* were published recently by UKWIR and presented at the Big Phosphorus Conference in July. Pete Vale (Severn Trent) and Simon Leaf (Environment Agency) explore phosphorus in our lead article, looking at the difficulties it causes in receiving waters, the fact that it is a valuable, finite resource and the subsequent need to recover as much as possible at the wastewater treatment stage. One of the most significant drivers for this is to meet ever-stricter consents as a result of Water Framework Directive requirements.

FWR are launching a new interactive website for the South Chilterns Catchment Partnership, which we host. This enables the user to interrogate maps of the catchment, see where projects have taken place and find out what future works are planned. Details are on page 5.

A round-up of a busy early summer season on the wastewater conference front is provided by Steve Bungay. And Mike Waite gives an account of the *UV Disinfection Workshop* organised by CIWEM and the International Ultraviolet Association.

For information on events and news highlights please go to our website *www.fwr.org.* You can also contact us via email *office@fwr.org.uk* or by telephone on 01628 891589.

Maxine Forshaw - Editor

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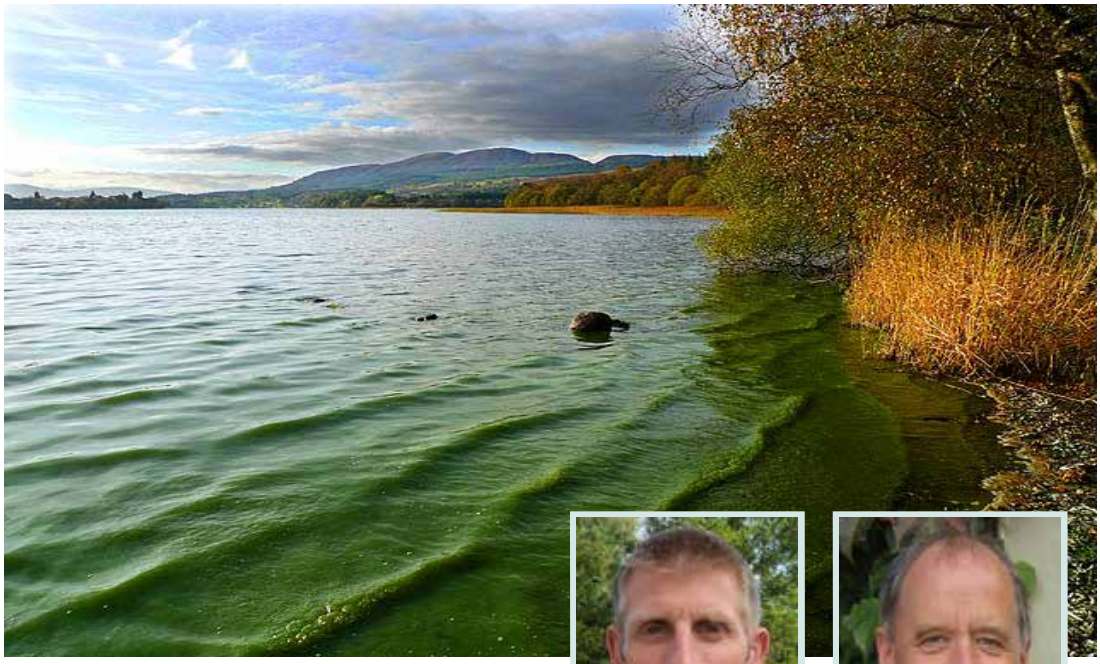


Lake of Menteith, © Dr Richard Murray, geograph.org.uk

Peter Vale, *Technical Lead (Innovation), Severn Trent Water*

Simon Leaf, *Senior Advisor (Nutrients), Environment Agency*

MOST GARDENERS AND FARMERS are aware that phosphorus (chemical symbol P), like nitrogen, is a plant nutrient.

P is a major component of the fertilisers they use to make their lawns, flowers, fruit 'n veg and crops thrive and grow. It is also an essential ingredient in the feed that farmers give to livestock. It is a good thing. In fact it is essential to life on Earth: part of the structure and function of all living cells.

What rather fewer gardeners and farmers realise is that P is a non-renewable and finite resource, derived from phosphate rock which occurs in only a few countries in the world, with virtually none in Europe. Our agriculture is hugely dependent on mined P rock for its supply of fertilisers and animal feed. Unfortunately, whilst in historic times human wastes were recycled to the land to support the growth of more crops, modern agriculture is very inefficient in its use of nutrients. Much of the P applied to land ends up accumulating in soils or, after conversion to food, is lost to rivers and lakes after passing through people and sewage treatment works (STWs). In the UK, the amounts lost in this way, each year, exceed the amounts used in fertiliser and we all contribute through our unavoidable need to eat and use the toilet.

Once P enters the freshwater environment, its fertilising effect can cause major ecological problems, releasing algae and plants from their natural growth constraints. The result is algal and plant proliferation. In lakes the algae may 'bloom' in huge numbers. Some blooms release toxins which are a hazard to people participating in water sports and dogs or livestock that may drink the water. The algae cut out the sunlight, killing off the water plants and ruining the habitat for fish and the small invertebrates on which they feed. When a bloom dies back the oxygen in the water is consumed, with further impacts on the biota. Similar effects can occur in rivers, with weed growth being a further problem to anglers and to fish themselves through the clogging of spawning areas. Excessive weed growth can add to the risks of flooding by restricting river flow. The over-supply of P to fresh waters from sewage effluents and agriculture run-off can be summarised as 'too much of a good thing'. The process of excess nutrients entering water and causing adverse ecological effects is termed 'eutrophication'.

THE DEVELOPMENT OF EUTROPHICATION AS AN ISSUE IN ENGLAND

In England, the development of eutrophication as a water quality concern took place gradually in the decades following World War II. In the 1930s, river P concentrations were at, or close to, the concentrations that would restrict the grosser effects of eutrophication such as large growths of blanket weed. That said, general river quality, in terms of organic (oxygen consuming) and industrial pollution, with little legislative control until 1951, was much poorer than nowadays, so river health was not good. Concentrations of P in rivers rose steadily and distinctly from 1950 to the 1990s. This was due to the introduction of P in household and industrial detergents, together with population growth and the increasing use of artificial fertilisers in agriculture. Figure 1 shows this dramatic rise, using the River Thames at Walton as an example.

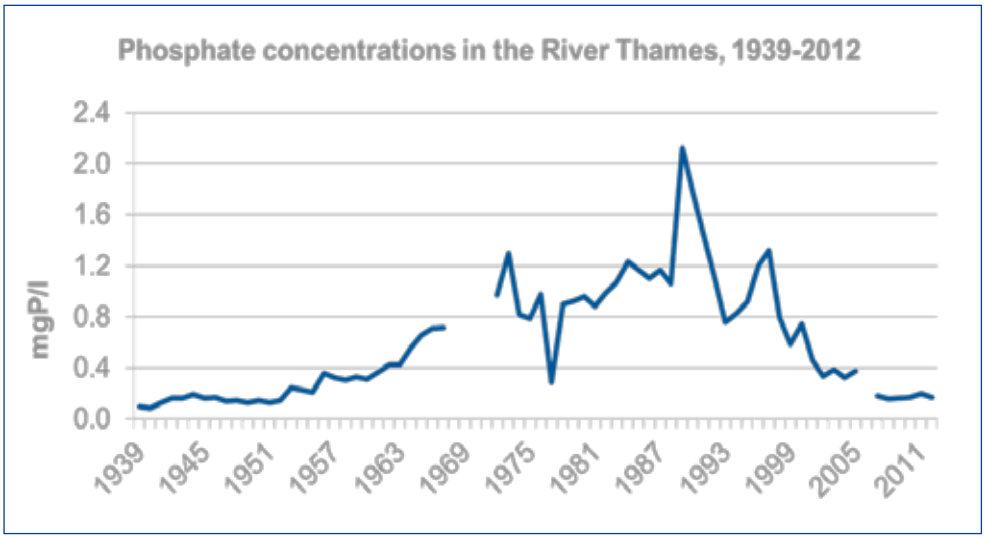


Figure 1 Phosphate concentrations in the River Thames at Walton, 1939-2012. Source: Environment Agency

During this time, progress was made in tackling toxic chemicals in sewage and industrial effluents, such as ammonia and heavy metals, and improving oxygen levels. But the issue with high nutrient levels and associated eutrophication problems really only emerged in the late 1980s and 1990s. A spate of blue-green algal blooms in 1989 hit the headlines. Prime examples involved the death of 15 dogs and 20 sheep at Rutland Water, after drinking water containing algal scum at the edge of the reservoir, together with the hospitalisation of two army recruits after capsizing their canoes in an algal scum on a lake in the Midlands. Aside from water sports, eutrophication also causes problems in terms of other water uses, notably the abstraction and treatment of drinking water, angling/fisheries and wildlife conservation. Several major rivers in lowland England were formally designated as eutrophic in the 1990s and early 2000s.

Credit: Environment Agency

PROGRESS IN TACKLING P IN RIVERS AND LAKES

In the 1990s action was taken to begin to address the sources and effects of eutrophication. Under an EU directive (the Urban Waste Water Treatment Directive) the removal of P from sewage was introduced at STWs discharging to some of the worst affected waters. Further such measures were brought in to protect waterbodies of high conservation interest, such as the Norfolk Broads.

Broadly speaking there are two ways of removing P from sewage: chemical precipitation and biological removal. Chemical removal is the most common form in the UK and involves the addition of a metal salt, usually iron or aluminium. The metal salt reacts with the soluble P, converting it into a particle that can then be removed through settlement or filtration. Because iron and aluminium have the potential to also cause damage to the aquatic environment there is the need to limit the residual concentration of

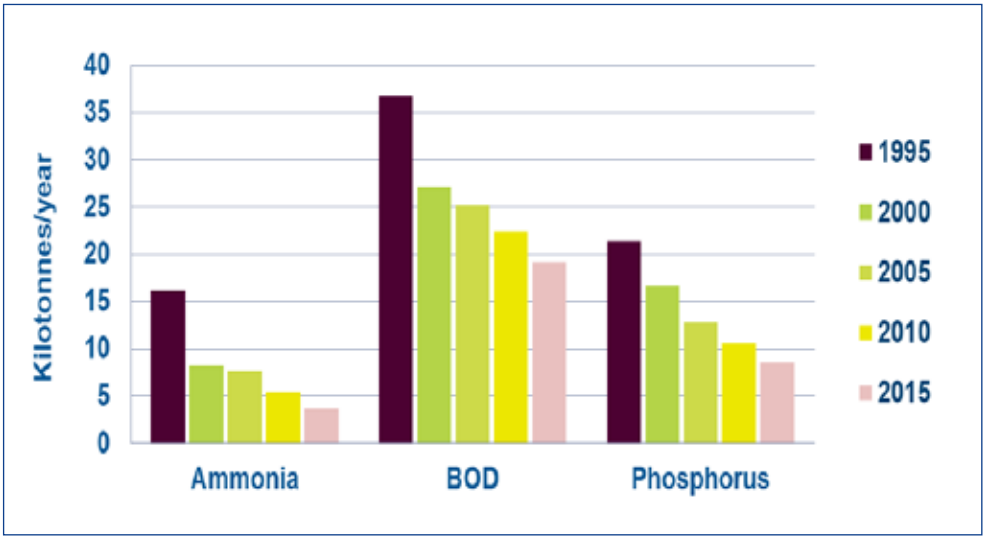


Figure 2 Reduction in the ammonia, BOD and phosphorus load discharged by sewage treatment works since 1995. Source: Environment Agency

the metal in the effluent discharged from STWs. Biological nutrient removal (BNR) utilises a specific type of bacteria that can take up soluble P and store it inside the cell. By removing the bacterial cells as a 'sludge' from the treated effluent, the P is reduced to the required levels. The principal drawback to this biological method is that it works best with a more concentrated wastewater and it is not as robust as chemical P removal.

Over the last 20 years the number of STWs with P removal processes installed has increased dramatically, so that by 2015, P reduction was in place at some 650 large STWs, with phosphorus discharge limits typically set at 1 or 2 mg/l total P. It is estimated that the UK Water Industry will have invested £2 billion by 2020 to improve treatment specifically to remove P. As shown in Figure 2, this has led to a substantial reduction of 60% in the amount of P discharged to rivers from STWs.

During this time, the use of P in detergents also dropped progressively from about 50% of the P content of crude sewage in the 1980s to about 15% by 2010. Action to reduce P losses to water from agricultural land were also introduced. Catchment Sensitive Farming from 2006 has helped to promote good land management practices and the use of artificial P fertilisers has fallen considerably. The effect of these actions on river quality has been quite dramatic, as illustrated in Figure 3.

MORE TO DO

The standards for P in freshwaters, designed to control eutrophication, are very stringent. Despite major progress in reducing P inputs to water, over half of assessed river water bodies and three-quarters of lake water bodies currently exceed their P standard. P is the most common reason for English water bodies not achieving 'Good Ecological Status'. In addition, based on a 'weight-of-evidence' approach to assessing eutrophication, developed by the Environment Agency, around 25% of assessed river water bodies and 28% of lakes in England have strong evidence of eutrophication.

The importance of effectively dealing with eutrophication is illustrated by the value of fresh waters to the UK economy that was estimated, for 2012, to be £40 billion by the Office for National Statistics. The services to society provided by fresh waters include public water supply, recreational visits and fisheries, all of which can be degraded by eutrophication.

England is not alone in its challenges with P; across Europe, despite water quality improvements, concentrations of nutrients in many places are still high, causing eutrophication and affecting the ecological health of waters. In the USA eutrophication accounts for over half of impaired river reaches and lake areas, including major problems in the Great Lakes. It is also a serious problem in China.

Climate change presents a future risk, with higher temperatures helping algal growth and reduced river flows meaning less dilution for effluents and more time for algae to grow. Population growth in areas such as south-east England is another future challenge as it will increase P loadings to rivers unless these are controlled. It must also be recognised that ecological recovery from eutrophication tends not to be quick and easy. Experience from the Norfolk Broads and elsewhere indicates that in lakes it may take 10–30 years for good ecology to be re-established.

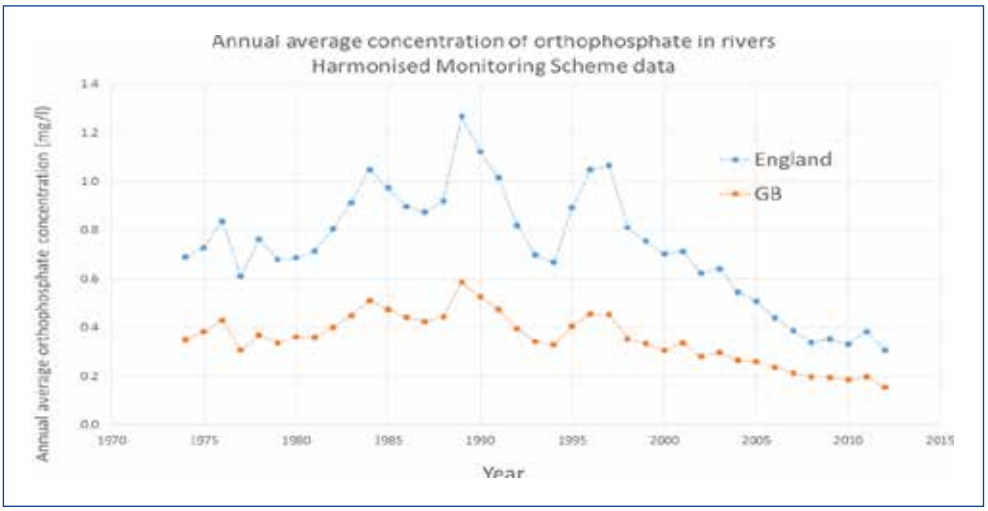


Figure 3 Trends in river phosphorus concentrations in UK and English rivers. Source: Defra Harmonised Monitoring Scheme data

Further major reductions in P loadings from STWs and agricultural sources are required to achieve good ecological status as required by the Water Framework Directive (WFD). In order to achieve these levels of reduction it is clear that not only will P removal processes have to be rolled out across many more STWs, but also the P discharge limits will have to be tightened significantly from the 1 to 2 mg/l level currently in place, to levels perhaps as low as 0.1mg/l. This presents a significant challenge to the Water Industry as the conventional technologies used today will not robustly achieve these limits.

Excessive river macrophyte growth. Credit: Environment Agency

To address this challenge the UK Water Companies, together with the environmental regulators (The Environment Agency, Natural Resources Wales and the Scottish Environment Protection Agency), have collaborated on a national programme of trials to investigate and evaluate technologies that may be capable of meeting these stringent new P targets. The trial has been configured to assess both the optimisation of current technologies and the adoption of novel technologies and involves full scale and pilot plant trials across the UK. The preliminary results from this programme have recently been published, and the findings illustrate that meeting very tight P limits, even with newly developed technologies, is a real challenge. However, with optimisation of current processes it could be possible to achieve <0.5mg/l, and with the adoption of new technologies limits of 0.25mg/l are perhaps achievable.

These results will be used by the Water Companies in their investment planning process for the period 2020–2025 and by the Environmental Regulators to aid in the setting of new P discharge limits. Alongside action at STWs, further action to improve nutrient usage in agriculture and to reduce water pollution is also needed. Farmers must be encouraged to adopt good nutrient management practices on their farms. Technological advances can help, for example through breeding plants that can use P more efficiently, or by developing more efficient fertiliser formulations and ways of applying them.

Trial of the BluePRO® process at Severn Trent Water's Shirebrook STW, part of the UK Water Industry Research (UKWIR) national programme of trials (credit Severn Trent Water).

LOOKING AHEAD

It is evident that while much remains to be done, great progress is being made in protecting our rivers and lakes from the enriching effects of P. What we mustn't forget, however, is that P is an extremely precious and limited resource (it is on the EU's list of critical materials) and we should therefore be doing much more to preserve our global reserves. Unfortunately most of the low P sewage treatment processes that have, or are likely to be, installed in the next few years use chemicals (iron or aluminium) that 'lock-up' the P, making it much harder to recover and recycle. Thankfully, other P recovery technologies are being developed and implemented, eg processes that recover P as struvite (magnesium ammonium phosphate) or use ion exchange to remove the P and then recover it as calcium phosphate. Severn Trent Water and Thames Water in the last few years have installed full scale P recovery plants, and ion exchange processes for both P and nitrogen (N) recovery are being explored by Cranfield University and others.

There is a fantastic opportunity for the Water Industry to embrace the circular economy approach and transform STWs into product recovery factories. In the future, expect to see sewage biorefineries that have energy positive processes that turn sewage into clean water while recovering valuable materials such as P, N, cellulose and bioplastics. ❖

SOUTH CHILTERNS CATCHMENT PARTNERSHIP

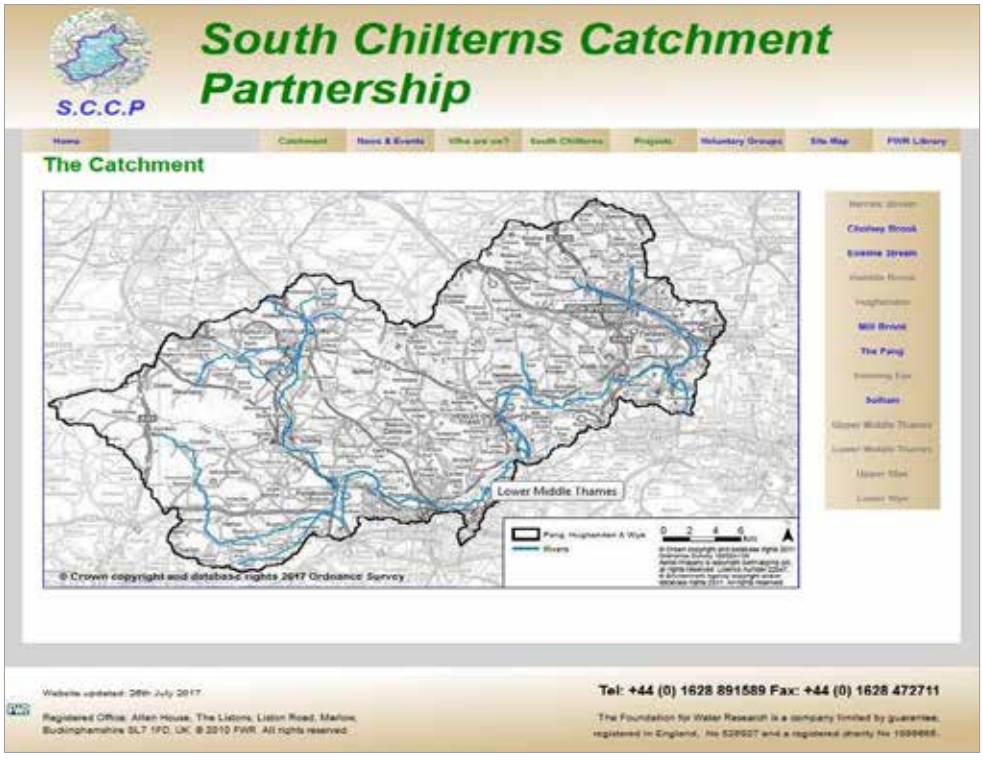
New Website

Neil Tytler, *FWR*

The South Chilterns Catchment Partnership (SCCP) are pleased to announce the launch of a new, updated catchment website which has the dedicated web address:

www.southchilternscatchmentpartnership.org

The site will go live from 16 September 2017. It achieves two main objectives. Firstly, to express in a web-based format an outline Catchment Plan of actions and measures within the catchment to improve the aquatic environment including activities that address the Water Framework Directive's (WFD) objectives. The site has been developed by FWR as the host, from comments and suggestions made by various members of the partnership. Secondly, it is a 'living' site that will continually evolve as circumstances within the catchment develop. It will be updated, providing a reservoir of knowledge on the catchment and its issues, the work of the partnership, projects, and the objectives and aims of the WFD itself.



An interactive map of the catchment forms the Home page. Moving the cursor over the map, the names of each of the 13 water bodies within the catchment are revealed. Clicking on the name takes you to that water body providing you with background facts relating to that area and its environs along with the Environment Agency's WFD classification (both chemical and ecological). Further interrogation takes you to a map showing the locations of potential projects that would help to improve the water course. At present these are suggestions and the list is by no means exhaustive; it will be up to the partnership to consider and draw up a shortlist for further development into fully costed projects for which contributions will be sought from a variety of possible funders. This essentially forms the Catchment Action Plan. Clicking on any of the proposed project buttons shows details of that project.

A short introduction to the history of the partnership and their vision is provided, including a list of the participants within the SCCP. A 'News and Events' area highlights events and topics relating to the partnership. 'Who are we?' details the individual partner representatives on the steering group and how to contact the partnership host. 'South Chilterns' leads to a number of separate pages. 'Overview' covers a number of topics including the geology of the catchment, the nature of chalk streams, agricultural practices, flood risk management plans and the overall WFD status of the catchment. Minutes of partnership meetings are also available. 'WFD' outlines the background to the Water Framework Directive and the current Catchment Based Approach.

'Voluntary Groups' provides connections to websites of groups involved in the partnership along with links to funders of previous projects. Links are also provided to the catchment hosts which adjoin the South Chilterns catchment. In addition, there is also a link to FWR covering many aspects of water (supply, wastewater, and the environment) that is freely available to all internet users. ❖

UV Disinfection Workshop - a guide to validation

May 2017 Mike Waite, *FWR Water Supply Co-ordinator*

CIWEM and the International Ultraviolet Association (IUVA) jointly organised this workshop which was, of necessity, very technical. Some of the presentations included too much information for the non-expert to assimilate although this is not a criticism of a very interesting meeting. My full report is available at:

http://www.fwr.org/drnkwatr/UVwkshp2017.htm

The introduction of UV disinfection guidelines by the Drinking Water Inspectorate from the initial 2010 revision has enabled far greater application of UV disinfection technology across the UK. This seminar reviewed the fundamental aspects of this technology and its validated application within the UK.

The meeting began with a presentation from Volker Adam (Heraeus-Noblelight) on the ***fundamentals of UV technology***, including the mode of action of UV and its advantages as a treatment process, either at 257nm which disrupts DNA for disinfection or at 180 nm for the oxidation of organics.

UV lamp (credit Hanovia UV)

Ian Mayor-Smith (IUVA & Hanovia) spoke about ***calculating UV dose/fluence*** before going on to describe a methodology for measuring fluence. The fluence (UV dose) is obtained by multiplying the fluence rate (or irradiance) by the exposure time in seconds (International Ultraviolet Association). Jutta Eggers (DVGW) then gave a ***validation overview comparing the three main standards in use:*** UVDGM (the USEPA approach), DVGW 294 (the main European standard), and ÖNORM (the Austrian standard). UVDGM provides technical information on UV but is not a regulation and has no legal status, whereas DVGW 294 contains requirements which are legally binding at least in Germany, and provides certification which involves regular surveillance of equipment production sites to ensure continued conformity. Certificates are valid for five years. DVGW itself is an organisation which has many other roles beyond UV validation. Reactor validation by DVGW involves technical testing by the examination of documentation and characterisation of components, and also performance testing both at bench and full scale.

Karl-Heinz Schön (DVGW) described the ***critical components of reactor functionality.*** The control cabinet must trigger shutdown of the reactor in the event of lamp or sleeve failure or overheating, and only permit flow if irradiance, flow and operation of lamps and ballasts are satisfactory. It must also warn if irradiance is getting low for a certain amount of time. In addition, it should compare readings from duty and reference sensors. Disinfection efficiency may decrease due to fouling of sleeves and ageing of components; low pressure lamps are also affected by water temperature. Fouling of sensors can also be important and consequently they must be accessible for cleaning.

Christy White (MWH) described ***validation approaches and challenges with wastewater and storm water in the UK,*** referring to the results of UKWIR project WW17. Without any disinfection, final effluent after dilution with the receiving water may contain around 104 *E.coli*/100ml – bathing water targets are 80 *E.coli*/100ml and shellfish targets are 110/100ml. Treated sewage from 9 million PE (population equivalents), or about 7% of the UK population, requires disinfection before discharge. The UKWIR study looked at company data and concluded that in many cases there was an overachievement of dose and the need for a UV/dose relationship, more effective dose control and site-specific data to set the desired inactivation level.

Finally, Chris Rockey (South West Water) gave a ***West Country perspective on UV disinfection systems for public drinking water.*** South West Water installed its first UV treatment plant in 1993. The 2000 Water Quality regulations made it a criminal offence not to adequately treat and disinfect drinking water. The company has many good quality groundwater sources which, in a lot of cases, rely solely on UV and have no contact tanks for chlorination. The company is continuing to retrofit additional UV plant.

See some of the presentations here: *http://www.ciwem.org/events/ultraviolet-disinfection-workshop-a-guide-to-validation/* ❖

WRc Innovation Day

April 2017 Mike Waite, *FWR Water Supply Co-ordinator*

WRc's 5th Innovation Day attracted over 200 delegates and exhibitors. Once again I was pleased to attend and found the event to be a great success. With 49 exhibitor stands and only a one-hour lunch break to visit them, it was impossible to assimilate all that was on show and it would be unfair to pick out any particular exhibit.

Gavin Esler opens the day (credit WRc plc)

After a welcome from WRc's CEO, Mark Smith, the proceedings started with a fascinating and polished talk on ***trust and business in a suspicious century*** by Gavin Esler. He made many references to his experiences as a TV news presenter from meetings with presidents, authors, musicians, and Dolly Parton! His main point was that institutions and politicians can no longer rely on being trusted. Andrew Hunt (Commercial Director WRc) spoke about ***relationship constants during times of change.*** He gave examples of how easy it was for trust to be lost, quoting as examples the discovery of benzene in Perrier Water in 1992, the finding of lead in the Flint (Michigan, USA) water supply in 2014, and the demise of the Ratner jewellery business in the early 1990s. He quoted that 'trust is gained in drops but lost in buckets' and outlined the evolution of WRc over the past 90 years. He pointed out that customers often demand cutting-edge innovative technology but demand also that it be tried and tested. The bankruptcy of Kodak in 2012 showed the consequences of failure to recognise changing circumstances and innovate accordingly.

The morning session ended with a presentation by Sonia Home (Chief Executive C-me) on ***one size doesn't fit all – actively building authentic relationships.*** She said that brand loyalty was diminishing and selling was becoming more and more based on image rather than product. She stressed that organisations and companies need to understand the customers' needs in order to deliver. It is not sufficient to have a good product without a good team. A good team needs a balance of strengths and should not be the result of hiring staff in one's own image.

The afternoon began with 11 short five-minute presentations on WRc 'Hot Topics'. These covered a wide range and the visual aids used by presenters can be found here: *(http://www. wrcplc. co. uk/Data/Sites/1/media/Speakers/technical-showcase-presentations. pdf)*

A choice of three workshops rounded off the day: ***Innovating in a Post-Brexit Britain, Is Procurement a Barrier or Lever to Innovation?*** and ***How to use Relationships as a means to Reducing Risk in Innovation.*** I participated in the first of these which set out to draft a letter to send to the Prime Minister on behalf of the water and gas industries, exhorting her to ensure that standards are not lowered and the environment remains well protected. See: *http://www. wrcplc. co. uk/Data/Sites/1/media/pdfs/general/Brexit_Working_Group_Letter. pdf* ❖

WASTEWATER Conference Round-up

Steve Bungay, *FWR Wastewater Section Co-ordinator*

The conference circuit has been packed since the last newsletter. In April, Aqua Enviro organised *Strippers & Scrubbers – the fight for nitrogen recovery, recycling and removal.*

The conference investigated options for managing nitrogen/ammonium arising from anaerobic digestion, whether via recovery, recycling or removal techniques. There was a good mix of presentations with Kristy Blakeborough-Wesson from Secanim Ltd setting the scene, detailing the current requirement for nitrogen within the UK agricultural market. There then followed a series of presentations on various recovery technologies.

Utility Live – Steve Bungay (Helix ECL and FWR) and Niki Roach (Uros Consulting) attended here in May, giving a joint presentation on the challenges and opportunities of Ofwat's proposed deregulation of the sludge market. Their session 'Opening the bio-resources market' also included presentations from Alison Fergusson (Ofwat), and Rob Harvey (Severn Trent Water).

July was a busy month, with **The Big Phosphorus Conference, Wastewater & Sewage Treatment Expo,** and **Sludgetech**. The Big Phosphorus Conference was held over two days, presenting the findings from the UKWIR National Phosphorus Trials. It brought together experts in the field of phosphorus, technology suppliers and operators. Pete Vale from Severn Trent Water opened the conference. His presentation ***The National Phosphorus Trial – A collaborative programme towards low phosphorus levels*** (see lead article) introduced the low P trials. The conference also covered removal, control and monitoring, technology, catchment control, operational experience, struvite and biochar, and recovery.

The following day saw the Wastewater & Sewage Treatment Expo which was co-located with the UK AD & Biogas and World Biogas Expo. I presented an update from Utility Live, with my presentation ***Sludge Deregulation – Challenges and Opportunities,*** demonstrating that Ofwat's proposed deregulation of the sludge market is not going to offer any cost savings to water company customers. Cross-boundary trading is the only real opportunity that could offer any savings. A separated sludge business will not only prevent economic savings that could be made from optimising the overall treatment network, but will also facilitate the transfer of 'savings/profits' to the non-regulated business of the water companies. In addition, due to the disparity in the cost of complying with environmental regulations (the Sludge Use in Agriculture Regulations vs the Environmental Permitting Regulations), there is no incentive for the commercial sector to enter the deregulated water company sludge market. Matt Taylor, Organics Technical Manager at Aqua Enviro, echoed this message. His presentation ***Increased competition in sludge markets – what difference will it make?*** highlighted that the challenges significantly outweigh the opportunities. Ultimately, deregulating the sludge market will fail to achieve Ofwat's desired reduction in customer water bills, a message that, in my opinion, is currently not getting through to Ofwat.

Almost immediately after Utility Live, and now in its third year, Sludgetech has grown substantially. At **Sludgetech 2017: IWA Specialist Conference on Sludge Management**, there were 320 attendees from every corner of the globe, and the event ran over five days, with a number of workshop sessions, two days of conference presentations, plus site visits to Crossness, Reading, and Basingstoke WwTWs. The opening address was given by the founder of the conference, Dr Nick Mills (Thames Water); the conference then split into parallel sessions covering anaerobic digestion and sludge pre-treatment; material and nutrient recovery; dewatering, recycling, policy and contaminants; thermal conversion and biochar/ash; optimisation of existing assets; anaerobic digestion of other wastes; and developing countries and small scale. In addition to the busy technical schedule, the event included a spectacular and inspirational conference dinner at the Science Museum. ❖

The Lockheed 10A Electra NC5171N aircraft above the diners at the Science Museum

Wastewater Innovation Forum Summer Meeting

The forum continues to focus on four key areas of research

- microplastics
- the Chemical Investigations Programme
- antimicrobial resistance (AMR)
- unflushables.

These are emerging challenges to the integrated management of wastewater systems and water quality. As well as these areas of key interest, the forum is always looking to showcase innovative technologies.

Tom Stanton, a research student from the University of Nottingham, presented ***Sources, pathways and receptors of microplastic pollution in the UK*** which considered the role of atmospheric and freshwater environments in the UK as sources of microplastic pollution and pathways for their transport to the marine environment, as well as how biotic and abiotic factors intercept this transport. Tom's talk was a great follow-on from Alice Horton's presentation at our last meeting, and highlights that microplastics is still very much an emerging environmental problem. Pratik Desai, a research associate from the University of Sheffield and the Research & Innovations manager at Perlemax Ltd, presented his research ***Hot microbubble injection in thin layers for ammonia – water separations***, which is based on increasing the regeneration performance of the liquid catholyte via microbubbles and plasma activation. This involves using a fluidic oscillator to generate microbubbles for the stripping of ammonia via Microbubble Mediated Ammonia Recovery Processes (MMARP), potentially recovering ammonia as a pure product. Pratik's talk was a good contrast to Tom's presentation, showcasing an innovative technology in wastewater treatment. Both presentations are available at *http://www.fwr.org/wransom1.html* along with an archive of presentations from past meetings.

Following recent presentations at the forum, FWR are producing a new ROCK (Review of Current Knowledge) for microplastics, and are looking at the possibility of producing one covering antimicrobial resistance. The date of our next meeting is Wednesday 18 October 2017 at CIWEM's HQ. In the meantime you can keep up to date with the forum's activities at *@F4WaterResearch*. ❖

the information centre for water, wastewater and related environmental issues

Caryll Stephen
Chief Executive, FWR

FWR activities

Another summer is now starting to draw to a close. Weather-wise it has been fairly quiet for a couple of months, but as you will have read throughout the newsletter, we have been busy. However, it turned out to be the hottest June day for over 40 years when FWR received a further delegation from China!

We are delighted to include the lead article on phosphorus in fresh waters and a special thank-you goes to Pete Vale (Severn Trent Water) and Simon Leaf (Environment Agency) for this excellent read. The South Chilterns Catchment Partnership area of the website has undergone a complete revamp and is now being launched with an independent web address in addition to appearing on our site. We encourage readers to try it out and let us have any comments, which we can then pass to the partnership.

We have been present at various events over the past few months, which have included a couple of summer festivals, as you can see below. The next quarter will see new Reviews of Current Knowledge in the pipeline plus visits to various appropriate conferences.

As always, thanks very much to our contributors!

The Industry Cleaning Association of China

We were very pleased to welcome a delegation of 25 people to hear our presentations on the Water Framework Directive plus some information on waste treatment. Not only this, but they also managed to experience that rare phenomenon, a British heatwave, and the hottest June day since that memorable summer of 1976!

FWR Out & About

Crick Boat Show (May)

Institute of Water Annual Conference, Manchester (June)

George Best's mini at the National Football Museum

New Forest & Hampshire County Show (July)

Design Agency - http://www.connellmarketing.com

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