The Journal of the Water Management Society

THE WATER MANAGEMENT SOCIETY

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waterline

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Review or not to review?
A risk assessment story

A Rose by Any Other Name

Risk Assessment challenges,
feedback and personal opinions of various end-users

PLUS

- Effect of sample pH on the identification of an NRB in Closed Hot and Cold Water Systems
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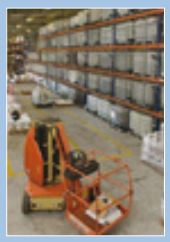


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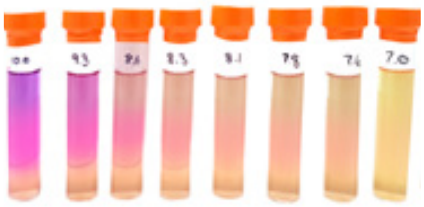

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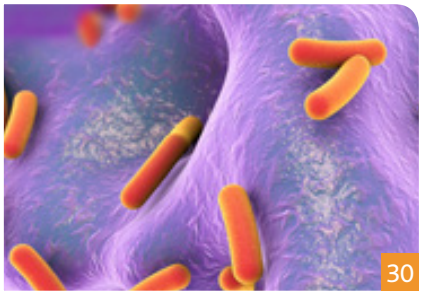

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PipeLine

in memory of Sue Pipe, former Waterline editor

Sue Pipe

It is with deep sadness that we report the dreadful news that Sue Pipe died on Monday 16th December 2019. She passed away peacefully in hospital. One of the Water Management Society's foremost guardians has left us.

Not only was Sue the Editor of the Waterline Journal contributing with her regular 'Pipeline' articles, she ran the WMSoc secretariat function from its beginning as the Cooling Water Association, taking over from her father. The society would not have made it past the 1980's without her as it's guiding light. She was the rock on which the society was built. Sue did everything with a great deal of enthusiasm and wisdom, coupled with a sense of humour.

She was appointed as Company Secretary onto WMSoc Council in 2011 and was part of many sub committees over the years including Membership, Technical and Training. Sue was the most genuine, incredibly welcoming, organised and supportive person you could ever wish to meet, and her positive impact on the society's many fields will be sadly missed.

Sue was a major support to the WMSoc (and the LCA). She will be missed as the conscience of the Council and Committee meetings keeping everybody on the right path. A stalwart of our Society, totally dedicated to the Water Management Society and Waterline, she will be dearly missed. We have lost not only someone we respected enormously, but also a very good friend.

Letter to the Editor

Dear Editor

Some might call me an old salt in the water treatment industry, but I certainly don't feel like one and while, I may know quite a bit, there is even more that I don't know or have never experienced. Every day is a school day and I urge my colleagues and competitors to also strive to become more competent (an overused and misunderstood word these days) through experience, training and learning from others and keeping an open mind when new situations or problems are encountered.

I am increasingly finding that clients and service providers are becoming focussed on a quick fix to most issues encountered. Typical process - "What's the problem? Here's a quote. Can I have the order please?" Don't get me wrong that approach is often appropriate but too often a quick fix is the preferred solution when a bit of time to investigate is what is really needed. There seems to be a couple of barriers to the proper investigation - one is a lack of people with the appropriate competence and confidence to conduct the investigation. Another is commercial and contractual pressures where the "who is paying for it?" questions seem to dominate.

*All of us in the industry, myself included, would do well to remember in this compliance and financially driven age our ultimate goal is to make water treatment and water systems **safer** for the people that use or work at those facilities using our products or services. We also need to be mindful of the fragile nature of our planet and be responsible in minimising the impact of all that we are involved with on the environment.*

The focus must become more leadership focussed. By leadership I mean a water treatment professional leading the client to the right and safest solution without incurring excessive cost. I appreciate we will all draw the excessive line in a different place, but I think all members of the society will know roughly where to draw the line.

Leadership is difficult, it may involve disagreement, conflict and pain but if it is done with integrity, technical competence and good old fashioned common sense then the water systems will be safer for everyone and we can, as water treatment professionals, do our tiny bit to help preserve our planet.

One final thought, when I started in water treatment in 1990 my boss Derick (who was excellent by the way and instilled my passion for water treatment into me) said always make friends with your customers. I looked for definitions of friendship online and found the following:

Friendship -

- *A state of mutual trust and support*
- *True friendship is when someone knows you better than yourself and takes a position in your best interests in a crisis*

So, nothing has changed in 30 years really and I don't think it ever will.

Best Wishes for a healthy, happy and prosperous 2020 and RIP Sue Pipe who did so much for the Society over such a long period of time and was a friend to so many people.

- Stuart Nixon

GRIME SCENE

Flexible Hose?

This hose was fitted on a wash hand basin in Valletta, Malta.

So much for quality plumbing (and tiling for that matter!)

Sent in by Ian E Kershaw.

GET INVOLVED: Can you beat this grime?

Submit your photos & captions to the Waterline email address:

waterline@wmsoc.org.uk

UKAS SERVICE IMPROVEMENT UPDATE
October 2019

UKAS recently announced some important changes we are making to improve the service we provide. All allocated Assessment Managers and Customer Liaison Officers will remain the same and the central point of contact, but to support their efforts, we have made the following changes:

A Dedicated Post-Visit Administration Team
We have created a dedicated Post-Visit Administration Team (PVAT) that will focus on ensuring that assessment reports and improvement actions are issued promptly. They will facilitate the closing of improvement actions by tracking the submission of evidence and allocating time for our assessors to review evidence.

Dedicated Witnessed Assessment Co-ordinators
Witnessed assessments are a vital element of the UKAS Assessment programme. As such we have appointed dedicated Witness Co-ordinators who will work closely with customers to find suitable witnessed assessment opportunities, in close liaison with the existing allocated Assessment Manager and Customer Liaison Officer.

Planning Visit Dates 12 months in Advance
To help our customers plan for UKAS visits, our Assessment teams will now discuss visit dates for the following year during the assessment, and agree dates for future assessments wherever possible. This is particularly in relation to surveillance and reassessment visits.

We are confident that these changes will help us improve our service to our customers and better plan for our visits. If you have any queries, please contact: *info@ukas.com*

SAVE THE DATE!

THE WATER MANAGEMENT SOCIETY

WMSoc One Day Conference
25th March 2020 - Manchester Conference Centre

bsi. Updates

BSI: EH/3/2 'Physical, chemical and biochemical methods' meeting was held on 17th September 2019. It was agreed that there is a need to revise BS 1427:2009 "Guide to on-site test methods for the analysis of waters". This will be followed up at the next committee meeting held in January/ February 2020 further to the completion of all the actions from the ISO international meeting in Tokyo.

BSI: EH/3/4 Meeting Update by webex 11/12/19

National Work

BS 8680 'Water Safety Planning in Buildings – Code of Practice' is available as a draft for public comment until 19th January 2020. All WMSoc members were sent a link in November 2019 and were encouraged to give their feedback.

International work - ISO/TC 147

Reports were presented after meetings in Tokyo, Japan, 14-19th Oct 2019 with a number of actions to be followed up.

Review or not to review?

A risk assessment story

Colin Shekleton

It only seems like yesterday that the fourth edition of the Approved Code of Practice (ACOP) and guidance on regulations L8 and its associated guidance and technical guidance was updated and published. Yet it was back in 2013, so we have been using, referring and applying the updated guidance for six years now!

Compared to the third edition, the 2014 updated version had separate technical guidance's in the guise of HSG274 parts 1: The control of legionella bacteria in evaporative cooling systems, parts 2: The control of legionella bacteria in hot and cold water systems and part 3: The control of legionella bacteria in other risk systems.

Since its inception, the ACOP has provided advice on the requirements of the Health and Safety at Work etc. Act 1974 along with the Control of Substances Hazardous to Health Regulations 2002, in addition to giving guidance with the relevant parts of the Management of Health and Safety at work Regulations 1999.

The ACOP and HSG274 documents, as well as providing advice on how to comply with those aspects of the law, also provides sound and clear, albeit basic, technical information on various water systems types and their operation. In addition there was some specific guidance given for healthcare premises, and also for shared premises and residential accommodation when it was updated.

To further aid us, we have the recently updated BS8580-1:2019; Water quality – Risk assessments for *legionella* – Code of Practice. For more specialists systems, since 2017, we have had HSG282; The control of legionella and other infectious agents in spa-pool systems, and not forgetting the Department of Health's; Health Technical Memorandum (HTM) 04-01: Safe water in healthcare premises (parts a, b, c 2016 and supplement 2017). There are a plethora of other associated British Standards which are too numerous to mention. We are probably not lacking guidance or advice when it comes to this subject matter!

In terms of how to control the risk of exposure to legionella bacteria, little has changed from the first large outbreak in England and Wales which occurred at Kingston Hospital in Surrey between December 1979 and July 1980 (just 7 years after the author of this paper was born in that very establishment!). The principles of control that were eventually applied at Kingston 40 years ago still work today and therefore still apply. Of course there have been some detail changes, including the evidence and appraisal approach of when to clean a cooling tower packing, or the consideration of hot water circulation in far more detail by means of identifying principal, sub-ordinate or tertiary hot water circulating loops (to name only two examples).

As someone who carries out legionella risk assessments on a regular basis, the above documents and the technical information therein has been hugely useful over the years. In the opinion of this humble risk assessor, one of the most significant changes was the removal of the 2 year frequency for reviewing legionella risk assessments. The industry seemed to "hang their coat" on this 2 year period, yet the wording "at least every two years" only ever appeared in the guidance part of the previous L8, not in the ACOP part! Even today we still get questions about when to review the risk assessment from end-users and Duty Holders. I do understand this frustration, as Duty Holders are usually very busy people with lots to consider, not just water. They say "just tell me how often I need to do the risk assessment!" unfortunately in the world of risk, and its assessment, this is not straightforward, there are just too many variables at play to give a single answer to this complex question. Whilst it may be a complex question, the principle behind the answer is actually quite straightforward, and again the ACOP gives us some well-defined advice on how to decide on when to carry out a review. Before analysing this advice let's consider a scenario where a 2 year risk assessment frequency may be in-appropriate:

We begin with two buildings, of equivalent size and age, located on the same road. The surrounding area has commercial, retail and residential properties, along with a medium sized hospital within 2 km of the properties in question.

In property "A" we have a web development company where the average age of employee is 29. The workspace is predominantly desks and work-stations, along with a break-out meeting area. The water services include an incoming mains supplying a communal WC area, a kitchenette and a small electric water heater which provides all the hot water.

In property "B" we have an engineering company where the average age of the employee is 52. The workspace is predominantly desks, with a small manufacturing area set aside for proto-typing one-off components. The domestic water services present are similar to building "A", but in addition the manufacturing process requires that heat must be rejected, so a small, open circuit, evaporative cooling tower is located at the rear of the building exhausting to atmosphere.

Whilst the buildings in either scenario themselves are largely similar in size, the inherent risks associated with the systems described above are intrinsically very different, as is the potential for exposure to legionella bacteria, due to the presence of the cooling tower. In property "A" a suitable risk assessment frequency may be every 2 years, or perhaps longer than 2 years…? Yet in property "B", 2 years between assessments may be too long, given the inherent and potential residual risks at play.

In other words a risk based approach should be considered when attempting to define a recommended frequency for review.

The ACOP and Guidance states the following:

ACOP L8 Para 32: "You need to review the assessment regularly and specifically when there is reason to believe that the original risk assessment may no longer be valid."

There is a potentially tricky word in that quote: "regularly". When you look up the definition of the word "regularly", you see explanation examples that use words such as "frequently" or "often". Neither of these words are especially helpful, if you take the time to look up the meaning of "frequently" or "often", you would find the word "regularly" is used as their primary definition, and hence we go round in circles! Another word that does come up in a definition search of "regularly" is "uniform". In the context of "uniform intervals", this is probably more useful

to us. We therefore conclude that "regularly" could mean:

- Every 2 years, or
- Every 4 years, or
- Every 3 months… etc.

Whilst all of the above are "uniform" and hence "regular", are they sufficient in the context of a legionella risk assessment? Well that depends...

It is of course reasonable, and indeed useful, to define a frequency of when next to review the risk assessment. However, as in life, things often change, and hence the risk may also be affected. As the "record of assessment is a living document that must be reviewed to ensure it remains up-to-date" a review should be considered. Yet again we can turn to ACOP L8 for assistance in this:

Within guidance of ACOP L8, specifically para 47 it states:

"An indication of when to review the assessment and what to consider should be recorded. This may result from, e.g.:

(a) changes to the water system or its use;
(b) changes to the use of the building in which the water system is installed;
(c) the availability of new information about risks or control measures;
(d) the results of checks indicating that control measures are no longer effective;
(e) changes to key personnel;
(f) a case of legionnaires' disease/ legionellosis associated with the system."

So whilst we may define a uniform, or "regular" frequency of risk assessment review, should something change (as defined above) then we should consider the impact this has to the inherent and residual risks, and we achieve this by reviewing the risk assessment. It should be noted that such a decision to review the assessment overrides the suggested timeframe frequency previously defined.

Such a review may be very simple and require just a small adjustment to documentation, perhaps such as a water outlet becoming little used due to a space being vacated. So we ask questions such as:

- Do we need the outlet, can it be removed?
- What impact does the lack of use of the outlet have on the rest of the water system? i.e. is it fed from a cold water storage tank that is now oversized?
- Is the water hygiene regime appropriate? The outlet should be flushed at a suitable frequency (HSG 274 table 2.1 suggests weekly, or as indicated by the risk assessment)

Likewise such a review may be much more involved, due to the addition of complex risk systems. Large parts of the entire document may need to be re-written.

As is so often the case much of this interpretation, and hence decision making process is reliant on the competence of the individuals concerned. Someone with the appropriate skills, knowledge, ability, training and experience will understand the need to establish what has changed so that they can make an informed decision on when to review and what is sufficient in terms of what that review may require.
Ultimately a decision must be made by those who are competent and understand the systems and the risks.

Summary

Every scenario is different, even if buildings are identical, the people within them and the usage may not be. Hence the frequency of review may be different. The ACOP is well written and does give useful advice in this aspect.

Whilst having a date in the diary to review a risk assessment is undoubtedly useful, a better measure on when a risk assessment should be reviewed is considering the validity of the current risk. So, instead of asking "when is the risk assessment due?", perhaps we should ask "is the risk assessment still valid?". This is a different mind-set, but is one that we should all work together with end-users to convey.

Happy Risk Assessing.

GAIN A CPD POINT BY ANSWERING THESE QUESTIONS ON THIS ARTICLE

Q1: Who should decide the frequency of when to review a legionella risk assessment?

Q2: What results might we have to indicate that the control measures are no longer effective?

Q3: How far should the risk assessment go in recommending a review frequency?

EMAIL YOUR ANSWERS IN TO ADMIN@WMSOC.ORG.UK TO GAIN YOUR CPD POINT

The answers will be published in the Spring 2020 edition. Extra CPD points will be awarded to members who provide extra research and/or evidence and to those members whose answers are accepted for publication in Waterline.

1 cpd point

NEW members

Since the last edition of Waterline was printed the WMSoc has received 27 new membership applications from the following sectors of the industry:
Water Hygiene – 7, **Water Treatment** – 8, **Facilities Management** – 1, **Local Authority** – 2, **Manufacturer** – 3, **Consultancy** – 1, **Laboratory** – 1, **Other** – 4.

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NEWS FROM THE WHOLE FIELD OF WATER AND ITS EFFECTIVE MANAGEMENT

Nous avons un problème avec nos stations de ski

French ski resorts are having to spend millions of Euros reinforcing cable car supports and other structures being weakened by subsidence as climate change causes the permafrost that cements them in place to melt.

Chamonix has spent €1.4 million shoring up cable car supports in 2019. Les Deux Alpes and Val Thorens have also had to reinforce structures.

Concern is growing for the future of France's lucrative ski industry, and resorts facing shrinking glaciers and diminishing snow cover are struggling to preserve the fragile Alpine environment from the consequences of pollution.

Chamonix has been forced to shore up its Bochard cable car supports by consolidating the ground and rebuilding stronger foundations. It is now lobbying the authorities to restrict the number of cars allowed into the Chamonix Valley in an effort to cut pollution.

A recent survey of 947 resort structures built on permafrost found that 45 ski lifts, 6 shelters and 1 tunnel were at high risk of destabilisation.

Cleared fatbergs lift flooding threat

Two huge fatbergs together weighing almost 100 tonnes and threatening to cause floods in homes and businesses over Christmas have been cleared from sewers in central London.

Thames Water said a fatberg weighing 63 tonnes was cleared from a Pall Mall sewer after being broken up by engineers with power tools and by hand.

Another weighing 30 tonnes and stretching 70 metres was removed from the sewers of Cathedral Street, near the Shard.

The two fatbergs were threatening to cause wastewater flooding over the festive period, the water supplier said.

Fatbergs are formed when fat, oil and grease are poured down sinks and drains and combine with items that should not be flushed down the toilet, such as wet wipes, nappies and cotton buds. Thames Water asked people not to "feed the fatberg" over Christmas, saying the two discoveries served as a timely reminder about the importance of properly disposing of cooking fat.

Toilet paper getting less sustainable

The growing trend for "luxury" four-ply and quilted toilet rolls is fuelling the increasing use of virgin wood pulp. Toilet paper - the one product that the majority of us use just once and flush away – is becoming less sustainable, according to research. Analysis from Ethical Consumer magazine found that major brands were using less recycled paper than in 2011, while only five of the nine major supermarkets (the Co-op, Morrisons, Sainsbury's, Tesco and Waitrose) offered an own-brand recycled toilet paper.

The UK uses 1.3m tonnes of tissue a year, according to the Confederation of Paper Industries, with the average British consumer reportedly getting through 127 rolls every year.

"There is no need to cut down forests to make toilet roll, yet this is precisely what is happening," said Alex Crumbie, a researcher for Ethical Consumer. The new research flags to consumers that the chemicals used in the production of recycled paper are far less toxic than those used to bleach virgin pulp. It also warns consumers to be wary of thinking an FSC label on toilet roll is enough to ease their conscience. Most toilet rolls use the FSC Mix mark. This means the paper is made from a mix of FSC virgin wood, recycled, and virgin wood from "controlled sources". These are not fully certified FSC forests, but are considered low risk.

The study recommends that consumers purchase the following brands: Ecoleaf, Essential, Traidcraft or Who Gives A Crap (the recycled paper version).

"Only around 30% of the world's population uses toilet roll," Crumbie added, "so we know that there are lots of perfectly hygienic alternatives to using paper-based products. It's important we consider what we're using to wipe our behinds with, because at the moment our precious planet is getting a bum deal."

SOS in a bottle saves family

A family of three who got stuck on a raging waterfall were rescued after floating an SOS message in a bottle down a river. Curtis Whitson, his girlfriend, and his 13-year-old son were on a backpacking trip in central California this summer. Their plan was to follow the Arroyo Seco river through a canyon until they reached the waterfall. At the waterfall, they would shimmy down a rope and carry on their journey to a campsite.

On day three of the hike however, the family found themselves stranded in a narrow part of the canyon where the walls were 40ft (15m) high on either side. The rope Mr Whitson expected to be there wasn't, meaning they couldn't climb down or out. To make matters worse, the waterfall was flowing too fast for them to enter.

"My heart sank when I realised the volume of water was just too dangerous to make rappelling down possible," Mr Whitson said. With no phone signal or "a single soul" in sight, he concocted a plan. He wrote a note on a bar order slip that his girlfriend, Krystal Ramirez, had brought to keep game scores: "We are stuck here at the waterfall. Get help please," the note read. Then he put the note in a green water bottle and carved "help" into the side before throwing the bottle into the water. "With one lucky toss, it went right over the waterfall," he said.

The note was found around 400m down-river by two hikers, who raised the alarm. A rescue crew found the family around midnight, just hours after hikers found the floating message. "They were really out of options if they hadn't gotten the message out that way, it might've been a while," Todd Brethour, of the California Highway Patrol, said.

Hydro-power protects rare Bible collection from flooding and damp

An innovative hydropower scheme is set to protect one of the most important books in Welsh history from the effects of climate change. It has been installed at Ty Mawr Wybrnant in Snowdonia, which houses a collection of over 200 rare Bibles, including the first Welsh translation. Increased rainfall and damp are affecting the manuscripts. Now the plan is to use electricity generated from a stream near the property to control humidity levels.

The 16th Century farmhouse was the birthplace of Bishop William Morgan, whose translation of the Bible into Welsh in 1588 has been described as the most significant step in ensuring the survival of the language today. Visitors can see one of the last remaining copies at the property, which is now managed by the National Trust.

The entire collection is susceptible to moisture and the trust said the farmhouse was feeling the effects of more persistent, heavier rainfall and what it described as the "worst flood in living memory" earlier this year.

Working with researchers at Bangor University and Trinity College Dublin, the trust has placed a small water pump on a stream near the property. The 4.5kW so-called "pico" hydro has been designed to allow the site to be heated as sustainably as possible.

"The hydro will only borrow a certain percentage of water from the stream once the water levels reach a certain point," explained Keith Jones, the National Trust's climate change advisor. "This means we are generating electricity when we most need it, when there's more moisture in the air after rainfall. The energy is consumed directly onsite, solely for the conservation of this priceless Bible collection."

Monster trawler plundering the seas

The Margiris, a super-trawler 14 times the size of UK fishing boats, and part of a larger "freezer fleet" owned by a Dutch company, caught over 1,600 tonnes of fish from a Marine Conservation Zone in British waters in one visit. It was boarded by UK officials who found it to be operating legally under European law.

However, environmentalists fear that it could be endangering short-beaked common dolphins and Bluefin tuna. The ship – described as a vast floating fishing factory that can net and process 250 tonnes of fish per day – has been the target of several campaigns, culminating in its banning from all Australian waters.

Greenpeace commented: "The owners claimed there was zero bycatch. This claim has been challenged by local fishermen, politicians and conservation groups, who have expressed serious concerns about how a ship of this size can operate sustainably in UK waters.

Under the common fisheries policy set out by the European Commission, each EU country is given a quota of fish it can catch in European waters. Each country then divides that quota between vessels, allocating set catch sizes along with documentation in the event of an inspection.

A company spokesman said it was behaving perfectly legally in European waters and denied that its fishing techniques threatened endangered species.

A European Commission official said: "The commission is aware of concerns among non-governmental organisations, concerning the activity of large trawlers. All vessels operating in EU waters have to abide by the rules and this is controlled by the member states' inspection and control services. It is a priority that all union vessels comply with the legislation in force."

In October an Isle of Wight resident started a petition to ban super trawlers from fishing in UK waters, with 20,000 signatures in the first week.

Sperm whale dies with 100 kg plastic in its stomach

A sperm whale which died after it became stranded on the Isle of Harris in Scotland's Outer Hebrides had a "huge ball" of marine debris in its stomach.

Whale experts said that while it was not immediately clear whether the debris had contributed to the whale's death, it undoubtedly highlighted the wider problem of marine pollution.

Members of the Scottish Marine Animal Stranding Scheme (SMASS), an organisation that investigates the deaths of whales and dolphins, dissected the whale to try to determine its cause of death.

According to a post on the group's Facebook page, they discovered "approximately 100kg of marine debris - a whole range of plastic including sections of net, bundles of rope, plastic cups, bags, gloves, packing straps and tubing."

SMASS described the amount of plastic as "horrific", adding that it "serves to demonstrate, yet again, the hazards that marine litter and lost or discarded fishing gear can cause to marine life. It is also perhaps a good example that this is a global issue caused by a whole host of human activities."

The group said the 20-tonne animal was buried on site at Luskentyre beach on Harris.

Scientists confirm long-held suspicions

It's long been suspected that thinning in the ring of floating ice around Antarctica is driving mass loss from the interior of the continent. Now a new study finds the diminishing thickness of ice shelves is matched almost exactly by an acceleration in the glaciers feeding in behind them. What's more, the linkage is immediate.

It means we can't rely on a lag in the system to delay the rise in sea-levels as shelves melt in a warmer world. The glaciers will speed up in tandem, dumping their mass in the ocean. "The response is essentially instantaneous," said Prof Hilmar Gudmundsson from Northumbria University, UK. "If you thin the ice shelves today, the increase in flow of the ice upstream will increase today - not tomorrow, not in 10 or 100 years from now; it will happen immediately," he told BBC News.

The edge of Antarctica is bounded by thick platforms of floating ice. These "shelves" have formed as the continent's many glaciers have drained off the land into the sea. On entering the water, their buoyant ice fronts have lifted and joined together to form a single protrusion. But these shelves are being besieged by the invasion of warm ocean water that's now eating their undersides.

"That's a problem because the ice shelves act as a kind of architectural buttress, slowing the movement of the ice sheet behind them," explained Prof Helen Fricker, a satellite expert from the Scripps Institution of Oceanography, US.

Prof Gudmundsson put Scripps' satellite data of shelf thinning into a numerical ice sheet model to see how the land ice should respond based on the current best understanding of the physics involved. What the UK-US team found was that the predicted changes in the patterns of speed-up tallied precisely with what has been observed in the real world. What was previously just a correlation is now supported by quantifiable evidence.

Coke bottles made with plastic from the seas

Coca-Cola is using 'breakthrough technology' to make bottles from plastic retrieved from the oceans. The bottles can be made from previously low-quality marine waste plastic that has been 'upcycled' into high-quality plastic under the new process.

On 3rd October the company announced that it had produced 300 bottles made of ocean plastic as prototypes to be tested, with the intention that they can become part of the commercial supply chain.

The plastic for the bottles was scooped up from the Mediterranean. The product is the first to be made using marine plastic that has been successfully recycled for use in food and drink packaging.

The company is using a process called depolymerisation, which means lower grade plastics can be broken down and reformed, with impurities removed, to be recrafted into material for food-grade quality PET plastic. Previously, lower-grade, non-transparent and coloured plastics could not be 'upcycled' into bottles.

Angry seal busts drug smuggling ring

Australian police believe they have busted an international drug smuggling ring - with the help of an angry seal.

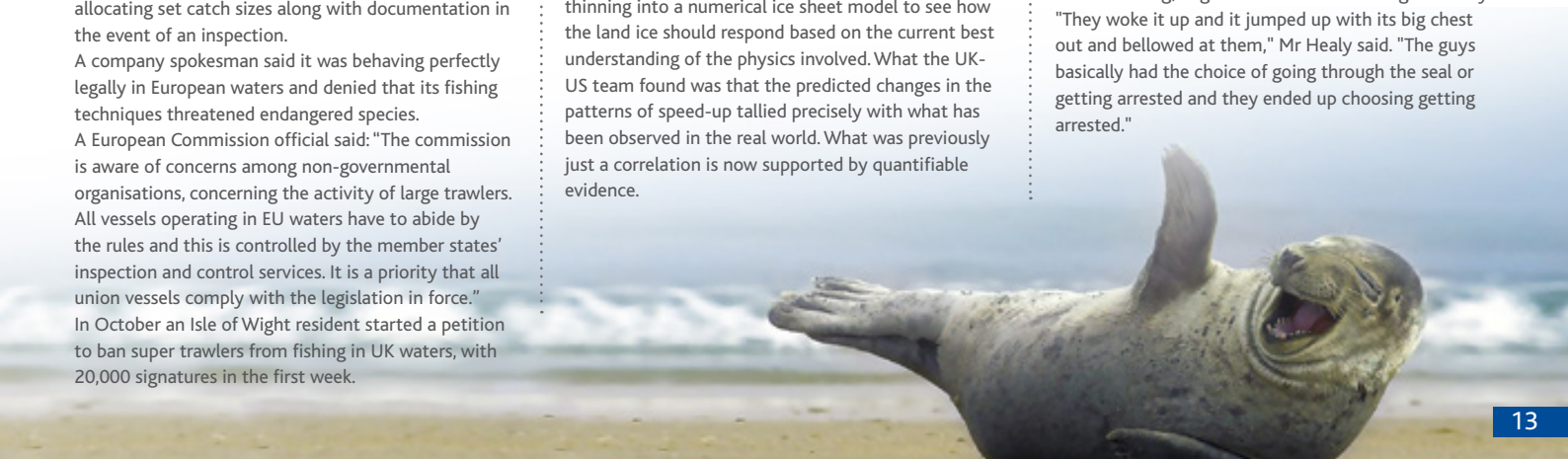
Police were first alerted to the alleged plot when a UK and French national were found hiding on an island the day after their yacht ran aground off Western Australia. Officers also discovered an estimated $688,000 (£588,000) of illicit drugs. A second Briton, an American and Australian appeared in court in connection with the haul.

Police Commissioner Chris Dawson said they were allegedly the "shore party" who were "ready to receive" the drugs. "We have disrupted a big international drug syndicate here," he added, saying officers were still working with international partners, including the UK's National Crime Agency.

However, things may have been different had the two men aboard the yacht not been prevented from escaping by a large seal. Damien Healy, Geraldton Volunteer Marine Rescue Service vice-commander, revealed how the men were spotted on an island west of the town of Geraldton a day after the yacht was found.

The suspects had reached the island with the help of an inflatable dinghy, and allegedly hidden the drugs - including cocaine, ecstasy and methamphetamine - under some seaweed. Once they realised they had been found, they made a bid to escape - only to discover a "big, huge seal" was now blocking their way.

"They woke it up and it jumped up with its big chest out and bellowed at them," Mr Healy said. "The guys basically had the choice of going through the seal or getting arrested and they ended up choosing getting arrested."



Vicious cycle: delicate wash releases more plastic microfibres

Delicate wash cycles should be avoided whenever possible, according to scientists who found they can release hundreds of thousands more plastic microfibres into the environment than standard wash cycles. Researchers at Newcastle University ran tests with full-scale machines to show that a delicate wash, which uses up to twice as much water as a standard cycle, releases on average 800,000 more microfibres than less water-hungry cycles.

"Our findings were a surprise," said Prof Grant Burgess, a marine microbiologist who led the research. "You would expect delicate washes to protect clothes and lead to less microfibres being released, but our careful studies showed that in fact it was the opposite. If you wash your clothes on a delicate wash cycle the clothes release far more plastic fibres. These are microplastics, made from polyester. They are not biodegradable and can build up in our environment."

The finding challenges the assumption that more aggressive washing cycles, which use less water, change direction more frequently and spin at higher speeds, release more fibres into wastewater. Instead, the volume of water used per wash appears to be the most important factor in dislodging fibres from clothing, the study found.

The clothing industry produces more than 42m tonnes of synthetic fibres every year. The vast majority, about 80%, are used to make polyester garments. Previous tests have found that washing synthetic items can release between 500,000 and 6m microfibres per wash. Some washing machine manufacturers are introducing microfibre filters, but Mark Kelly, the first author of the study published in Environmental Science and Technology, said avoiding delicate washes and half loads would help to reduce the amounts of microfibres released by washing.

No more "ladies" and "gents" at the Old Vic

The Old Vic theatre has scrapped its men and women toilets and replaced them with 'self-selection' facilities that can be used by both genders. The historic London theatre in Waterloo had previously promised to double the number of women's toilets to help tackle the industry-wide problem of long queues for female loos. However, instead, all male and female toilets have been replaced with cubicles or urinals, which can be used by both men and women.

Under the new system, according to critics, women would have access to 24 toilets (cubicles), which would have to be shared with men. In contrast, men will have access to 42 facilities, including urinals that only they would use. The admission sparked a raft of complaints from theatregoers on social media.

The theatre tweeted: 'After nine months we're very proud to share our newly accessible building with you, complete with a brand new entrance, a revamped Penny (restaurant), up to 10 wheelchair spaces and twice the number of loos. When you come to visit us you might notice something a little different about our new loos. First, there are double the number - 44 loos within the building. Our loos now offer 'self-selection' rather than being labelled male or female. This takes a descriptive, rather than prescriptive, approach following advice from surveys conducted with focus groups. When you arrive in the theatre, you will see labels signposting which blocks contain cubicles and which contain urinals. We also have one specifically designed gender neutral loo. You can choose which one you want to use, rather than responding to a label placed on you which you may not identify with. There will also be two roomier toilets designed for pregnant women or those with young children.'

The Old Vic's refurbishment was planned to help make it more accessible and update public spaces. Part of it was in response to repeated criticism about the long wait for loos during intervals.

Otter road-kill increasing

Dorset Wildlife Trust (DWT) has been made aware of a rising number of otter deaths in Dorset this autumn. Most deaths have occurred on roads and are thought to be due to otters resorting to using roads as recent rainfall has left them unable to swim under bridges in rivers. Small ditches and streams are also holding more water, enabling otters to move through the landscape more easily, bringing them into increased contact with roads.

In Dorset, otters are regularly seen on the river Stour, however they are mostly shy nocturnal animals and their presence is normally detected by their distinctive sweet musky smelling faeces (known as spraints) which are deposited in prominent places.

DWT is working with Dorset Police to help ensure safety for road users when an otter is found. Dorset Police advise people not to stop on dangerous bends in the dark and to consider their own safety and that of others if they find an injured otter in the road. Contact Dorset Police if it is causing a hazard to drivers. If medical assistance is needed for an injured otter, phone the RSPCA National Emergency number: *0300 1234 9999*.

For any suspicious circumstances of otter deaths, this must be also be reported to the police as a wildlife crime. Evidence of snares or home-made snares such as cable ties, an appearance of being shot, trapped or poisoned should be reported.

Saving whales better than planting trees

Climate activists would be better off trying to save whales rather than planting trees if they had to choose between those options, according to a study published by the International Monetary Fund. Great whales are the carbon-capture titans of the animal world, absorbing an average of 33 tonnes of CO_2 during their lifetime. Annually a whale captures 24 times the amount of CO_2 as compared to an average tree.

When they die, whales sink to the bottom of the ocean, keeping the carbon entombed within them. The CO_2 lies trapped for several centuries.

In addition to absorbing carbon dioxide, whales also support the production of phytoplankton, which contributes to at least 50% of all the oxygen to the Earth's atmosphere. Phytoplankton capture as much carbon dioxide as 1.7 trillion trees, or four Amazon rainforests. Whales contribute by swimming up to the surface from deep waters, their large bodies moving nutrients up and increasing the food source for the phytoplankton.

Shocking news

DNA research has revealed two entirely new species of electric eel in the Amazon basin, including one capable of delivering a record-breaking jolt. The findings are evidence, researchers say, of the incredible diversity in the Amazon rainforest – much of it still unknown to science – and illustrate why it is so important to protect a habitat at risk from deforestation, logging and fires.

"In spite of all human impact on the Amazon rainforest in the last 50 years, we can still discover giant fishes like the two new species of electric eels," said lead researcher C David de Santana, a zoologist working with the Smithsonian National Museum of Natural History. The research "indicates that an enormous amount of species are waiting to be discovered in the Amazon rainforest, many of which may harbour cures for diseases or inspire technological innovations," he said.

For centuries, it was believed that a single species of electric eel existed throughout the region known as Greater Amazonia, encompassing parts of countries including Brazil, Suriname and Guyana. But as part of a project to better understand electric eels and map wildlife in remote parts of South America, de Santana and his team decided to test that theory.

Further analysis, including DNA from 107 samples they collected, upended centuries of assumptions and revealed three species: the previously known *Electrophorus electricus*, along with *Electrophorus voltai* and *Electrophorus varii*. And their research also uncovered another stunning result: *E. voltai* is capable of delivering a jolt of 860 volts – much more than the 650 volts previously recorded from electric eels.

The findings, published on Tuesday in the journal Nature Communications, theorise that the three species evolved from a shared ancestor millions of years ago.

Invasion of the pink salmon

An invasive breed of salmon – which has spread from Russia – is feared to be colonising Britain's rivers and putting native fish at risk.

In 2017, 'unprecedented' numbers of the Pacific pink salmon were seen in British waters, where they successfully spawned. Now after two years out at sea, the Environment Agency warned that more pink salmon will return to British waters during 2019 to spawn.

The danger is that they will introduce diseases or parasites that could afflict Britain's native Atlantic salmon and wild trout and compete with them for food. Pink salmon are native to the icy waters off Alaska and Canada but they were introduced to Russian rivers in the 1960s and came to Britain after spreading across northern Norway.

Simon Toms of the Environment Agency said in August: 'Anyone catching a pink salmon is urged not to return it to the water, but to report it, photograph it and freeze it.'

There have already been ten confirmed sightings across Britain by late summer, including one in Wales, three in Scotland, and two off the Northumbrian coast.

Plastic pollution killing hermit crabs

An estimated 570,000 hermit crabs have been killed on two remote islands after being trapped in plastic debris, a new study has said.

The study looked at strawberry hermit crab populations on two remote tropical island locations, sites on the Cocos (Keeling) Islands in the Indian Ocean and Henderson Island in the South Pacific. Researchers say both locations are littered with millions of pieces of plastic.

Co-author Alex Bond, a senior curator in the department of life sciences at the Natural History Museum in London, said, "Plastic in the ocean entangles and is ingested by wildlife, but on land it acts as a trap and a barrier to species going about their daily lives."

The researchers say crabs had crawled into plastic containers and were unable to get out, eventually dying. The containers had openings that allowed the crabs to enter, but were positioned with the opening facing an upward angle, so that the crabs would have difficulty crawling back out.

The researchers counted how many hazardous containers there were and how many contained trapped crabs, and extrapolated their findings to estimate totals for the islands. "These results are shocking but perhaps not surprising," said lead researcher Jennifer Lavers from the institute for marine and Antarctic studies at the University of Tasmania in Australia. "It is inevitable that these creatures will interact with and be affected by plastic pollution," she said.

The problem is worsened by the fact that hermit crabs don't have a shell of their own. As they grow, they need to move into larger shells. When one crab dies, it emits a smell that tells another crab a new shell is available. Meaning, "the very mechanism that evolved to ensure hermit crabs could replace their shells, has resulted in a lethal lure," according to the paper.

Pepsi can washes ashore after 70 years

A 1940's Pepsi-Cola can found on a Dorset beach has highlighted how long rubbish stays in eco systems. Bex Nuttall, a National Trust ranger, discovered the 70-year old can at Studland, a beach used for practicing the 1944 D-Day landings. She feared it could be a Second World War bomb.

Allison Ogden-Newton, chief executive of Keep Britain Tidy, said the can was an "ugly reminder" about the longevity of litter. "All the packaging that we discard in our environment will stay there or make its way into our marine environment," she said.

Note: Pepsi-Cola changed its name to simply Pepsi in 1961.

Reproductive cycle of Clownfish vulnerable to climate change

Scientists say that clownfish, made famous in the film Finding Nemo, are in trouble due to climate change. The fish has a finicky reproductive cycle that make it vulnerable to any changes in its habitat and environment.

Scientists evaluated the fish over a ten year period around Kimbe Island, off Papua New Guinea *(nice work if you can get it – Ed.)*. Describing the reproductive cycle of the fish, researcher Benoit Poujol said "When the female dies, the male becomes female and the largest of the non-sexually active males became sexually active. The clownfish does not have the genetic variation which will allow it to modify its reproduction method if there are environmental constraints."

A single anemone is home to one female fish, non-sexually active males and one sexually-active male. Protecting their anemone home is vital to protecting these important fish. Warming oceans affect coral, including anemones. The paper said that 50% of the fish' ability to survive was the quality of its anemone home.

Breeding seals scared off by drones

Researchers at Swansea University have warned that Grey seals in Pembrokeshire, South Wales, are being scared away from the coast by drones.

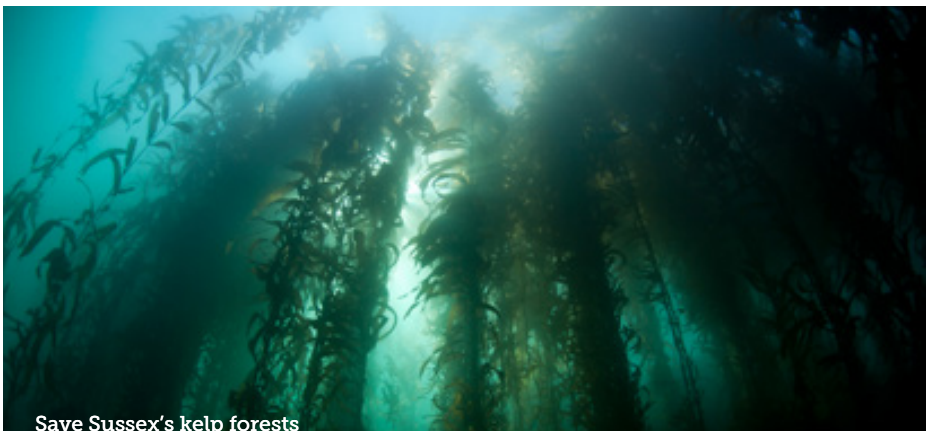
The seals usually stay out of the sea during the breeding season, between August and November and their pups also remain on land until they have moulted their white coats and trebled their birth weight - usually over a period of two to three weeks. However seals are being driven out to sea by low-flying drones and may not return. Drone users are being urged to learn about the potential dangers of flying near wildlife.

Paul Renfro, of the Pembrokeshire Coastal Forum, said a ban on drones would be difficult to enforce but the situation would be helped by users "acting responsibly." He added: "Plan ahead, know where the sensitive areas are and keep your distance. If the seals are starting to notice you, then you are too close. If they are scared they can injure themselves on stones getting back into the water and that can cause them to not want to return or not have a successful breeding season."

Anouska Mendzil-Griffiths, one of the researchers who took part in the study, said the impact was immediately clear in the more remote location where they tested the drones. "We saw that even just our presence was disturbing them," she said. "Some of the seals were shuffling, then flushing into the water. They were looking at us up on the cliff top and were clearly agitated."

"They weren't showing much disturbance with a fixed-wing drone because it looks a bit like a bird, but with the multi-copter drones they were very disturbed by that and especially at heights that were quite close to them."

The researchers plan to publish their full results by the end of the year.



Save Sussex's kelp forests

Sir David Attenborough is supporting a campaign to help save an important marine habitat.

Kelp forests off the West Sussex coast are among the most biodiverse environments on the planet, but they have been damaged by storms, changing fishing habits and the dumping of sediment on the seafloor.

Kelp is also important in reducing the impact of climate change. According to one estimate, globally it can absorb ~ 600 million tonnes of carbon a year, twice as much as the UK emits annually.

Sir David has backed an initiative by the Sussex Wildlife Trust and the Inshore Fisheries and Conservation Authority to introduce an inshore trawler exclusion zone to help the kelp regenerate.

Kelp forests previously stretched along 25 miles of the West Sussex coastline, extending out to sea at least 2.5 miles. He said: "The loss of the Sussex Kelp forests over the past 40 years is a tragedy. We've lost critical habitat that is key for nursery grounds, for water quality and for carbon storage."

Globally Kelp forests absorb 600 million tons of carbon, roughly twice the amount the UK emits each year. They provide habitats in the UK for seahorses, cuttlefish, lobster, sea bream and bass.

The Help our Kelp campaign supports a new bylaw proposed by the Sussex Inshore Fisheries and Conservation Authority to stop trawling within 4km of the coast. It is a restoration scheme led by Sussex Wildlife Trust, Blue Marine Foundation and the Marine Conservation Society.

The campaign follows the announcement of the biggest seagrass restoration scheme, in September, with one million seeds being planted off the west coast of Wales to help tackle climate change.

"Free Willy" law approved by Canadian parliament

Watching captive whales or dolphins for entertainment will eventually become a thing of the past in Canada as lawmakers recently adopted the Ending the Captivity of Whales and Dolphins Act — dubbed the "Free Willy" bill, named after the 1993 hit movie.

The bill prohibits keeping, breeding and importing marine mammals from the cetacean family (including whales, dolphins and porpoises) for entertainment or for any other reason besides rescue and rehabilitation. The legislation contains a grandfather clause, meaning marine mammals currently held captive can stay confined but cannot continue breeding. The law will contain exceptions for marine mammals who require rehabilitation following an injury, or for scientific research.

The only captive whales or dolphins in Canada are now at Marineland in Ontario near Niagara Falls and the Vancouver Aquarium. The latter announced plans to end its captive cetacean programme in early 2018 and only one dolphin is now there. There are about 60 cetaceans housed at Marineland, including Kiska, the lone "killer whale," or orca, captive in Canada. Kiska and the estimated 55 beluga whales and five bottlenose dolphins at Marineland won't be freed by the bill, because the ban exempts those already in captivity. Canada has made itself a leader through the passage of the bill. A number of countries, such as Costa Rica, India and Switzerland, prohibit displaying cetaceans for entertainment. In the U.S., some states or counties have banned display and the country strictly regulates the import of wild-caught cetaceans. Canada is the first North American country to ban both displaying for entertainment and importing or exporting cetaceans.

Key units of measurement redefined

Metrologists have voted for new definitions of the kilogramme, mole, ampere and kelvin. The size of the units will not change, but they will be more stable as they are no longer reliant on physical objects. The new definitions are based on fundamental physical constants, meaning that all seven base SI units are now defined in a manner that ensures future stability.

Since 1879, the kilogramme has been defined by a cylinder of platinum and iridium, called "Le Grand K" which is locked away in a safe in Paris. In 1990 it was discovered that it had become lighter by some 50 microgrammes as compared to official copies.

The kilogramme will now be defined using the Planck constant. The uncertainty in the kilogramme also impacted the mole, which will now be defined with respect to Avogadro's number. The ampere will be defined with respect to the electric charge carried by a single proton, and the kelvin with respect to the Boltzmann constant.

Note: Metrology (measurement science) is an interesting and unusual profession. Some practitioners design measurement systems or instruments. Others perform calibrations. Still others do basic research into underlying scientific principles.

Bet you didn't know that. Ed.

Busy Xmas for the RNLI

Tourists taking selfies on perilous stretches of coast have helped cause an almost doubling in emergency call-outs at Christmas, from 85 in 2014 to 155 in 2018. Rescue crews say the rise appears to be linked to the increasing number of people visiting the coast, who are unfamiliar with the dangers they face.

While a common source of call-outs in the Eighties was embattled fishing vessels, lifeboats are now more likely to be deployed to tourists trapped by the tide or stuck in mud. At Christmas, danger can also be found on cliff walks where unfamiliarity with their surroundings can make tourists blind to the risks from venturing too close to the, often unstable, cliff edges. And on Christmas day whilst many families will be thinking about presents, turkey and time with the family, dedicated RNLI volunteers from 238 lifeboat stations across the UK and Ireland will be ensuring their traditional yellow wellies and lifejackets are ready for when the call comes.

Beavering away

The National Trust has been given permission by government agency Natural England to release beavers into two of its reserves. Wildlife experts believe the animals can alleviate flooding as they create dams near headwaters, which slow water flow further along the river.

Two pairs of beavers will be each released in separate enclosures at Holnicote, Somerset. A third pair will be released into an enclosure at Valewood, on the edge of the South Downs, in West Sussex.

Clare Robinson, the National Farmers' Union senior countryside adviser said: "Any species introduction, particularly if it has not been in this country for hundreds of years, can have a massive impact on the many benefits the countryside and farming deliver. Beavers in the wild could have potentially serious implications on farmland such as land drains being blocked in lowland arable areas."

However Ben Eardley, the Holnicote project manager, said: "Their presence is a sustainable way to help make our landscape more resilient to climate change and the extremes of weather it will bring."

Flooding aiding knotweed invasion

Floods are spreading Japanese knotweed and other invasive species, according to a report by The Wildlife Trust. Volunteers and workers who surveyed trust nature reserves after flooding discovered knotweed rhizomes which were not there before.

The seeds of other invasive species, noticeably Himalayan balsam and giant hogweed have also been found at a wildlife sanctuary, Woodhouse Washlands nature reserve, in Rotherham, after the land was inundated with 1.5m of floodwater when the River Rother burst its banks.

A Defra spokesperson said knotweed was known to spread during flooding and added that river banks should be monitored after a flood. They advised that rhizomes should be gathered and burnt on site if possible, and definitely not put on compost heaps.

2019 – The year of the jelly fish

According to National Geographic, one group of animals that are most likely to increase both in range and abundance due to warmer waters and changes in the acidity level of the ocean are jellyfish. But it's not just climate change that's to blame.

Overfishing means that numbers of tuna and swordfish, the natural predators of jellyfish, are on the decline. With fewer predators posing a threat, jellyfish populations have been able to grow.

Swarms of Barrel Jellyfish arrived in the summer months on South West England and West Wales coasts. These giants of the jellyfish world are around 1.3m in size. By the end of October a fresh wave of jellyfish arrived in the South West, this time the dreaded Portuguese Man o' War. Now here is an interesting fact, the Man o' War isn't actually a jellyfish! It may look like a bloated jellyfish, but it's actually a siphonophore—a bizarre group of animals that consist of colonies made up of dozens, hundreds, or even thousands of genetically-identical individual creatures. A siphonophore starts out as a fertilized egg. But as it develops, it starts "budding" into distinct structures and organisms. These tiny organisms—called polyps or zooids—can't survive on their own, so they merge together into a tentacled mass. They must cooperate as one in order to do things like travel and catch food. Now you know!

Now the good news. Turtles eat jellyfish and a Leatherback was spotted off the Dorset Coast this summer, the first one seen since 2015.

Memorial to Australia's first submarine rededicated

A memorial in Barrow (UK) to Australia's first two naval submarines was rededicated in September after the mystery around the fate of one of them was finally solved. The rededication was 105 years to the day since the first boat, AE1, was lost with all hands, off the coast of what was then German New Guinea, and the wreck was only found two years ago: *www.navy.gov.au*.

AE1 was built at the shipyard in Barrow by Vickers, and a memorial to the vessel and its sister, AE2, was put up in Ramsden Square in 2013. After AE1 was found, experts concluded its loss was caused by a diving accident rather than enemy action, and now the memorial has been updated.

Experts who analysed the wreck believe HMAS AE1 sank after a ventilation valve in the hull was left partially open when the sub dived. It's not clear if it was human error or a mechanical failure that caused the fault. However, with the valve open, water would have flooded the engine. As AE1 sank to its 100-metre crush depth, an implosion would have ripped through the vessel, killing all on board instantly, an Australian National Maritime Museum report says.

The submarine was the first wartime loss for the Royal Australian Navy and the first Allied submarine loss in the First World War. It was last seen on patrol off the province of East New Britain on 14 September 1914 during an otherwise successful operation to seize the German colonies in New Guinea and the south Pacific. A search by five navy ships in the days following failed to find the sub, nor any tell-tale shimmer of escaping oil floating on the surface of the water. And there was no distress call to help guide the search. Enemy action was not suspected because the only German vessel nearby at the time was a small survey ship.

In 2017, the wreck was discovered under 300 metres of water during a search off the Duke of York Islands, near the former East New Britain capital Rabaul. It was the 14th attempt to find the vessel and the resting place of its crew. AE1's final contact with destroyer HMAS Parramatta at 2.30pm had placed it in the area.

US Civil War steamship gets protected status

The wreckage of a Liverpool-built steamship that sank on its maiden voyage while carrying supplies for the Confederate forces during the American Civil War has been granted protection.

Paddle steamer Lelia left the city for Bermuda in January 1865, but foundered in Liverpool Bay due to stormy weather. Forty-seven crew members died, as did seven rescuers. The ship now lies at the bottom of the bay. It was built at Millers shipyard in Toxteth, and was clandestinely ordered to help slave-owning Confederate forces in the southern states of the US, fighting the Unionist forces in the North.

"The Lelia is one of a small group of British ships involved in British complicity in running guns and munitions to the Confederates," said Duncan Wilson, chief executive of Historic England. Though the UK remained officially neutral throughout the American Civil War, the Lelia comprises evidence of the British financing of blockade runners that sent munitions and luxuries to Confederate ports in return for cotton and tobacco."

The ship has been granted protection by the Department for Digital, Culture, Media and Sport on the advice of Historic England. Recreational divers can still descend to the site but they are not allowed to remove anything from the wreck. The partially buried remains lie 15m (50ft) below the surface, 10 miles north-west of Hilbre Point on the Wirral.

The Confederacy had to look to Europe for arms and supplies, as the north had more manufacturing industry. Liverpool was the obvious choice because of strong links forged during the cotton trade. The Confederacy had no navy or ships to beat the northern blockade of southern ports and looked to Liverpool shipyards to secretly build a fleet of blockade-runners and naval cruisers.

Ocean oxygen levels falling

Climate change and nutrient pollution are driving the oxygen from our oceans, and threatening many species of fish. That's the conclusion of the biggest study of its kind, undertaken by conservation group IUCN. Around 700 ocean sites are now suffering from low oxygen, compared with 45 in the 1960s. Researchers say the depletion is threatening species including tuna, marlin and sharks.

The threat to oceans from nutrient run-off of chemicals such as nitrogen and phosphorus from farms and industry has long been known to impact the levels of oxygen in the sea waters and still remains the primary factor, especially closer to coasts. However, in recent years the threat from climate change has increased.

As more carbon dioxide is released enhancing the greenhouse effect, much of the heat is absorbed by the oceans. In turn, this warmer water can hold less oxygen. The scientists estimate that between 1960 and 2010, the amount of the gas dissolved in the oceans declined by 2%. That may not seem like much as it is a global average, but in some tropical locations the loss can range up to 40%.

Even small changes can impact marine life in a significant way. Waters with less oxygen favour species such as jellyfish, but are not so good for bigger, fast-swimming species like tuna. "We have known about de-oxygenation but we haven't known the linkages to climate change and this is really worrying," said Minna Epps from IUCN. "Not only has the decline of oxygen quadrupled in the past 50 years but even in the best case emissions scenario, oxygen is still going to decline in the oceans." If countries continue with a business-as-usual approach to emissions, the world's oceans are expected to lose 3-4% of their oxygen by the year 2100.

Bigger fish have greater energy needs. According to the authors, these animals are starting to move to the shallow surface layers of the seas where there is more of the gas dissolved. However, this make the species much more vulnerable to over-fishing.

Great Barrier Reef outlook officially downgraded from poor to very poor

Rising sea temperatures thanks to human-driven global warming remain the biggest threat to the reef, a five-year Australian government report says. Actions to save it "have never been more time critical", the report reads.

Stretching over 2,300km (1,400 miles), the reef was designated a World Heritage site in 1981 for its "enormous scientific and intrinsic importance" but in recent years the reef has been increasingly damaged by warmer seas which have killed off coral and affected its long-term health.

Unesco's World Heritage Committee is due to consider adding the reef to its list of sites that are "in danger".

The massive report documents the condition of the reef and its outlook for the future. Under Australian law, the Great Barrier Reef Marine Park Authority (GBRMPA) must produce a report on the state of the World Heritage site every five years.

In the first report in 2009 scientists said the reef was "at a crossroads between a positive, well-managed future and a less certain one". The second report in 2014 ranked it as "an icon under pressure" with efforts needed to fight key threats. "Since then, the region has further deteriorated and, in 2019, Australia is caring for a changed and less resilient reef," the most recent report states.

Rising sea temperatures caused "mass bleaching events" in 2016 and 2017 that wiped out coral and destroyed habitats for other sea life. While some habitats remain in a good state, the condition of the site as a whole is worsening.

Public lavatories do not meet needs of disabled

The UK's capital is the worst-performing region when it comes to providing fully-accessible toilets known as Changing Places, which are essential for more than 250,000 people across the country with severe disabilities. Muscular Dystrophy UK's latest figures show there are 80 Changing Places toilets in London, which has a population of 8.8 million. This means there are just 0.9 facilities per 100,000 people – without even taking into account the 30 million annual visitors to the capital. In comparison, Scotland tops the list with 3.6 Changing Places toilets per 100,000 people.

Changing Places toilets stick out like a peninsular at least a metre away from the walls on either side, plus a height-adjustable changing bench, an overhead track or mobile hoist, a privacy screen and enough space for up to two carers to help. These toilets are used by those with disabilities including muscular dystrophy, cerebral palsy, motor neurone disease, muscular sclerosis, stroke, the elderly and people with severe and multiple learning difficulties.

The research highlights a varied picture across the UK. Northern Ireland has an average of 1.4 toilets per 100,000 people, followed by 1.7 in the South East. Meanwhile, the West Midlands, Yorkshire and the Humber, and the Channel Islands have three apiece. Some areas are more than 20 miles away from a Changing Places toilet, which is why Muscular Dystrophy UK is also calling for at least one facility in every town.

While the figures paint a disappointing picture, there have been encouraging developments over the past 12 months. The Government is expected to make Changing Places toilets mandatory in new, large public buildings following years of campaigning by the Changing Places Consortium, which Muscular Dystrophy UK co-chairs, and in addition, the Department for Transport is providing £2 million funding to install Changing Places toilets at motorway service stations in England. And a partnership with supermarket giant Tesco has resulted in a rollout of 35 facilities at stores across the country.

British cod has had its chips

Just two years ago, marine conservationists hailed the return of cod to the North Sea, with reports suggesting that there were 152,000 tons in the area, the highest for 35 years. This followed an extensive recovery programme set up a decade earlier by governments in Scotland and England, when numbers were at a record low of 44,000 tons.

Forecasts suggested that stocks would hit 180,000 tons in 2019, but a report by the International Council for the Exploration of the Sea, said the true figure was estimated to be 81,000 tons. This has prompted the Marine Stewardship Council to remove its sustainability certification from North Sea cod, from October 24th.

The fishing industry has promised to work collectively to recover the stock over the next five years. It is not clear what has led to the declines, although experts say it could be the result of warming waters, with cod moving further north, driven by climate change, and fewer young cod surviving into adulthood. Cod sourced from Iceland and Russia remains sustainable.

Airline passenger mistakes exit for toilet door

A flight from Manchester airport in 2019 was delayed for almost eight hours when a confused passenger opened an emergency exit after mistaking it for the toilet door.

The Pakistan International Airways (PIA) flight to Islamabad was nearly ready to depart when the woman grasped for the wrong door, launching the emergency evacuation slide. The startled passenger told airline staff she thought the door was for the toilet. The airline and Manchester airport confirmed the details of the incident.

Officials in Pakistan blamed a shortage of airline staff for allowing the emergency exit door to be opened, according to the English-language newspaper Express Tribune. The flight carrying nearly 400 passengers eventually left Manchester at 5am the next day. It arrived in Islamabad seven hours late having made up some time during the journey. Several other departures from Manchester were also delayed as a result of the disruption.

Dog walker alert on Cornish beaches

A warning was issued to dog owners in November, after palm oil washed up on beaches in Cornwall. Porthmeor in St Ives and Portheras Cove near Pendeen are among the beaches affected by the oily, yellow substance - which can be toxic to dogs. Delia Webb from the Friends of Portheras Cove group, said it was "horrific" to see and has put up warning signs. Cornwall Council is asking people to report any other sightings.

Palm oil can cause problems if released - legally - into the marine environment at sea by ships. Whilst on the ships, and whilst in the sea, palm oil can become contaminated with other waste products and because it is edible, it can be attractive to some animals despite it being toxic to them.

"You can't really miss it", Ms Webb said. "I don't think we've ever seen this much coming ashore at one time - it's quite horrific when you see an orange rock pool. It's not like we usually see palm oil washing ashore in hard, waxier lumps. This seems to be very fresh - still very squishy, waxy, oily and it's forming tiny globules now."

Dog owners have been warned by the council to be particularly vigilant "as palm oil can be dangerous for dogs". The Maritime and Coastguard Agency (MCA) has been made aware of the problem, which is being investigated.

The Thames is "back from the dead"

In 1957 the river Thames was so heavily polluted that it was declared "biologically dead." Now, more than 60 years later experts have counted more than 100 seal pups on the river's shores.

Scientists from the Zoological Society of London discovered a total of 138 pups on the sandbanks and creeks of the river, in their first comprehensive count. This is evidence that the river's ecosystem has come back from the brink, after the 1957 report said its low oxygen levels and polluted waters would mean that nothing could survive in its murky tides.

The count was carried out using photographs as it is much easier to identify and count individual seals using photographs rather than trying to follow constantly moving, playful creatures.

Thames total seal count, adults and pups, in 2017, was 1,104 harbour seals and 2,406 grey seals. Other species also thriving in the river's ecosystem, including over 100 species of fish, two types of shark, short-snouted seahorses and the critically endangered European eel.

Blue whale at nature's limits

The first ever recording of the blue whale's heart rate has found it is working at its limit and this could explain why it never evolved to grow even larger.

Researchers at Stanford University collaborated with Paul Ponganis, from the Scripps Institution of Oceanography. They collected and then analysed the ground-breaking data captured during an experiment at Monterey Bay, California. A sensor-packed tag was secured onto the whale's left flipper with four suction cups. It recorded the animal's heart rate through electrodes embedded in the centre of two of the suction feet. Analysis of the data suggests that a blue whale's heart works at its limits.

They found that when the whale plunged deep beneath the waves it dropped to as low as two heart beats per minute, but rose to 37 once it returned to the surface and was breathing again.

As well as posing evolutionary questions it could also suggest that some of the unusual features of the whale's heart enables it to perform at these extremes. Jeremy Goldbogen, assistant professor of biology in the School of Humanities and Sciences at Stanford said: "Animals that are operating at physiological extremes can help us understand biological limits to size," he said. "They may also be particularly susceptible to changes in their environment that could affect their food supply. These studies may have important implications for the conservation and management of endangered species like blue whales."

"Where the unicorns go to wash"

Cornish tourism chiefs have been left in a confused state after a newly opened Premier Inn advertised on its promotional materials that guests could visit local attractions, naming the beach, the local train station or the "historic Remwood Lagoon."

Residents quickly pointed out to the hotel in Penzance that the lagoon doesn't exist, and it remains unclear as to how the mistake occurred.

Malcolm Bell, head of Visit Cornwall, said: "I am scratching my head to try and think of a lagoon in the area. I think if it's confusing locals, it will certainly confuse visitors. The first thing Premier Inn should do is clarify this and tell us where it is. If it's not well known enough for the locals then it's not worth adding in. There are so many great attractions in the area within walking distance, including the largest seawater lido, so there is no need for them to create things that don't exist." As an afterthought he added: "Maybe the lagoon is where the unicorns go to wash."

Agricultural pollution kills 10,000 fish

The Environment Agency (EA) has revealed that a toxic spill in August along the River Mole in North Devon caused a huge fish kill more in the region of 10,000 than 6,000 as originally thought.

Revealing the degree of damage the EA said it had established the cause as anaerobic digestate generated by anaerobic digestion near South Molton, but declined to give further details as the investigation is ongoing. At the time, EA staff said it was the worst incident in the area they could remember.

Anaerobic digestate is often used as a fertiliser, but has a very high chemical oxygen demand if it gets into water. The incident led to the mass death of roach and trout along a 5km stretch of the River Mole, but had now ceased. The agency has restored oxygen levels to safeguard wildlife.

Swallowing a credit card a week

From the top of Mount Everest to the deepest oceans, we know that plastic is everywhere on Earth. Now we know it's in us, too. You're eating, swallowing or breathing in about 2,000 tiny pieces of plastic each week, a new study suggests, an amount equal to the weight of one credit card.

"Not only are plastics polluting our oceans and waterways and killing marine life – it's in all of us and we can't escape consuming plastics," said Marco Lambertini of the World Wildlife Fund, which commissioned the study. This plastic contamination comes from "microplastics" – particles smaller than five millimetres – which are making their way into our food, drinking water and even the air.

The study was carried out by the University of Newcastle in Australia. "This study has helped to provide an accurate calculation of ingestion rates for the first time," said Thava Palanisami, the project co-lead and microplastics researcher at the University of Newcastle. The study found that globally, the average person consumes up to 1,769 particles of plastic each week from water, 182 from shellfish, 11 pieces from salt and 10 from beer.

In Europe around 72 per cent of tap water now contains plastic, with nearly two plastic fibres found per 500ml.

Although the long-term effects of plastic ingestion on the human body are not yet known, some studies have shown that beyond a certain level, inhalation of plastic fibres produce mild inflammation of the respiratory tract. Some types of plastic carry chemicals and additives which have been shown to influence sexual function, fertility and to increase the occurrence of genetic mutations cancers.

Water bills to fall over next 5 years

Ofwat, the water regulator, has ordered water companies in England and Wales to cut bills for customers by £50 over five years and spend £51bn on improving services and investment in infrastructure. The toughest ever crackdown on water industry profits could put Ofwat on a collision course with companies that are considering whether to take the regulator to the Competition and Markets Authority.

Water companies fear that Ofwat may stifle foreign investment into the sector by expecting better service and new infrastructure while charging "unreasonably" low bills. The sector had planned to spend £56bn over the next five years to meet Ofwat's standards but the regulator has told companies to make do with £5bn less.

Ofwat told the water companies to cut the amount of water lost to leaks by 16%, which it said would save enough water to meet the needs of everyone in Birmingham, Bristol, Cardiff, Leeds, Liverpool and Sheffield.

Companies have also been told to identify and help an additional 2 million customers who need extra support and to invest more than £1bn to protect communities at risk of flooding.

Rachel Fletcher, the Ofwat chief executive, said: "Today (16th December) we're firing the starting gun on the transformation of the water industry backed by a major investment programme to deliver new, improved services for customers and the environment and resilience for generations to come."

UK whale & dolphin deaths double

Pollution could be to blame for the number of whales and dolphins found dead on Britain's beaches nearly doubling in 5 years, a study reports. The number of washed-up marine mammals – including dolphins, whales, harbour porpoises and turtles – has risen from about 600 in 2012 to more than 1,000 in 2017, according to a 7 year review recently led by the Zoological Society of London.

Chemical pollution has been identified as one of the most significant but "invisible" killers. The report's author, Rob Deaville, said: "Chemical pollution is a harder issue to sell because it's an invisible problem, you can't see it like you can see plastics on the beach, or plastics in animals' stomachs.

Chemicals such as polychlorinated biphenyls, banned in the 1970's, still persist in the marine environment, as they are very resistant to being broken down. Other chemicals, such as those used on the bottom of boats to stop them bowing and flame retardants for sofas, are also leaching into the sea.

The research team conducted 1,030 post-mortem examinations to identify the cause of death. The two most common findings were death by infectious disease and incidental entanglement in fishing gear. The cause of the infectious diseases were commonly attributed to pollution from chemicals. Roughly 75% of all deaths were due to infectious disease and 23% of dolphin deaths by fishing gear. 25 animals were identified as having been killed by coming into contact with shipping.

Living next to the sea is good for your mental health

People living within five kilometres of 'blue spaces' experienced fewer mental health problems such as anxiety and depression, a new study has found. Exeter University researchers compared adults with the same incomes, but who lived at different distances from the seaside.

This suggests the coast may act as a 'protective zone' for psychological wellbeing and highlights the importance of so-called 'Blue Health.' Study lead author Dr Jo Garrett said: "There are many possibilities for the positive impact of the sea on people's mental health. "Sea views, fresh air and physical activities could all contribute, but we cannot say for sure because this study did not look at causes. "Many people find a visit to the seaside helps them to recover from stressful events."

The scientists crunched Health Survey for England data from nearly 26,000 respondents dating from 2008 to 2012. Participants were grouped into categories according to how far they lived from the sea and compared residents on the same incomes.

The strongest mental health benefits were in those living within a kilometre from the sea, with the effects dwindling the further inland the person lived. There was no recorded benefit for those living further than five kilometres from the coast. Living by the sea positively impacted the mental health of those on lowest household incomes, with richer households unaffected. The research suggests, for the first time, that people in poorer households living close to the coast experience fewer symptoms of mental health disorders.

The study's findings add to the growing evidence that being near to water, particularly the coast, might improve health and wellbeing. Published October 1st in the Health and Place journal, the study is the first to link the benefits of coastal living to income in such detail. This research is part of the EU-funded Blue Health project, which examines how water-based environments in towns and cities can affect health and wellbeing.

From the Archive: This paper first printed in **Waterline** Autumn 2015

A Rose by Any Other Name

by David Bebbington
CSci., CChem., MRSC., FWMSoc

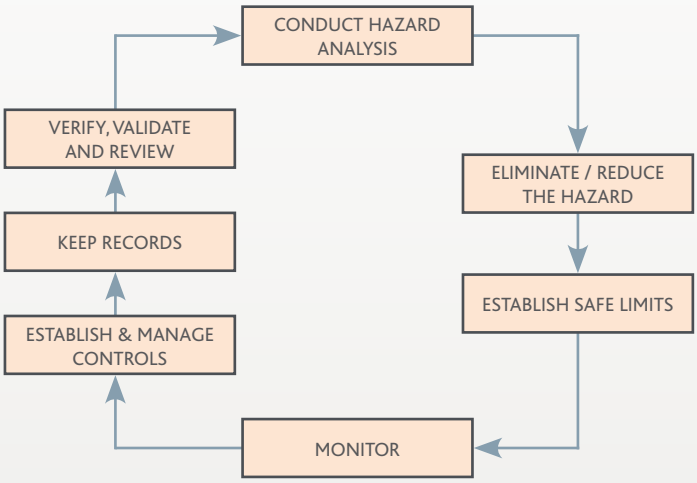
In recent years Hazard Analysis and Critical Control Points (HACCP) via the Water Safety Plan (WSP) has been talked about and in some quarters feared due to the perception that it is anti-risk assessment, may confuse the marketplace, and so complicate and threaten the long established Legionella risk assessment (LRA) industry.
I hope this article will help to reassure those who are concerned and that the risk assessment industry is unlikely to collapse anytime soon.

Comparison of COSHH Legionella risk assessment supported by a Written Scheme of Control (COSHH/LRA), with the HACCP/WSP approach shows the two processes are largely complementary and comparable.

HACCP is a process that was established by and for the food industry and has been accepted and approved by the World Health Organisation.

It is being rolled out into other industries (health, water and pharmaceuticals) and is a process concerned with hazards (things that have the potential to cause harm, not just Legionella). The aim of the process is to identify and eliminate (reduce or control) hazards.

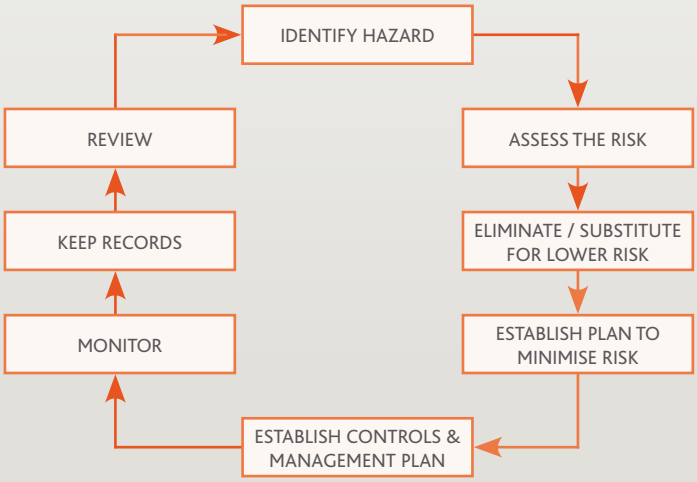
Fig. 1 The HACCP process can be summarised as follows:



This process is incorporated into a WSP which requires the assembly of a Water Safety Team to document and describe the system, manage the assessment and control of the hazards using the process as shown in **Figure 1**, above.

Control of Substances Hazardous to Health (COSHH) is also concerned with hazards, but unlike HACCP/WSP, is risk assessment based. This approach is enshrined in UK law through the Control of Substances Hazardous to Health Regulations 2002 and as such it is approved by government. The Regulations require us to identify the hazards, assess the risks associated in their use and to minimise and control risks.

Fig.2 The COSHH process can be summarised as follows:



By applying this process to Legionella (which is the hazardous substance), the COSHH Legionella risk assessment is completed.

As we do not know when Legionella will enter the system, but do know that it is likely to do so at some time (depending on the water source), the assessment of risk is actually carried out on the system, looking for points within the system where the bacteria would have time to grow; conditions that would allow growth (such as water temperature outside 20-50°C; inadequate or inconsistent control measures); materials of construction that allow growth; corrosion, dirt and contamination that can act as nutrient for growth; areas and actions that would allow generation and release of aerosol; the amount of aerosol released, the period of time it is being released over and the numbers and susceptibility of those people likely to inhale that aerosol.

If the assessment of risk is anything higher than is reasonably practicable, then we must ask ourselves can the system be eliminated. If elimination is not reasonably practicable we ask if it could be substituted by a lower risk system. If neither option is reasonably practicable, then the plan to minimise risk must be devised and implemented as described in **Figure 2**, left.

The management plan would include the requirement for a written scheme to be put in place and this scheme includes the risk assessment.

Figure 3. HACCP versus COSHH

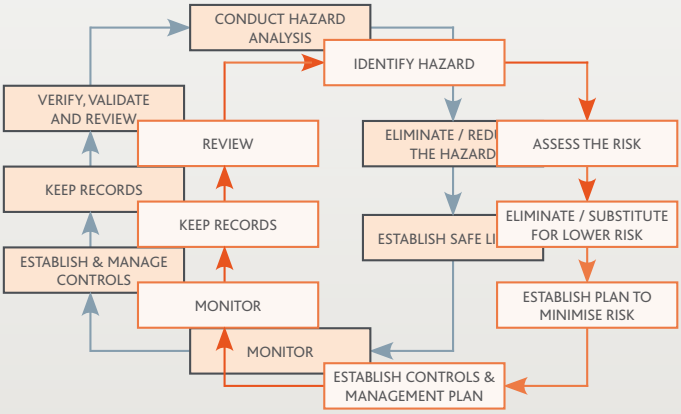


Figure 3 is obtained by overlaying **Figures 1** and **2** where we can see that the two processes are very similar. If we can bring ourselves to ignore the fact that one is hazard based and the other risk based, the differences appear to be trivial. The main difference is that one is incorporated into a 'Water Safety Plan' while the other is included in a 'Written Scheme (of control)'.

So, is there any correlation between these two documents? Let us compare what we would expect to see in these:

WATER SAFETY PLAN	*WRITTEN SCHEME*
Assemble a team of people who understand the system and include a competent risk assessor.	A competent risk assessor must be used. For unusual systems and complex processes, a team of people is required. The management structure should be included showing the duty holder; the responsible persons; communication pathways; training; allocation of responsibilities of and to the various stakeholders.
Document and describe the system schematics, design criteria and maintenance requirements.	Record the purpose and scope of the scheme. System schematic and details of correct and safe operation ought to be included.
Assess hazards and prioritise risks.	Assess risks and maintain actions.
Assess the system.	Risk assessment is included in the scheme.
Identify control measures. Actual measures depend on the system.	Correct and safe operation of the system (including safe start up and shut down procedures) are included in the scheme.
Monitor control measures. Include physical and chemical controls.	Control measures and parameters are included in, and determined by, the risk assessment. Precautions in place (with frequencies) to prevent or minimise risk associated with the system; include monitoring requirements, analytical tests and operational checks as required.
Prepare management procedures.	Incident plan covering major plant failure; high and/or repeat positive Legionella results; an outbreak of legionellosis, suspected or confirmed as being centred at the site or in the area which includes the site.
Establish verification and surveillance. Internal and external audits to confirm that operational monitoring and corrective actions are being undertaken.	Remedial action in the event of the scheme being shown not to be effective, including control scheme that operational monitoring and reviews and any modifications made.
Develop supporting programmes. Include staff training and education, maintenance and calibration, backflow and plumbing controls.	Covered in the management section.

(ref.L8 (Fourth edition) 2013; HSG 274 part 2 Appendix 2.2 2014; WHO Legionella and the prevention of legionellosis 2007)

Inspection of the above comparison of the requirements of the WSP and the written scheme show very little difference between the two. The difference is in emphasis of assessing and controlling the hazard in the WSP compared to assessing and controlling the risk in Legionella risk assessment.

WSP will be applied to all hazards, not simply Legionella. However, Legionella risk assessors should inform the site of any matters of evident concern outside of their contract, of which they become aware, when completing their tasks, so it could be argued that the LRA will go some way to helping in this regard. (ref. LCA Code of Conduct)

In summary, in my opinion there is no major difference between these two systems and those in the risk assessment industry need have no concerns about the introduction of Water Safety Plans and I hope I have explained the reasons why I believe this to be the case. The sky is not going to fall down.

David Bebbington, A Rose by Any Other Name:
'At the time of going to press for this edition of Waterline, British Standards Institute have issued a draft of BS8680, Water safety planning in buildings – Code of practice, for public consultation requiring comments by 19th January 2020. In my opinion, the proposed standard does not render the comparisons made in this article invalid. Indeed the standard emphasises the requirement for legionella risk assessments to be completed (as per BS8580).
BS8680 covers all hazards, biological, chemical, physical and radiological but directs the reader to BS8580 for Legionella and Pseudomonas aeruginosa risk assessments.'

WMSoc Welcomes New Fellows

Any member of the Water Management Society who has been a full member for a minimum of 10 years and in the opinion of the council has made major contributions to the activities of the society and/or the industrial or commercial application of water may be invited to accept the grade of "Fellow". We are pleased to announce that the following members accepted the grade of Fellow at this year's AGM held at Aston Villa Football Club on the 11th June 2019.

Dr Tom Makin *has over 35 years' experience in medical microbiology as a Biomedical Scientist and was the Directorate Manager of the Department of Medical Microbiology in the Royal Liverpool University Hospital for over 20 years. He now provides microbiology consultancy services through his own company Makin & Makin Consultancy Ltd. Dr Makin has worked on many scientific and technical papers, providing research and advice to the Department of Health and many NHS trusts. During his career he has lectured at many conferences and seminars in the UK, Europe, USA, and the Middle East on Legionnaires' disease and other water-borne infections.*

Following a degree and PhD in Metallurgy ***Dr Phil Munn*** *has been working for the last 30 years in the area of corrosion control and testing. Initially working for Fernox in testing, and later as development manager in their water treatment laboratory, Phil left in 2001 and setup his own company, Midland Corrosion Services, which carries out corrosion testing and failure analysis mainly in the area of building services. During his career Phil has represented the UK on many British and International standards committees*

Mr Ian Penney *has worked for the past 35 years with several water treatment companies in varied roles including lab chemist, in-house tech support, field sales, and sales management leading to his current General Manager role at DTK Water. Ian is a graduate of Guelph University in Ontario, Canada having received a BSc degree in Applied Chemistry and has been a member of the WMSoc Council for a total of 5 years.*

Mr Alan Watson *worked his way up within Dearborn Chemicals from junior consultant in 1979 to area manager for Scotland in the late 1990s. In 2002 ChemTech Consultancy Ltd was born in Scotland to serve the developing Legionella compliance marketplace. Today the company has some 40 employees and is one of the largest Legionella compliance companies in Scotland. Alan remains the Director and is committed to the provision of quality service to the water hygiene market place.*

We would like to ccongratulate each of our new fellows to this elite club and look forward to their continued involvement in the industry.

Dr Tom Makin

Dr Phil Munn

Mr Ian Penney

Mr Alan Watson

SAVE THE DATE!

THE WATER MANAGEMENT SOCIETY

WMSoc AGM and One Day Conference

3rd June 2020 - Drayton Manor, Tamworth

THE WATER MANAGEMENT SOCIETY

Paying membership Fees

Alongside your traditional methods of payment; a reminder that we have now made it easier for you to pay your membership fees! Simply log in to your Members account at *www.wmsoc.org.uk* and pay online.

Your membership subscription grants you access to Waterline as well as a variety of other benefits, so keep yourself in the loop!

ANSWERS TO THE ARTICLE IN OUR AUTUMN ISSUE

CORROSION IN CLOSED HEATING AND CHILLED WATER SYSTEMS – CAUSES AND PREVENTION

Q1: Name the 3 main types of bacteria as classified by their oxygen requirements for growth.

Q2: Which metals do not undergo corrosion in aqueous environments?

Q3: What is the difference between erosion corrosion and cavitation?

1 cpd point

A1: The 3 main types of bacteria classified by their oxygen requirements for growth are: aerobes (grow in the presence of oxygen), facultative anaerobes (able to grow with or without oxygen), and anaerobes (grow in the absence of oxygen).

A2: Noble metals such as platinum and gold don't undergo corrosion in aqueous solutions.

A3: Erosion corrosion requires dissolved oxygen whereas cavitation may occur due to the formation of steam bubbles in deaerated water.

Answered by Karen Gerrie, A.W.MSoc, Chivas Brothers

If you would like to get involved with this issue's CPD activity, see page 9.

Risk Assessment challenges, feedback and personal opinions of various end-users

Colin Shekleton

NOTE: The following is based upon a number of conversations had with various individuals, all of whom have come across legionella risk assessments in various guises as part of their work. These are the opinions of the individuals and do not reflect the opinions of the WMSoc.

These days, it is safe to say that the industry is largely aware of the requirement to carry out a legionella risk assessment in order to comply with the various aspects of the Health and Safety at Work etc. Act 1974 along with the Control of Substances Hazardous to Health Regulations 2002, in addition to giving guidance with the relevant parts of the Management of Health and Safety at work Regulations 1999.

The Challenge:
As risk assessors, our first priority should be to ensure we produce an assessment that is both "suitable and sufficient". What does this mean? There is a lot of good guidance in existence now that helps us define what is required. In addition to the ACOP L8 2013 and its associated technical guidance parts 1-3 HSG274, we also have BS8580-1:2019 Water Quality – Risk assessments for Legionella control – Code of Practice. We also have helpful guidance documents published by the Water Management Society; Guide to Legionella Risk Assessment W043. Yet, despite all this guidance the process of risk assessment is still an incredibly emotive subject.

Given the variety of different water systems out there, it is reasonable to conclude that the content of legionella risk assessments also has to vary enormously to accommodate this, i.e. what is required to risk assess a cooling tower is very different to risk assessing a spa pool, a water feature or a domestic hot and cold water system.

Much as we would like to produce a one-size-fits-all assessment, the reality is that this is just not the case for differing risk systems. The skill of the risk assessor is to identify this and adjust the report output accordingly.

As a risk assessor myself, I am always trying my best to interpret the ACOP, guidance, various British Standards, and of course understand the water systems, the usage and the susceptibility of all those who might be exposed to those water systems. I then attempt to compile the relevant data collected into a cohesive, succinct, easy to read document that supposedly provides the Duty Holder and Responsible Person with an assessment of the inherent and residual risks posed by the differing water systems present and gives clear, unambiguous advice on how to eliminate, reduce, manage and control the risk to as low as a "reasonably practicable", compliant, level for each water system.

The single biggest challenge I experience when conducting a survey and compiling a risk assessment is access:

a. Access to systems
b. Access to areas
c. Access to outlets
d. Access to paperwork
e. Access to people (communication)

A clearly defined scope should clear a lot of this up, but so often ambiguity in the scope means that interpretation can lead to issues. More often than not a simple conversation with the appropriate people also helps enormously… if they are available. Without sufficient access a suitable and sufficient risk assessment cannot be produced.

As my own experience as a risk assessor has increased, I have become increasingly interested in how these assessments are viewed, used and applied by the end-users. This information has helped me as a risk assessor tailor the reports such that they are still suitable and sufficient in the eyes of the regulations, but also provide, useful and practical advice. As a risk assessor who is a member of the WMSoc I myself am interested in hearing the thoughts of others on this very subject, so I contacted a number of colleagues in the industry, (the majority of whom this author has not worked directly with) and asked them all a number of identical, pre-set questions, these are their opinions and thoughts. In the interests of attempting to obtain frank and unbiased views the participant's names have been withheld, but I would like to take this opportunity to thank all those who contributed to this exercise, you know who you are!

The following represents a snap-shot of the conversations had:

Question 1:
As an end-user / responsible person (or advisor to those roles) what are the most important aspects of the final risk assessment product to you?

"I am time restricted and under-resourced, therefore a clear and concise document, with an easy to understand format and structure"
Duty Holder within the service industry

"Concise, no waffle, no large abstracts of L8 (I already have a copy!)"
"I don't like pricing quotations for remedial actions within the risk assessment document"
"Give me a proportionate risk rating"
Water hygiene compliance officer within a local council authority

"Cut through the bumf, get to the nitty gritty. What are our most critical risks and how do we mitigate them?"
Engineering manager at a public attraction

"A clear and concise product with an executive summary up front"
"A properly defined scope, what's included, what's not-included?"
Independent advisor for a healthcare water safety group

"The risk assessment should provide a practical steer towards controlling the risk"
"Practical guidance"
An Environmental Health Officer from a local authority

Author comment:
Some common threads / comments, with the words clear and concise being repeated by most.

This is what the BS8580-1:2019 suggests:
Section 9.1
"The report should be concise and unnecessary repetition and/or inclusion of superfluous information should be avoided…"

Question 2:
What frustrates you the most about the process of legionella risk assessment?

"It can take longer than we expect sometimes"
"It can be intrusive"
Engineering manager at a public attraction

"The lack of communication between the end-user and service provider at tender stage about the scope"
"This can result in the scope not being followed or properly defined"
Independent advisor for a healthcare water safety group

"The risk assessment process often takes longer than expected or has been allowed for"
"There are often gaps within the risk assessment process that are not adequately caveated within the report"
An Environmental Health Officer from a local authority

"Lack of communication, resulting in access not being arranged, resulting in poor schematics, missing outlets or plant"
Water hygiene compliance officer within a local council authority

"Lack of communication between an end-user and risk assessor"
Duty Holder within the service industry

Author comment:
Again, opinions were very similar, with all mentioning communication in some form as being a frustration at times.

Question 3:
In your opinion, what things can service providers (in terms of their LRA service) improve upon to make the life of a responsible person better?

"Don't just turn-up if access has not been arranged"
"Send an interim email with the major headlines so that we are made aware of critical risks ASAP"

"Be concise, don't regurgitate table 2.1 from HSG274 part 2. Be specific and relevant to the site"

Water hygiene compliance officer within a local council authority

"Follow the LCA service delivery standard for legionella risk assessment"

Duty Holder within the service industry

"Don't restate law or the guidance excessively within the report"

"Ensure schematic drawings make it clear where certain assumptions have had to be made"

An Environmental Health Officer from a local authority

"Communication"

"Go along to a WSG meeting and work collaboratively"

Independent advisor for a healthcare water safety group

"Be concise and give me clearly defined risk ratings and recommendations"

Engineering manager at a public attraction

Author comment:
A mixture of views here, that perhaps mirrors the variations in how service providers and end users work.

Question 4:
In your experience, what are the biggest challenges to overcome when completing a risk assessment?

"Understanding how the equipment we have on site is "actually" used by personnel compared to how we "think" it is being used, so that the risk can be assessed accurately"

Engineering manager at a public attraction

"Arranging logistics so that access is available"

Water hygiene compliance officer within a local council authority

"Training and knowledge, competence of both sides"

Independent advisor for a healthcare water safety group

"Walls; there are somethings that cannot be seen during a risk assessment, such as the inside of pipework or behind walls. This is just the practical reality of the situation"

An Environmental Health Officer from a local authority

"Communication"

Duty Holder within the service industry

Question 5:
More detail in a report or less detail?

"Relevant and concise detail"

Duty Holder within the service industry

"More detail, provided it is accurate and site specific"

"The more I know, the more comfortable I am"

Engineering manager at a public attraction

"Specific, not generic detail… as necessary"

Water hygiene compliance officer within a local council authority

"A good executive summary, report by exception."

"Be specific"

Independent advisor for a healthcare water safety group

"The report should provide sufficient detail that truly describes the site"

An Environmental Health Officer from a local authority

Author comment:
A range of views that perhaps reflects the range of the sample from the industry questioned. The words "specific" and "relevant" came up a lot in the conversations.

Question 6:
What information helps you the most when you read the risk ratings?

"Straightforward and defined"

Almost everyone

"I don't like a risk rating applied to a whole building. Different water systems within a building are often likely to have different levels of risk, therefore suitable detail is required to describe the risk"

An Environmental Health Officer from a local authority

Author comment:
Everyone was in agreement in their responses. Scoring systems are ok if they are understandable, as are using statements like "medium risk", providing this is defined within the document. The regulator wished to point out that details about levels of risk could significantly differ between water systems in a single building, and this should be conveyed sufficiently within the assessment.

Question 7:
What information helps you the most when you read the recommended remedial actions?

"Priorities"

Everyone

"Understanding priorities; need to have versus nice to have"

Engineering manager at a public attraction

"Where practical, give options to manage the risk"

Independent advisor for a healthcare water safety group

Author comment:
Whilst every conversation was different in this exercise, everyone mentioned prioritised remedial actions. Which is again mentioned in BS8580-1:2019.

Question 8:
Any other thoughts or comments?

"Box ticking is not risk assessing"

Duty Holder within the service industry

"Give advice on a sampling plan where appropriate"

Independent advisor for a healthcare water safety group

"Don't go over the top for small, low risk systems / scenarios"

Water hygiene compliance officer within a local council authority

"Be consistent when making recommendations"

Engineering manager at a public attraction

Bonus Question 9:
As a regulator, what areas within the process of risk assessment do you most have to give advice on?

"To the recipient of the assessment: get into the detail, as often the devil is in the detail"

An Environmental Health Officer from a local authority

All of the comments above are just a snapshot and are purely opinions of a few. All those interviewed expressed that these views were intended to be constructive and all agreed that working together is critical in producing a suitable and sufficient risk assessment.

Summary:
Not one of those end users interviewed mentioned cost in their answers, admittedly this is only a very tiny snapshot, but food for thought nonetheless…

My own biggest "take-away" from conducting this experiment was that all parties (service providers **and** end-users) should look to pro-actively communicate better. After all, we are all looking to achieve the same objective which is to sufficiently assess risk and manage any such risks in a reasonable and practicable way that prevents harm and complies with the law.

event report

Designing Out 3

Wednesday 20th November 2019 - SCI, London

Dr Jimmy Walker (Walker on Water) opened the conference by discussing significant and unexpected design failures in engineering e.g. the Boeing 737 MAX 8, the Genoa bridge collapse and poorly laid-out cycling pathways. There is a need to design better in healthcare and understand the final outcomes on water management. Jimmy also advised that BS 8680 "Water safety planning in buildings - Code of practice" is now available for comment as a Draft for Public Comment (DPC) until 19th January 2020: *standardsdevelopment.bsigroup.com/projects/2017-02537*

Mike Ralph (NHS England) gave a really insightful presentation entitled "We've always done it like that" and advised to beware of false knowledge, especially using guidance as regulation. He gave an example of the installation of vacuum toilets which failed due to cleaners putting buckets of waste-water down which caused foaming and damaged internal valves etc. He also advised "Revolution not Evolution" which is difficult in a risk-averse organisation such as the NHS. He elaborated on a case study at Great Ormond Street whereby they lowered circulating water temperature and applied a biocide. He noted that a well-educated multidisciplinary team was essential in order to succeed. Ongoing data shows energy and carbon saving, as well as decreased microbiological counts. Questions arising from this revealed that this approach is probably not easy to retrofit on old buildings but would be worth considering at the design stage of a new build. Also, the way to work effectively with a multi-disciplinary team would be via education and communication, with a good evidence-based and comprehensive validation for any innovative new techniques.

Jonathan Gaunt (Cundall) is the current chairman of the Society of Public Health Engineers (SoPHE). The main topic of his presentation was regarding keeping cold water cold. The incoming water-supply has been getting warmer and warmer over recent years, leading to issues with biological growth and poor taste quality. This is a recognised industry issue, but the general public are also becoming aware via social media and climate-change. Some of the reasons for over-heating are low flow rates, shallower mains and water tanks located above ground in warm buildings. Water conservation can also exacerbate problems, such as the use of rainwater and water-saving fittings. He noted that there is a lack of, or old, regulations and guidance and higher void and plant room temperatures. Architects are demanding less space for services, but public health engineers need to fight against this. He also advised that temperature is not being monitored enough or correctly. With regard to over-sized tanks, designers refer to HSG 274 part 2 and water regulations, but water is coming in at temperatures above those recommendations. In order to avoid stagnation and have good flow, there is a need to understand the pattern and period of occupancy of buildings as well as the configuration of supply and equipment. Jonathan discussed a number of passive measures such as good insulation as well as active measures such as a circulating cold-water supply with automated and controlled flushing. There were pros and cons of each of these which need to be managed appropriately. He also discussed the Loading Unit Normalisation Assessment (LUNA) project with Herriott Watt university: *www.cibse.org/knowledge/knowledge-items/detail?id=a0q0O00000CBW9lQAH* for sizing domestic hot & cold water services. He advised that passive measures are best practice. Questions revealed that feedback is needed from FM companies and he believed that recent feedback from a Coroners court to RIBA and CQC would have a positive effect. He also advocated the need for risk assessment early in the design stages.

Eddie McLaughlan (Health Facilities Scotland) discussed lessons learned from recent healthcare projects. He also asserted the need for multidisciplinary teams with relevant education and excellent communication. Healthcare designs are sometimes copy and paste, not innovative and there can be a lack of technical skills in design teams. Items such as thermal models can be designed too late and thus do not inform the design solution. Contractors are employed with insufficient skills, knowledge and supervision; therefore installations are not to best practice. Healthcare specific competence is lacking and construction and design regulations not always followed effectively. This is then followed by poor commissioning and water distribution systems can be handed over already contaminated with harmful pathogens. Eddie discussed the problems with tracking the 'golden thread' of accountability should things go wrong. There is often minimal training at hand over and post-occupancy "as installed" information is incorrect with ongoing maintenance not to best practice. Following up on lack of training and insufficient competence, Eddie noted that FM teams are sometimes not fully competent or resourced in water hygiene management. He advised independent checks at all stages of the design and installation process and seasonal commissioning. Infection control staff are rarely trained in engineering and the risk from poorly managed water and do not always view this as their role. "New" microbes are being identified as the cause of infections, but there is still a lack of knowledge as to what to test for and what levels represent what risk? He advised that the jury is out on thermostatic mixing taps as there is mixed evidence at present, with complex interstices and organic materials being moved closer to the air / water interface when compared with thermostatic mixing valves. Eddie advised that a new national body will be formed in Scotland in the next financial year with a remit to improve the safety of the healthcare environment in relation to built environment risks. He also reviewed the Statutory Compliance Audit and Risk Tool (SCART) and HAI SCRIBE (Healthcare Associated Infection – System for Controlling Risk in the Built Environment) (based on HFN 30), which are multidisciplinary tools to help drive compliance. They are based on HSE principles using a proactive approach. They are web based and can be found on: *hfs.scot.nhs.uk*. Eddie advised the basic principles of Communication, Collaboration and Compromise.

A lively Q & A session with all the morning speakers then followed with the following information arising:

- The Premises Assurance Model (PAM) is mandatory in England now.
- Chemicals can invalidate certain warranties.
- Copper pipes are still not used in Scotland – stainless pipes instead.

There was a big discussion regarding wash handbasin (WHB) provision, succession management planning and a lot of reinventing the wheel! A question arose about the water management for modular designs as these are already in place for decontamination, theatres and ward blocks. These need to be risk assessed alongside temporary units such as mobile MRI units. Some thought process has gone into the routing of cold-water services via ventilated ceiling voids and whether there would there be a potential for heat recovery? British standards may need revision to account for newer technologies. The team needs to be provided with a "bag full of golf clubs" in order to have the right equipment to manage hospital water.

Graham Thompson (Oculus Consulting) and Council member of The Water Management Society opened the afternoon session. He noted that the tendering process of a large project includes detailed, complex tender information and once rolling, any changes can be very costly. An up to date water hygiene risk assessment needs to be conducted right from the design stage. Re-assessment is needed as complex process and documentation are adjusted during selection of components, 1st fix and again at substantial completion. Although there is plenty of guidance, Graham was able to present a number of case studies where design and selection issues went on to be present after handover e.g. very long pipe runs to drinking water fountains, dirty tanks at handover, instantaneous water heaters set at 38 degrees C and flexible hoses that sneak in when rooms are fitted out 'by others'. He asked what percentage of expansion vessels are of a flow-through design, as guidance recommends. Independent checks also need to be made during construction on workmanship, he showed an example of an installation with severe over-use of jointing compound and examples of access for servicing not being considered. Graham stressed the need for competent and experienced risk assessors very early in design process.

Professor Catherine Noakes (University of Leeds) discussed microbial exposure routes and mechanisms of aerosol spread. Toilet plume, for example, demonstrates an indirect evidence of spread in contrast with a clear association with taps and showers. Dispersal of aerosol is a combination of physics and biology. The physics of flow characteristics is crucial and mostly occurs as turbulent flow within domestic hot and cold-water systems. Cath showed images of types of water flow such as jet-flow which is generally seen in showers and taps. Exposure by splash is more often by toilet-flushing or the design of taps and basins. Other influences of importance are evaporation and ventilation. She provided evidence that droplets up to 100 microns are inhalable and that hydrophobic bacteria are more likely to aerosolise as they prefer the water-air interface. These factors all have implications for design. Cath also noted that just because you didn't sample it doesn't mean it's not there!

Mary Henderson (Rainbow Water) opened her presentation by explaining that all delegates will interact with healthcare on a personal basis, whether a visit to the dentist, or a member of their family attending Hospital. WMS members and the wider audience will be the influencers to ensure appropriate standards and guidance are in place for healthcare on water quality safety. Risk assessing both legionella risks and wider water quality safety in healthcare demands a higher level of competence and knowledge from service providers She discussed increasing risk due to complexity of systems and the susceptibility of occupants as reasons for this increased complexity, along with specialist equipment which comes under other risk systems. The Legionella Control Association (LCA) has made some clearer definitions of Healthcare premises in their September 2019 Newsletter; (those providing legionella risk assessments for healthcare should be registered for category 1.4 Healthcare Risk Assessment with the LCA and use the HTM 04-01 guidance, and those undertaking more than domestic legionella risk assessment (e.g. on specialist equipment) must be registered for category 1.3 (Process and Other Systems)). There is also a Healthcare facilities definition within HTM 04-01. She described some specialist water systems such as dental, renal, birthing pools and endoscopy washers. Mary explained the importance of Water Safety Groups and Water Safety Plans and referred to audit tools provided as part of HTM 01-05 for dental. Realistically each service should have bespoke risk assessment tools. With regards to risk she described 5 potential actions - Tolerate, Treat, Transfer, Terminate or Take the opportunity. The risk appetite of a Trust is linked to strategic objectives and will take into account all risks within their remit. There will be a risk escalation process from the Directorate to Divisional and then Corporate and these risks need to be prioritised across the entire Trust. She advised that Scotland are developing risk-based guidance and the consequences of failure to manage risk are widespread and can result in large fines.

The final questions and answer session centred around how to balance risk (especially regarding "Never-Events" and what can be learned from looking back with hindsight). There was some discussing about the risks of using rainwater for flushing toilets, although they are not permitted in the latest version of HTM 04-01, many healthcare buildings had them installed according to previous design requirements. In reality there is no real difference between toilet designs with regard to aerosol production and having the lid down can create a jet effect.

The feedback from the event was excellent, with plenty of future topics suggested by the delegates for WMSoc to work on for their 2020 programme.

- Elise Maynard

DESIGNING OUT 3

Effect of sample pH on the identification of an NRB in Closed Hot and Cold Water Systems

Pamela Simpson (PhD), Whitewater Technologies Ltd and Richard Jones (MSc), Cheshire Scientific Ltd.

Introduction

A closed re-circulating pipework system is one which, as the name implies, is closed i.e. the water in them is not exposed to the atmosphere and is not significantly depleted due to evaporation or draw-off. The water is permanently enclosed and typically spends all of its time being heated, cooled and re-circulated in the process of delivering heating or cooling.

The potential problems in closed systems can start during construction. In large buildings, heating and cooling circuits can include pipes that are over a metre in diameter. In an ideal world, these pipes would be installed in a clean, debris-free condition but in practice, this is not always the case.

Pre-commission cleaning of closed circuit pipework systems and the subsequent monitoring of water quality are essential in any building. The implications of getting these wrong can be catastrophic. The resulting problems include disruption to occupants whilst systems are re-cleaned or, in the worst cases, complete closure of buildings whilst entire systems are ripped out and replaced due to early failure.

In theory, once the system is put into operation, the corrosion process should be controllable. If there is no replacement of the water in the system, the oxygen in the water should gradually become depleted thereby stifling the corrosion. Furthermore, corrosion inhibitor chemicals (such as nitrite and molybdate) should be added to further reduce the rate of corrosion. However, these may be depleted in a closed system by developing protective layers on pipes or reacting with any remaining oxygen in the water. Of more concern is the realisation that some inhibitors can provide a food source for certain bacteria, known as NRB especially if an appropriate biocide has not been dosed or maintained within the system.

Sources of Bacteria and Associated Problems

All natural sources of water (including mains water) contain many different types of bacteria, some of which may multiply and lead to problems within closed systems if they encounter suitable conditions for growth. Mild steel, stainless steel and copper are thought to be particularly prone to microbial influenced corrosion (MIC). For MIC to occur, it is necessary for some types of bacterial species to colonise the metal surface. The extracellular material produced by rapidly multiplying aerobic bacteria species e.g. *Pseudomonas* spp develops into a biofilm (i.e. slime) which produces both aerobic and anaerobic zones. The low oxygen levels within the system and under the biofilm enable anaerobic bacteria, e.g. sulphate reducing bacteria (SRB), to multiply and these species can be associated with localised pitting corrosion.

Another further species often associated with a biofilm is the NRB, *Pseudomonas denitrificans*. This species can enter closed systems via fill or top-up water during commissioning and will multiply if given an adequate food source such as a nitrite corrosion inhibitor. Loss of this corrosion inhibitor may contribute to a decrease in metal surface protection, but also an increase in corrosive ammonia and nitrogen gases within the water system. It is therefore essential to be able to identify the presence of NRB within a closed system to prevent pipe surfaces being left vulnerable to corrosion.

Microbial Water Analyses of Closed Systems and Pitfalls when looking at NRB

However, on occasion, the results obtained for bacteria, in particular NRB, can be misleading and the detection of NRB should be correlated to the water chemistry results. Table 1 illustrates how the detection of NRB is considered unlikely on 4/12/17 as neither TVC nor *Pseudomonas* spp were detected suggesting that the water was of acceptable quality microbiologically. However NRB were recorded as "heavy growth" and the nitrite levels were low suggesting that NRB had consumed the inhibitor. But is this the case?

As *Pseudomonas* spp. are one of many denitrifying bacteria, their presence (certainly if present as "heavy growth") would be detected in the TVC analysis and possibly also in the *Pseudomonas* spp. analysis. Although NRB have specific nutrient requirements for growth, some NRB species (other than *Pseudomonas* spp) may grow on both NRB Sig Nitrite Media and TVC Yeast Extract Agar but may be absent from a Pseudomonas Agar plate. Thus NRB species would always be detected on either TVC or Pseudomonas growth media if "heavy growth" has been recorded in the NRB test.

Table 1 below illustrates the point that the NRB recorded (as heavy growth) may be a false positive, especially in light that no bacteria are recorded for TVC and *Pseudomonas* spp.. Low levels of nitrite inhibitor, in his case, were more likely attributed to the inhibitor being absent or at a low concentration.

In this example, the system water pH was 9.9 (high for a closed system, usually in the range 7 - 9.5) and it was considered that the high pH may be contributing to the false positive of the NRB test. Laboratory techniques often use a Sig Nitrite Test. This utilises the production of ammonia and nitrogen gas by NRB to detect their presence in aqueous solutions. A positive reaction for this test is indicated by a pink colouration of the media as the production of ammonia by NRB increases the media's pH and/or the production of bubbles in the media by nitrogen or other gas production.
Water samples from closed systems often have a high alkalinity and have been shown to produce an instant pink colouration in the Sig Nitrite Media test. The colouration is intensified the longer the samples are left. If looking for a colour change as part of the laboratory protocol, these samples would be recorded as having "heavy growth" even though NRB are absent, leading to a false positive result and possibly unnecessary re-dosing of a system with biocide.

Controlled laboratory Investigation to Correlate pH with Colour Change

A laboratory investigation was carried out to identify if pH could contribute to a false positive as observed by a colour change. **Figure 1** (right) illustrated how sterile water samples influenced the colour change when pH was altered.

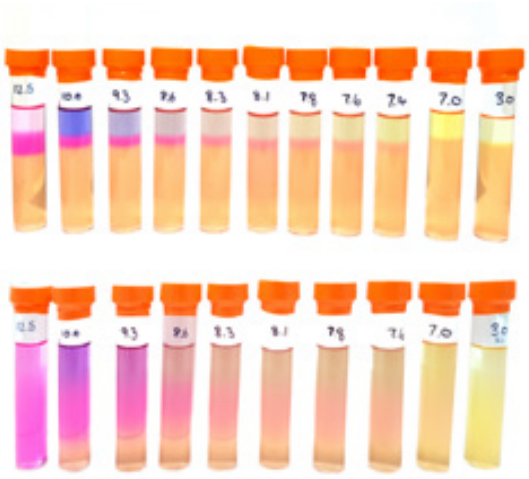
These tests confirmed that the effects of sample pH on the interpretation of Sig Nitrite Test results were deemed negligible at less than pH 7.4, but significantly altered the colouration above this pH which, for closed systems, would give a false positive result each time.

One other criteria of this test was to look for bubbles of ammonia gas produced by the growth of NRB bacteria within the media. However further studies using water samples inoculated with *Pseudomonas denitrificans* showed that bubbles were not produced by this species at any pH tested. A more intense pink colouration formed however, and it would

Table 1: Typical water analysis for a LTHW closed system

Date	LTHW System	*Pseudomonas* spp (cfu/100ml)	TVC at 22°C (cfu/ml)	NRB	pH	Nitrite (mg/L)
4/12/17	LTHW riser L13 Block X	0	<10	Heavy Growth	9.9	<9.9
	LTHW riser L11 Block Y1	0	<10	Heavy Growth	9.9	<9.9
	LTHW riser L09 Block Y2	0	<10	Heavy Growth	9.9	<9.9
	LTHW riser L11 Block Y3	0	<10	Heavy Growth	9.9	<9.9

Figure 1: Effect of pH on the colour change in sig Nitrite Test Media after 48 hours and 5 days respecitvely



be advised to set up a sterile blank of the same pH value for samples above pH 7.4. This would then be incubated alongside the sample and used as a comparison to differentiate the pink colouration caused by ammonia production from the pink colouration caused by sample pH. As discussed, *P. denitrificans* may not produce copious gas bubbles in the Sig Nitrite media and this may also be the case for other NRB species, thus it is only possible to rely on the pink colouration caused by ammonia production and differentiate this from the pink colouration caused by high sample pH in order to confirm the presence of NRB.

Conclusion

Closed water systems operate at a water pH in excess of 7.5. The methodology used within laboratories to identify NRB species is known as a Sig Nitrite Test. Often water results are reported as having heavy growth of NRB even in the absence of the detection of *Pseudomonas* species and Total Viable Counts (TVC). Having carried out a study using sterile pH adjusted water, it became apparent that the media used in the Sig Nitrite Test is pH sensitive and a pink colouration occurs in the absence of NRB species at a pH as low as 7.4. Furthermore, the NRB species, *Pseudomonas denitrificans*, did not produce bubbles of gas which are often used as a second indicator of NRB activity within the test. These species did contribute to a colour change within the test media and at a higher pH (ie greater than pH7.4 and characteristic of closed systems) it is advised that a sterile pH adjusted control is included in the test to compare the intensity of the pink colouration. It is hoped that by the inclusion of a sterile blank that false positives will be reduced within the closed water industry and avoid any unnecessary addition of biocides and/or system re-cleans.

About the Authors

Dr Pamela Simpson is a Chartered Fellow of the Society of Biology. She established Whitewater Technologies in 1998, before which she spent over eight years working in the speciality chemicals industry, initially as a Technical and European Director of the Industrial Biocides Division of a major chemicals manufacturing and processing company. She has developed a broad knowledge of the application of microbial control techniques in product preservation and antimicrobial surface protection, process water control, and microbial issues within hot and cold closed systems for both healthcare new-builds and commercial premises. She is also an approved trainer for Legionella awareness courses for water treatment engineers. Her recent work involved expert work for microbially-influenced corrosion in a range of commercial and healthcare buildings of hot and cold closed systems. She was on the Steering Group for the writing of BSRIA BG50/2013: Water treatment for closed heating and cooling systems.

Richard Jones (MSc) is a skilled and confident microbiology technician at Cheshire Scientific Laboratories, with 8 years experience in bacteriological water analysis using a broad range of traditional culture and molecular biology assays, further expanding his skill set in 2017 by obtaining a MSc Biomedical Science Distinction.

P. aeruginosa - Housekeeping in hospitals

How well do we know the bacteria that we need to control/eliminate from our hospitals?

Karina Jones, WCS Group

That is a VERY good question,... I'm sure not all healthcare personnel are aware of what the bacteria is or is capable of? and what the fuss is all about with regards to the need for its control / eliminate it from our hospitals? And this precisely is my point!

We need to understand the bacteria (little soldiers of the microbial army, if you would like to refer to it as such), in order to apply the correct action. We are all very busy in ensuring that we follow our own paths of responsibility with diligence and precision, and of course we automatically assume that our colleagues will do the same?
However, I have come across many situations where this is not always the case (and this is not to be taken as a criticism, but simply as an observation), not all of our dedicated staff which work so hard at our hospitals have been provided with the knowledge they require to allow them to do the correct thing to help us to eliminate the bacteria.

This brings me to this small list on P.aeruginosa bacteria characteristics and its discovery, (without being too technical):

Pseudomonas was discovered by Carle Gessard in 1882 (somewhat 137 years ago), and named by Walter Migula in 1894, it is an aerobic, gram negative bacterium which is rod shape (very similar to the Legionella bacterium in that respect), with polar flagellum. The shape of these bacterium helps it to swim in any water systems, even against the water flow.

- It thrives not only in normal atmospheres, but also in hypoxic atmosphere (deprived of adequate oxygen supply at the tissue level).
- It has very simple nutritional requirements. It is often observed "growing in distilled water", which is evidence of its minimal nutritional needs.
- *P. aeruginosa* possesses the metabolic versatility for which pseudomonads are so renowned, organic growth factors are not required, and it can use more than seventy-five organic compounds for growth, making it very resistant to many commonly used antibiotics.
- Its optimum temperature for growth is 37 degrees, and it can grow at temperatures as high as 42 degrees.
- It is tolerant to a wide variety of physical conditions, including temperature.
- It is resistant to high concentrations of salts and dyes, weak antiseptics, and many commonly used antibiotics.
- It will colonise many natural and artificial environments and therefore can be found even in commonly used items, such as re-usable disinfectant spray bottles for example that are often used by the cleaning staff.
- Because of the size of the bacterium it can be filtered out by using a point of use filters (POU), which are commonly used in health care to prevent further contamination. There are some Pseudomonas, though that are much smaller in size and therefore the use of point of use filters would not prevent the bacterium from contaminating other areas, these strains are Burkholderia and Ralstonia.
- There are 190 species of Pseudomonas known to us now and all are able to survive harsh environments.
- The bacterium has the ability to have cell-cell communication or quorum sensing (QS), via the production of small molecules called auto-inducers. This allows the bacteria to rapidly adapt to surrounding changes through environmental signalling.

These natural properties of the bacterium undoubtedly contribute to its ecological success as an opportunistic pathogen. They also help explain the ubiquitous nature of the organism and its prominence as a nosocomial pathogen. Perfect little soldier in the microbial army!

With all aspects of life, prevention is better than cure saving a lot of time and costs.

The strong indication here is to ensure we can prevent the bacteria in taking hold and establishing itself in the first place, as once a biofilm is established it is very difficult to remove the bacteria from the contaminated area, often spending lots of time on remedial works and preventative action, such as the application of point of use filters to ensure our patients stay safe. The stages at which the P.aeruginosa grows and develops in a biofilm is shown below:

- The biofilm growth develops in five stages:
- Initial attachment – first stage of biofilm, slimy surface

- Irreversible attachment – the second build-up of slimy surface
- Maturation 1- Multiplication of bacterium not only P. aeruginosa
- Maturation 2- Further growth of the slimy house within which P. aeruginosa and other bacteria is protected from any form of biocide and temperature.
- Dispersion - Final stage where all the bacterium including P. aeruginosa is dispersed into the water system free to colonise in other areas.

Source of Pseudomonas aeruginosa contamination leading to biofilm formation include the, following criteria, which in a lot of instances can be controlled by the actions we take.

- Contamination during contraction and repair of distribution system.
- Unsuitable materials of construction
- Temperature allowing growth of P. aeruginosa
- Stagnation of water in the building
- Badly designed tanks and expansion vessels
- Low use of outlets
- Poor hygiene at point of use and in other areas.
- Scaled up flow straighteners or spray outlets (showers)
- Complex components, which will include rubber and plastic
- Foul drainage, which can become blocked and start backing up

- Loss of control in areas of poor water flow.

Recognising the devastating effects of P.aeruginosa bacteria and the effects it has on our wellbeing.

P. aeruginosa bacterium almost never infects healthy tissue, yet there is hardly any tissue that it cannot infect if the host defences are compromised in some manner. It has been shown in recent years that there is a steady increase in resistance to antibiotics, which is very hard to avoid in healthcare scenario. P.aeruginosa bacteria can affect;

- Urinary track
- Respiratory system
- Dermatitis
- Soft tissue
- Bacteraemia and septicaemia
- Bone and joint
- Gastrointestinal
- Central nervous system
- Ear infections
- Keretitis caused by P. aeruginosa can result in blindness
- Can affect variety of patients with severe burns, also cancer and AIDS patients.

Observation and action

I often attend WSG groups meetings where all the relevant persons are present, but often housekeeping members of staff are not available to contribute their information to the group, and yet these are the person(s), who undoubtedly can inform us of so much with regards to their outlets state (is it clean, is scale present, is it used, has flexible hoses, dirt…), the same would apply to use of the rooms on the wards, often the frequent change of room usage is discovered by our cleaning staff, what was once a patients clinic room has become a store room, but not everyone is aware of it!

The WSG persons required to be present at water management meetings are:

Statuary Duty holder – Chief Executive (owner, CEO, Board of directors)

Designated person (water) Board level, Organisational arrangements

Responsible person (director of Estates)

Deputy responsible person

Site responsible person

Head of Infection Control (doctor, nurse)

Consultant medical microbiologist

Authorising Engineer – Independent professional advisor

Cleaning department, housekeeping control

I can perceive, there are only some people listed above, who would be more likely to know and understand the site in detail and one of them would be from the housekeeping department.

It is unfortunate that housekeeping staff at our hospitals have the highest turnover of employment and even though I'm sure all staff undertake the required training course as per HTM 04-01 – "The guidance also outlines that any person working on water distribution systems **or cleaning water outlets** needs to have completed a water hygiene awareness training course."

This vital information can be lost and often not be passed on correctly to the next employee, not to mention passing on and explaining **the reason why we need to take the essential course which shows the correct cleaning procedure?**

I believe if we understand **the reason why**? certain action are required to be completed in a specific way we are more willing to carry them out **diligently**, and this is why I feel the added information on the bacteria characteristics itself, can be of a benefit to staff who deal with water especially in the Hospital scenario, information on how cleaning and hygiene methods should be applied to our taps/showers, can be very easily overlooked as one of the most important actions carried out!

Once you know your enemy (P.aeruginosa), you are in a better position to defend and be proactive against it in the future.

Looking back to history, Florence Nightingale - The first thing she did with her team of nurses was scrub the hospital from top to bottom, provide clean clothing and make conditions, overall, sanitary.

Secondly, prior to Nightingale, nursing was thought of as a lowly profession, similar to our cleaning staff of today. She fought to raise the standards of nursing, highlighting sanitary conditions, educating her staff.

CONTRACTS, PRODUCTS & PUBLICATIONS

The information and advertising of products and services in this section and throughout this publication is not necessarily endorsed by the editors or the Water Management Society, who accept no responsibility for the accuracy of information in contributing articles.

RNLI launches funding appeal

Lives will be lost at sea unless donations to the RNLI increase, the charity has warned as it airs its first television advert in Britain in over a decade. Created as part of the RNLI's "Perfect Storm Appeal," the commercial includes real-life footage from previous rescues.

It comes as the number of people relying on the rescue service reaches a record high, with an average of 26 people being saved per day last year. RNLI leaders said the advert will highlight the importance of its mission to 500,000 existing members after experiencing a decline in donations left in wills.

Jayne George, the RNLI's funding director, said: "We want to thank our loyal supporters – without them we would not be providing the world-class life-saving service we are renowned for today. This campaign is about thanking them and re-engaging with them, but also trying to attract new supporters to provide ongoing, longer-term support for the RNLI."

Editor: I'm honoured to have worked alongside an RNLI lifeboat crew member for many years in the water treatment industry. He has appeared several times in the "Saving Lives" TV programme, has 18 years of service with the RNLI and is a helm and training co-ordinator with Porthcawl RNLI. Take a bow Simon Emms.

River pollution tests drop by 50% in 5 years

The number of tests on Britain's rivers to check they are not polluted has fallen by nearly 50 per cent since 2013, new figures show. Data obtained by Unearthed, the investigative arm of Greenpeace, shows that the Environment Agency last year carried out sampling on 5,001 fewer waterways than five years previously.

In 2013 the Agency took water quality samples at 10,797 sites with that number gradually tapered off over the ensuing years, dropping to just 5,796 sampling points in 2018.

During the same period the number of water quality samples also fell by 45 per cent - from 160,000 to 87,000 - due to a change in how collections are carried out.

Stuart Singleton-White, of the Angling Trust, said, "This is incredibly concerning and very serious. Our rivers are deteriorating. The number of pollution incidents seems to be increasing. The Environment Agency can't say with any confidence what the state of our rivers is because they're not monitoring them closely enough."

Mary Creagh, chair of the environmental audit committee, said "Our committee said a year ago that the agency does not have the staff and resources to monitor water quality and these new figures show how the monitoring has fallen off a cliff in recent years. It is completely unacceptable."

Weather monitoring in extreme conditions

A VENTUS X ultrasonic wind sensor has been deployed by researchers at the Summit Station on the Greenland Ice Sheet in the Arctic, 10,000 feet above sea level, as part of a project investigating the role of aerosols in cloud formation. With integrated heaters and no moving parts, the wind sensor does not require recalibration – a vital feature of equipment in one of the most remote locations on Earth.

Aerosols are important in cloud formation because they act as condensation nuclei, providing seeding sites for water vapour condensation, and as ice nucleating particles which modulate the formation of ice in clouds.

The Greenland Ice Sheet is of critical importance to human society because of its role in global sea-level rise, and is of particular concern because it is melting at an increasing rate. An understanding of aerosol-cloud interactions is therefore extremely important; especially where clouds are comprised of both ice and supercooled liquid water, because this represents a major source of uncertainty in weather and climate models.

Scientists from the University of Leeds School of Earth and Environment, and the National Centre for Atmospheric Science are therefore seeking to reduce this uncertainty with the use of advanced remote sensing technology, such as radar and lidar, in combination with satellite observations and a suite of other ground-based sensors (such as the VENTUS) and state-of-the-art numerical weather and climate models.

The project is seeking to determine the extent to which different aerosol properties cause significant changes in clouds, and to quantify the role aerosols may have on the melting of the Greenland Ice Sheet. In addition, this work is evaluating regional and global numerical weather and climate model performance against the project's observations; to identify any deficiencies that lead to biases in cloud occurrence, cloud thickness, and phase partitioning.

River Thames – breeding ground for superbugs, says report

The amount of antibiotics entering the River Thames would need to be cut by as much as 80 per cent to avoid the development and spread of antibiotic-resistant 'superbugs', a new study shows. Scientists from the Centre for Ecology & Hydrology (CEH) modelled the effects of antibiotic prescriptions on the development of antibiotic-resistant bacteria in a river. They found that across 75 per cent of the Thames catchment, antibiotics present were likely to be at levels high enough for antibiotic-resistant bacteria to develop.

Dr Andrew Singer of the CEH, who led the study said: "Rivers are a reservoir for antibiotic-resistant bacteria which can spread quickly to people via water, soil, air, food and animals. Our beaches offer a similar risk. It has been shown that surfers are four times more likely to carry drug-resistant bacteria than non-surfers."

Up to 90% of prescribed antibiotics taken by people pass through the body and into the sewerage system, where about half end up in rivers when effluent is discharged.

Ashtead Technology appointed rental partner by Drain Doctor

Ashtead Technology has been appointed as the Preferred Rental Partner for the CCTV inspection equipment needs of Drain Doctor, the UK's largest drain clearance and emergency plumbing company. With over 57 locations across the UK, the deal will ensure that all Drain Doctor's plumbing and drainage engineers are provided with quick and easy access to the latest inspection tools including crawlers, push rods and ATEX systems, from leading brands such as MiniCam, iPEK, Pearpoint and Wohler.

Drain Doctor's Purchasing Manager Steve Pickwell, says: "With Drain Doctor franchisees spread across England, Scotland and Wales, and engineers serving both residential and commercial customers, every job is different, and the equipment requirement varies accordingly. Access to Ashtead's fleet of inspection tools will therefore help to avoid significant investment costs and ensure that we are able to quickly solve customers' plumbing and drainage problems." Drain Doctor has been providing professional plumbing and drainage services in the UK since 1994, and CCTV drain surveys form an important component of the services provided. This is because remote visual inspections help to identify the cause of problems quickly and cost-effectively, without having to dig holes or trenches.

Expressing his delight with the announcement, Ashtead Technology's Regional General Manager, Ben Travis says: "We have invested over £198k in our CCTV inspection rental fleet in the past 12 months which demonstrated to Drain Doctor our ability to serve all of their franchisees. Our partnership with Drain Doctor will help them to deliver peace of mind to customers, by ensuring that their engineers have access to the most appropriate CCTV equipment for every job."

For further information email: gmeller@buttonwoodmarketing.com

Government action threatens British native oysters

Foreign oysters are colonising Britain's coastline after the Government introduced Pacific shellfish to help native stocks, experts have complained. Pacific oysters, introduced to supplement the shellfish industry following the decline of native oysters due to over-dredging, now threaten the species they were supposed to help.

The faster-growing Pacific oysters were imported by the Ministry of Agriculture, Fisheries and Food and grown in mesh bags in UK estuaries. Many have now escaped the bags and are invading native habitats. They have made some beaches too hazardous for owners to walk their dogs on, changing the nature of the shore by creating sharp intertidal oyster reefs, and smothering intertidal rock.

"We have seen an explosion in numbers around our coast and it has the potential to radically alter marine ecosystems and in protected areas of real natural significance," said Matt Slater of Cornwall Wildlife Trust.

Volunteers plotting the distribution of the Pacific oysters counted some 76,000 in Cornwall alone over recent months.

Instant Micro Confirmations Introduced at ALS's Wakefield Laboratory

ALS Environmental is now offering instant confirmations using MALDI-ToF (Matrix Assisted Laser Desorption Ionisation - Time of Flight) analysis at its Wakefield laboratory, cutting wait times dramatically. MALDI-ToF technology has been in use at ALS's Coventry site for some time now and both sites are fully ISO 17025:2005 accredited. Until recently, MALDI-ToF was primarily used in healthcare but ALS has spearheaded its use in the environmental sector, being one of the first to gain accreditation for its use in this capacity.

Wakefield Microbiology, Cryptosporidium & Logistics Manager, Christopher Ulph, comments: "The introduction of MALDI-ToF at Wakefield has significantly reduced confirmation wait times while maintaining scientific rigour and the integrity of our results"

MALDI-ToF works by vaporising a sample, in this case biological samples, while reducing the fragmentation that often occurs when ablating large molecules. This means that largely intact biomolecules, like proteins for example, can be accelerated into a mass spectrometer for analysis and their composition quickly determined. Most commonly a time-of-flight mass spectrometer is used as it can detect a wide range of masses, making it perfect for detecting the huge variety of masses found across biological samples. In simple terms, the instrument measures how long it takes for the sample to traverse it - the longer it takes the bigger the molecule.

Identification of the sample is achieved by comparing the results of the analysis with a database of known examples, looking for a protein 'fingerprint' that is unique to a particular species. If the results match, it can be confirmed that a particular organism is present in the vaporised sample. ALS currently, can confirm the presence of the following organisms using this technique: Enterococci; Coliforms e.g. E. coli; Pseudomonas; Salmonella and Clostridium.

If you'd like to know more about MALDI-ToF, contact Benjamin Parr, Sales and Marketing Assistant, ALS Environmental, UK & Ireland, T +44 (0) 2476935118

Scientists create slippery toilet coating that stops poo sticking

Researchers at Penn State University in the US have created an ultra-slippery toilet coating that could help save vast quantities of water around the world. Scientists say the coating cuts the amount of water required to flush excrement by 90% and also prevents bacteria from building up in toilet bowls and reduces associated odours.

The spray, which is more slippery than Teflon, would be affected by urine and need reapplying after about 50 flushes.

According to the researchers, who published their findings in the journal *Nature Sustainability*, the fresh water used to flush the world's toilets each day is six times Africa's total water consumption.

"Our team has developed a robust bio-inspired, liquid, sludge- and bacteria-repellent coating that can essentially make a toilet self-cleaning," Tak-Sing Wong, associate professor of mechanical engineering at the university, told Penn State News.

"Poop sticking to the toilet is not only unpleasant to users, but it also presents serious health concerns," he said. "Our goal is to bring impactful technology to the market so everyone can benefit," he added.

Micronics portable flowmeter used to check flow rates in Northwest swimming pools

CASE STUDY

A Stockport supplier of engineering solutions and services to the public swimming pool industry uses a Micronics Portaflow 330 to check the flow rates in swimming pools throughout the country. Lance Brookes, Head of Service for FT Leisure had an older Portaflow which he had used successfully on many occasions so replaced it with a Portaflow 330 in summer 2018. "The Portaflow is ideal because it is fully portable, which means we can use it in multiple locations. It allows us to establish the turnover of water in order to accurately estimate how long each swimming pool needs to be shut down for. We are very happy with its performance and would have no hesitation recommending it to others."

The clamp-on flow meter is ultrasonic and non-invasive which means it delivers simple, quick and accurate flow measurement from outside the pipe. There is no interruption to process and no downtime whilst it is used, crucial when using it to measure flow in swimming pools which are used every day of the week, with results achieved within minutes.

The Portaflow range has been designed to provide sustained performance in industrial environments such as the water, building services, energy management, power generation, and chemical, pharmaceutical, petrochemical and the food industries. Applications are diverse including HVAC and energy system audit, checking system meters, verifying pumps, testing boilers, sizing filters, measuring ultrapure water, metering heavy fuel oil and condensate measurement. It is recommended for many different fluids including potable water, river, cooling and demineralised water, water/glycol solutions, hydraulic, diesel and fuel oils, chemicals and petroleum products. And the rechargeable battery allows it to be used where there is no easily available mains power.

For further information on this project or the Micronics range call Micronics on: +44(0)1628 810456 or visit: www.micronicsflowmeters.com.

Micronics Portaflow 330
Image: micronicsflowmeters.com

Radioactive-free vodka produced from crops in Chernobyl

A radioactive-free vodka produced from crops in Chernobyl's abandoned zone has been brewed by a team of scientists. Professor Jim Smith, at the University of Portsmouth, described the artisan vodka – branded ATOMIK – as possibly the most important bottle of spirits in the world. He and colleagues in Ukraine, where vodka is traditionally brewed, hope it will help the region recover economically.

Professor Smith and colleagues in the UK and Ukraine recently presented the results of a three-year research project into the transfer of radioactivity to crops grown in the Chernobyl Exclusion Zone. They now want to produce the vodka made from grain grown near Chernobyl, and give 75 per cent of the profits back to the affected community. Many thousands of people are still living in the Zone of Obligatory Resettlement where new investment and use of agricultural land is still forbidden.

The team found some radioactivity in the grain: strontium-90 is slightly above the cautious Ukrainian limit of 20 Bq/kg. But, because distilling reduces any impurities in the original grain, the only radioactivity the researchers could detect in the alcohol is natural Carbon-14 at the same level you would expect in any spirit drink. They have diluted the distilled alcohol with mineral water from the deep aquifer in Chernobyl town, 10km south of the reactor, which is free from contamination.

"We don't think the main Exclusion Zone should be extensively used for agriculture as it is now a wildlife reserve," said Professor Smith. "But there are other areas where people live, but agriculture is still banned. We aim to make a high-value product to support economic development of areas outside the main Exclusion Zone where radiation isn't now a significant health risk."

Image: www.atomikvodka.com

The report has been positively received by the State Agency of Ukraine for Exclusion Zone Management. Mr Oleg Nasvit, First Deputy Head, said: "We welcome this initiative to use abandoned lands to help local communities. It is important that we do everything we can to support the restoration of normal life in these areas whilst always putting safety first."

Low Cost Test Solution for Unblended Hot and Cold Water Pipes

TME's Double TC Wall Port is a NEW test accessory for simplifying test and monitoring of unblended hot and cold water temperatures for legionella risk management. TME's TC Wall Port System already provides a low cost solution for connecting fine-wire temperature sensors/probes to concealed TMVs, crowded calorifier pipes and overhead tanks. The Double Port is a new addition to the system, connecting two pipes from one location to facilitate remote tests on unblended hot and cold water pipes.

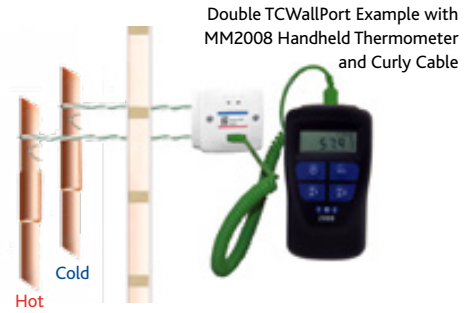
The Double TC Wall Port is the same compact size as the single (52 x 52 mm) but houses two thermocouple connection points instead of one, wired to a choice of lengths up to a maximum of 20 metres. Attach the sensors to hot and cold feed pipes and leave them in place. Ongoing tests are easily taken by plugging a thermometer into the wall port without needing to access the pipes directly, delivering an instant, accurate result every time.

Any thermocouple input thermometer is compatible but TME recommends its MM2000 or MM2008 with a single plug to plug cable (only one required). For paperless recording, the TC Wall Port System is compatible with TME's unique MM7000-2D Barcode Scanning Thermometer.

TME also supplies TC wall Port compatible WiFi Data Loggers with single or double thermocouple TMELOG1210 or TMELOG1250 offering continuous temperature profiling with email and text alerts plus optional cloud data storage.

TME is a UK manufacturing company, supplying thermometers and temperature sensors for all uses but especially Legionella Risk Management and Food Safety.

For further information visit: www.tmethermometers.com



Images: www.tmethermometers.com

US moving away from burning coal to produce electricity

On November 18, the largest coal-fired power plant west of the Mississippi River permanently ended operations. The shutdown of Navajo Generating Station brought an end to a four-decade relationship in Arizona between a coal plant and water-supply infrastructure.

For the utilities, the decision to flee from a fuel that, just a decade ago, accounted for nearly half of U.S. electricity production is a result primarily of economic forces. Electricity derived from natural gas, wind, and the sun is cheaper today than that from coal. The same economic forces are in play across the United States, where coal plants are closing at a record pace. At the end of 2018, coal contributed less than 28 percent of the nation's electricity mix.

Completed in 1974, the power station, located on Navajo Nation land in northern Arizona was the engine that drove the pumps of the Central Arizona Project, a bulk water provider that is the largest power user in the state. CAP's water supply network extends some 336 miles into Arizona's high-growth metropolitan core. It does not cross flat land, either, with the pumps lifting the water up nearly 3,000 feet in elevation, from Lake Havasu to Tucson.

The CAP will replace the power from Navajo Generating Station with a mix of sources. The agency has signed two long-term agreements for solar power. The cost is roughly half the cost of power from the coal plant. Solar contracts, combined with hydropower from Hoover Dam, will provide about a quarter of the project's electricity, operations power and engineering director at Central Arizona Project, Darrin Francom said. The remainder will be purchased on the open market.

There are risks that market prices will fluctuate, Francom said.

But current prices are "very favourable," he said.

So favourable, in fact, that CAP will save money with the closure of Navajo Generating Station. CAP energy costs in 2020 are expected to be $54 per acre-foot nearly half that which was forecasted in 2016 when officials projected energy costs in 2020 to be $101 per acre-foot.

Note: In the USA, water is commonly measured in acre-feet. But what is an acre-foot? One acre-foot equals about 325,851 US gallons or 1233 m^3 or enough water to cover an acre of land, about the size of a football field, one foot deep.

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Investigation of atmospheric conditions fostering the spreading of Legionnaires' disease in outbreaks related to cooling towers

Paper – published in July 2019

Int J Biometeorol. 2019 Oct;63(10):1347-1356. doi: 10.1007/s00484-019-01751-9. Epub 2019 Jul 24.

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Abstract

Legionnaires' disease (LD) is a severe lung infection caused by the bacteria Legionella pneumophila which is usually associated with water managing installations like cooling towers. Several outbreaks of LD have been linked to individual sources of bioaerosol in the past. However, the transmission pathways as well as the influence of meteorological factors in the spreading of such bioaerosols remain unclear. Using the meteorological data near 12 LD outbreaks in Europe for the period 2000-2016, the correlation between key meteorological factors and the occurrence of LD was assessed. Temperature, humidity, atmospheric pressure, wind speed, precipitation, cloud cover and, for the first time, fog occurrence were included as potential risk factors. It was found that the occurrence of fog was related to four of the LD outbreaks, suggesting that the presence of fog droplets and/or the thermal inversions associated with fog may play a role in the disease spreading. This finding can contribute to outbreak investigations and to the prevention of future outbreaks.

https://www.ncbi.nlm.nih.gov/pubmed/31342243

English water companies to plant 11 million trees by 2030

Water companies in England announced in August ambitious plans to plant 11 million trees, part of a wider commitment to improve the natural environment, to support their goal of achieving a carbon neutral water industry by 2030.

The joint proposals will see trees planted on around 6,000 hectares of land across England together with work to restore original woodland and improve natural habitats that themselves provide carbon capture. While some of this land is owned by the water companies themselves, additional land will be provided by partners such as local authorities, The National Trust, The Wildlife Trusts and The RSPB.

Local partnerships with councils and regional NGOs will ensure that projects include urban tree planting, to bring much needed health and wellbeing benefits to communities in towns and cities. In addition, The Woodland Trust has agreed to work with all the water companies to help identify sites and manage the planting programme once it is developed. Water companies will also look to join forces with existing initiatives such as the National Forest and Northern Forest.

The plan builds on a strong track record in habitat conservation and tree planting by the water industry. For example, United Utilities has already planted around 800,000 trees since 2005 and is committed to a further 440,000 in the next five years. Severn Trent has planted over 500,000 trees since 2015 and plans are in place for 250,000 trees to be planted in the next five years. In addition, Anglian Water has plans to plant a million trees, hedging plants and shrubs in urban areas, as part of a 25-year initiative.

The industry already has plans in place to plant the first 2.5 million of the 11 million trees. The next priority will be to identify additional sites across England which are appropriate for tree planting or habitat restoration.

New network of weather stations in Sheffield

OTT HydroMet is installing fifteen automatic weather stations as part of the University of Sheffield's Urban Flows Observatory, which is led by the Departments of Civil and Structural Engineering, and Automatic Control and Systems Engineering (ACSE). The monitoring sites are conveniently located at Sheffield schools, and data from the stations will contribute to the project's wider environmental monitoring objectives which include the free publication of data.

Like most cities, Sheffield faces challenges connected with air quality, carbon emissions, traffic congestion and a changing climate. The Urban Flows Observatory is therefore working to better understand energy use across the city by combining a variety of environmental and atmospheric data sources to create a dynamic model of the flows of energy and resources in the city. Weather conditions play an important role in this, so OTT Hydromet was commissioned to build a meteorological monitoring network.

"Time bomb" in fresh water lakes

Source - University of Cambridge. The original story is licensed under a Creative Commons License. *Note: Content may be edited for style and length.*

Journal & Author Reference: Andrew J. Tanentzap, Amelia Fitch, Chloe Orland, Erik J. S. Emilson, Kurt M. Yakimovich, Helena Osterholz, Thorsten Dittmar. Chemical and microbial diversity covary in fresh water to influence ecosystem functioning. *Proceedings of the National Academy of Sciences*, 2019; 201904896

DOI: 10.1073/pnas.1904896116

Every drop of fresh water contains thousands of different organic molecules that have previously gone unnoticed. By measuring the diversity of these molecules and how they interact with the environment around them, research has revealed an invisible world that affects the functioning of freshwater ecosystems and can contribute to greenhouse gas emissions.

Small shallow lakes dominate the world's freshwater area, and the sediments within them already produce at least one-quarter of all carbon-dioxide, and more than two-thirds of all methane released from lakes into our atmosphere. The new research suggests that climate change may cause the levels of greenhouse gases emitted by freshwater northern lakes to increase by between 1.5 and 2.7 times.

"What we've traditionally called 'carbon' in freshwater turns out to be a super-diverse mixture of different carbon-based organic molecules," said Dr Andrew Tanentzap in Cambridge's Department of Plant Sciences, who led the research. "We've been measuring 'carbon' in freshwater as a proxy for everything from water quality to the productivity of freshwater ecosystems. Now we've realised that it's the diversity of this invisible world of organic molecules that's important."

As the climate warms, vegetation cover is increasing in forests of the northern latitudes. By simulating this effect in two lakes in Ontario, Canada, the study found an increased diversity of organic molecules -- molecules containing carbon within their structure -- entering the water in the matter shed by nearby plants and trees.

Organic molecules are a food source for microbes in the lake sediments, which break them down and release carbon dioxide and methane as by-products. Increasing levels of organic molecules can therefore enhance microbial activity and produce more greenhouse gases.

Since the same microbes can make greenhouse gases from many different organic molecules, the diversity of organic molecules was shown to be more closely linked with levels of greenhouse gas concentrations than the diversity of the microbes. In addition, an elevated diversity of organic molecules may elevate greenhouse gas concentrations in waters because there are more molecules that can be broken down by sunlight penetrating the water.

"Climate change will increase forest cover and change species composition, resulting in a greater variety of leaves and plant litter falling into waterways. We found that the resulting increase in the diversity of organic molecules in the water leads to higher greenhouse gas concentrations," said Tanentzap. "Understanding these connections means we could look at ways to reduce carbon emissions in the future, for example by changing land management practices."

Further information: www.sciencedaily.com/releases/2019/11/191118190834.htm

Double sentence for Legionella control failure

Two people have been sentenced after failing to control the risk of exposure to Legionella bacteria in the cooling tower at their business premises in Spring Hill, Birmingham.

Birmingham Magistrates' Court heard that, between June 2017 and February 2018, Kulwant Singh Chatha and partner Satpaul Kaur Chatha of Isher Hangers failed to put suitable measures in place to control the risk of Legionella bacteria from the cooling tower on their premises. Concerns raised by their own water treatment consultants were ignored, and no Legionella risk assessments were in place.

An investigation by the Health and Safety Executive (HSE) found that the cooling tower was not being managed to control the risk from Legionella bacteria. This failure exposed employees of Isher Hangers, as well as members of the public, to Legionellosis – a collective term for diseases caused by the bacteria including Legionnaires' disease, which can be fatal. People who have underlying or current medical issues are especially susceptible to infection, which was a particular concern as Isher Hangers' premises are in the vicinity of two major hospitals.

Kulwant Singh Chatha and Satpaul Kaur Chatha pleaded guilty to breaching section 2(1) and 3(1) of the Health and Safety at Work etc Act 1974 and were each sentenced to serve 12 weeks in prison, suspended for 12 months, and ordered to pay costs of £12,115 each, including a victim surcharge of £115.

Speaking after the case, HSE inspector Karen Sweeney said, 'Isher Hangers were operating a cooling tower without biocide, ignoring the advice of their own consultants. Cooling towers have the potential to spread bacteria that can cause serious illness or death, if not maintained in accordance with the published guidelines.

Japan will have to dump radioactive water into Pacific, says minister

The operator of the ruined Fukushima Daiichi nuclear power plant will have to dump huge quantities of contaminated water from the site directly into the Pacific Ocean, Japan's environment minister has said – a move that would enrage local fishermen.

More than 1 million tonnes of contaminated water has accumulated at the plant since it was struck by a tsunami in March 2011. The power company says it will run out of storage space by 2022. Tokyo Electric Power (Tepco) has struggled to deal with the build-up of groundwater, which becomes contaminated when it mixes with water used to prevent the three damaged reactor cores from melting. The government spent 34.5bn yen (£260m) to build a frozen underground wall to prevent groundwater reaching the three damaged reactor buildings, which has succeeded only in reducing the flow of groundwater from about 500 tonnes a day to about 100 tonnes a day.

Tepco has attempted to remove most radionuclides from the excess water, but cannot rid the water of tritium, a radioactive isotope of hydrogen. Coastal nuclear plants often dump water that contains tritium into the ocean. It occurs in minute amounts in nature. Tepco has admitted that the water in its tanks still contains contaminants beside tritium.

"The only option will be to drain it into the sea and dilute it," Yoshiaki Harada told a news briefing in Tokyo. "The whole of the government will discuss this, but I would like to offer my simple opinion."

No decision on how to dispose of the water will be made until the government has received a report from a panel of experts.

One recent study by the Atomic Energy Society of Japan, said it could take 17 years to discharge the treated water after it has been diluted to reduce radioactive substances to levels that meet the plant's safety standards.

Japan has come under renewed pressure to address the contaminated water problem before Tokyo hosts the Olympics and Paralympics next summer.

Chlorine and Chloramine Impact on the Detection and Quantification of *Legionella pneumophila* and *Mycobacterium* Species

Paper published in: Appl Environ Microbiol. 2019 Oct 11. pii: AEM.01942-19. doi: 10.1128/AEM.01942-19. [Epub ahead of print] Free Text

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Abstract

Potable water can be a source of transmission for legionellosis and nontuberculous mycobacterium (NTM) infection and diseases. Legionellosis is caused largely by Legionella pneumophila, specifically the serogroup 1 (Sg1). *Mycobacterium avium*, *Mycobacterium intracellulare*, and *Mycobacterium abscesses* are three leading species associated with pulmonary NTM disease. Estimated rates of these diseases are increasing in the U.S and cost of treatment is high. Therefore, a national assessment of water-disinfection efficacy for these pathogens was needed. Disinfectant type and total chlorine residual (TClR) were investigated to understand their influence on the detection and concentration of these five pathogens in potable water. Samples (n=358) were collected from point-of-use taps (cold or hot) from locations across the US served by public water utilities that disinfected with chlorine or chloramine. The bacteria were detected and quantified using specific primer and probe qPCR methods. Total chlorine residual was measured spectrophotometrically.

Chlorine was the more potent disinfectant for controlling the three mycobacterial species. Chloramine was effective at controlling *L. pneumophila* and its Sg1. Plotting the TClR associated with positive microbial detections showed that an upward TClR adjustment could reduce bacterial count in chlorinated water but was not as effective for chloramine.

Each species of bacteria responded differently to disinfection type, concentration and temperature. There was no unifying condition among the water characteristics studied that achieved microbial control for all. This information will help guide disinfectant decisions aimed at reducing occurrences of these pathogens at consumer taps and as related to the disinfectant type and TClR. The primary importance of tap water disinfection is to control the presence of microbes in tap water. This study evaluated the role of disinfectant choice on at-the-tap presence of *L. pneumophila*, its Sg1 serogroup, and three species of Mycobacteria in tap water samples collected at points of human exposure at locations across the United States. The study demonstrates that microbial survival varies based on microbial species, disinfectant and TClR residual.

www.ncbi.nlm.nih.gov/pubmed/31604766?dopt=Abstract

Brewery waste could heat homes

By-products from beer production could soon become renewable fuel, according to Dr Ahmed Osman from the School of Chemistry and Chemical Engineering at Queen's University Belfast, bringing significant environmental benefits.

Test results have revealed that left-over barley can be converted into carbon suitable for use as domestic heating or barbecue fuel. It could also provide water filtration in developing countries.

Using one kilogramme of the grain, Dr Osman created enough activated carbon to spread across 100 football pitches. Breweries in the EU produce around 3.4 million tons of unspent grain waste every year. Liquid carbon is usually shipped to the UK from the Middle East while solid bio-carbon, in the form of wood pellets, arrives from the US and elsewhere. The Belfast-based academic therefore believes a huge opportunity exists to make a positive environmental impact from a very straightforward process. "Using this new technique, we can utilise more locally-produced resources, reduce emissions linked with the agriculture sector, and also create a high-value product," he said.

"Across the globe there is a real demand for carbon as it is used to create fuel for households, parts for water filters and charcoal for barbecues. If we are able to take something that would otherwise be waste and turn it into a useful biofuel, it can only be a good thing for our planet. It could really help to solve global waste and energy problems."

Worksop, Nottinghamshire floods – Closed sluice gate blame-game

Council officials and residents in Worksop repeatedly asked the Canal and River Trust (CRT) to alleviate the flooding by opening a sluice gate. The trust refused to do so and the gate was eventually opened by a firefighter several hours later. The CRT said it would have been "unsafe" for its engineers to open it.

However, the leader of Bassetlaw District Council insisted opening the sluice gate was "vitally important" and said it was "bizarre" the CRT would not do it. "One of the things that has most angered local people is the way in which, sadly, the Canal and River Trust did not step up to respond when they could have done," said councillor Simon Greaves. "For several hours there could have been more water being taken from the town centre, helping to alleviate and mitigate the crisis."

Worksop was flooded on 7 November when the River Ryton burst its banks following heavy rain. Twenty-five properties were evacuated.

The sluice gate in question is in a park in Worksop called The Canch. Opening the sluice gate allows water to flow from the River Ryton into another channel of water, which eventually feeds into the Chesterfield Canal, thus lowering the level of the Ryton. The CRT said the sluice gate was in a building "deemed unsafe" for its workers to enter, and it had reported the condition of the building to the council on 16 October. The building is owned by the council but the CRT is responsible for the sluice gate.

The CRT also said there were "some concerns about how it [opening the gate] would impact water levels elsewhere, because it's hard to determine how other areas would have been affected. Our staff have worked admirably at numerous locations to deal with incidents, including through the night in many cases," it added.

Drug Resistance – an official cause of death?

Britain's leading superbug expert, Lord Jim O'Neill, told a London conference that antimicrobial resistance (AMR) should be recorded as a cause of death on official certificates. He said the move would help raise awareness of the growing superbug crisis. In 2016 he led a major government review into AMR which called for a complete overhaul of the global antibiotics market.

Lord O'Neill said that the number of AMR related deaths in Europe has increased from an estimated 25,000 a year to 37,000 – over the past 2 years, a faster rate than previously predicted.

He was joined at the conference by Dame Sally Davis, the former chief medical officer who said she was disappointed by a lack of action since the 2016 report. Now a special envoy on AMR for the UK Government, she said she was in particular disappointed by the lack of new antibiotics being developed, representing a "market failure" – with pharmaceutical giants quitting the antibiotics industry because it was not lucrative. "The big companies have been hollowing out their pipeline and.....abandoning preclinical and clinical research and development, leaving it to small companies," said Dame Sally.

MRSA is one of the most well-known and widespread resistant infections, and is often deadly for hospital patients – its full name is methicillin-resistant staphylococcus aureus because it has evolved to fight off penicillin-like drugs. But many common infections are becoming resistant, such as gonorrhoea and E.coli.

Antibiotic resistance is blamed on various factors including doctors prescribing too many, people not taking them properly and farmers giving them to animals. The more often organisms are exposed to levels of the drug too low to kill them, the more opportunity they get to adapt to be able to fight them off during treatment.

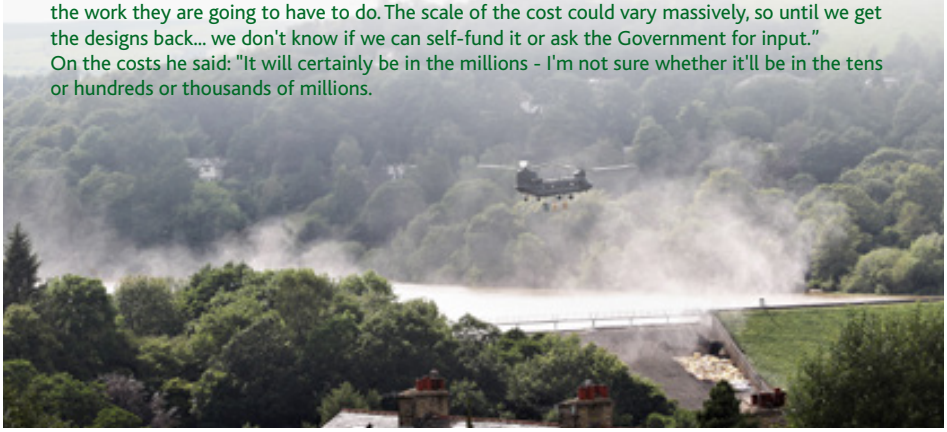
Whaley Bridge dam repair 'will cost millions'

The task of repairing the wall at Toddbrook reservoir which sparked the evacuation of over 1,500 people in the town has started but bosses have warned it will be a time consuming and expensive project. Repairs to the damaged dam above Whaley Bridge will cost millions and could take up to three years it has revealed.

The evacuation in residents was due to fears that the dam slipway wall at Toddbrook Reservoir could collapse after it began to crumble following heavy rain. The reservoir, which holds 300 million gallons of water, was drained using high pressure pumps before residents were eventually allowed back home.

Charity the Canal and River Trust, who are responsible for maintaining the dam, are now beginning the process of repairing it. However project manager Rob Jowitt has warned it will not be a simple operation. "I wouldn't like to speculate on the scale of the rebuild and repair, but it's going to be major and potentially two to three years' worth of work" he said. "It will easily be two years. Obviously any longer than that is going to be down to the scale of the construction and scale of the work they are going to have to do. The scale of the cost could vary massively, so until we get the designs back... we don't know if we can self-fund it or ask the Government for input."

On the costs he said: "It will certainly be in the millions - I'm not sure whether it'll be in the tens or hundreds or thousands of millions.



Whistle-blowers leak Glasgow hospital water contamination report

Warnings about the risk of water contamination at Scotland's largest hospital were issued just days after it opened, according to a leaked report. The 2015 inspection report into Glasgow's Queen Elizabeth University Hospital (QEUH) was passed to Labour MSP Anas Sarwar by whistle-blowers. It ranked infection control measures as "high risk" in several areas.

The hospital stayed open despite the warnings but has since had to close wards due to the risks from the water. NHS Greater Glasgow and Clyde (NHSGGC) insists the hospital campus has a "safe and effective water supply" and all inspection reports have been acted upon.

On 28th November 2019 in the Scottish Parliament, Mr Salwar said that he had seen figures which suggest there were 50 cases of infections at the Royal Children's Hospital - part of the £842m QEUH campus - between 2015 and 2018, and a further 15 unconfirmed cases so far this year.

The documents seen by Mr Sarwar show NHS Estates commissioned three separate independent reports into the water supply at the QEUH.

The first Legionella assessment, carried out by private contractor DMA Water Treatment on 29 April 2015, categorised the management of the bacteria as "high risk" because there was "significant communication issues between the parties" responsible for managing the risk.

The report also warned that there was a risk of stagnating water in parts of the 14-storey building, increasing the risk of infection; that cold and hot water supplies were not running at the right temperature and that five plant rooms in the hospital were deemed to be "high risk"

Inspectors also found debris, including washers, in a water tank and recommended it was cleaned and disinfected. Further inspections by the same firm in September and October of 2017 found debris was still in the same water tank and said there had been "no significant water system alterations".

A further report in January last year categorised Legionella management on site as being "high risk" and called for immediate corrective action. It states, "The information gathered highlights significant gaps in the Legionella (and potentially other bacteria) control on site, both in terms of management processes and the implementation of recommended preventative maintenance tasks".

Quizzed on the inspection reports at first minster's questions, Ms Sturgeon said: "The reason we have ordered a public inquiry is to make sure that in addition to all of the work that is being done, there is complete transparency, and if necessary complete accountability, around these issues. It is my job to make sure the Scottish government takes all appropriate action to get to the bottom of all these issues and that is what I and the health secretary are determined to do."

The health board said all of the issues raised in the inspection reports were acted upon and said routine water sampling had been carried out from the time the hospital opened. Specific infection tests were also carried out at the request of infection control doctors when investigating possible infections.

INDUSTRY UPDATES

Legionella Control Association

A Standards for Service Delivery LCA sub-committee is conducting a root and branch review of all 9 LCA Standards for Service Delivery and associated documents. The aim is to remove repetition during the LCA annual Company Audit and make the requirements clear for LCA members and in line with current legislation and guidance.
The next LCA Spring Conference will be a one day event held at Drayton Manor in Tamworth on 19 May 2020. A networking dinner (with discounted hotel rooms) will be held the night before. The conference presentations will include a launch of the revised LCA Standards for Service Delivery.
The new LCA website launched in Summer 2019 includes a members' login area for all LCA members to access all relevant LCA documents. The LCA website's homepage makes it easy for people to contact the LCA, find a registered LCA member, see standards and guidance and apply to become a member.

www.legionellacontrol.org.uk

CSCA

The CSCA's aim is to upgrade the standard of service supplied by the water treatment service provider and Pre-commission and Remedial Cleaning companies and is a standards organisation for CSCA members. A successful CSCA Open Day & AGM, chaired by John Smith, Chairman of CSCA, was held on 7 November 2019 in London with detailed and thought provoking presentations on all aspects of closed systems and how the CSCA can help industry.
A ballot to replace an Independent member on CSCA Management Committee was held in December 2019 and Chris Shaw of DTK was elected.
CSCA continue their positive working relationship with BSRIA. CSCA's Chris Parsloe is the author of BG29 and working closely with the BG29 steering group. Opportunities for interested companies to sponsor the BG29 updated book will be available and CSCA alongside BSRIA are planning nationwide launch events in 2020.
To join CSCA as a registered Service Provider or as a supporting Foundation member please visit:

www.cscassociation.org.uk

www.towersystems.co.uk

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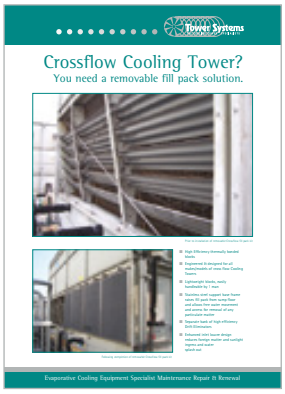
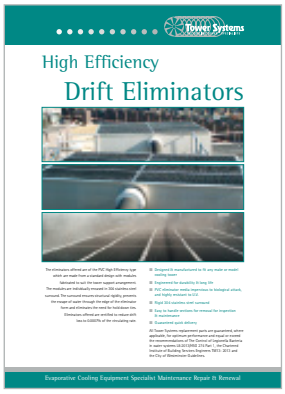


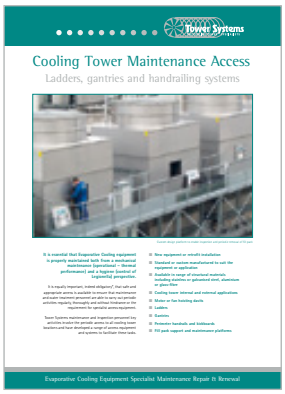
High Efficiency Drift Eliminators



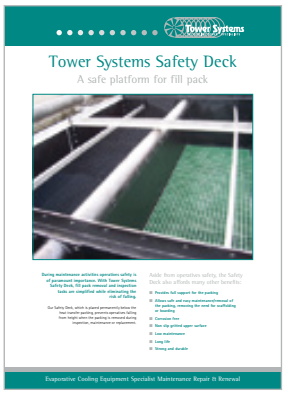
Routine Maintenance Visits

Replacement Parts

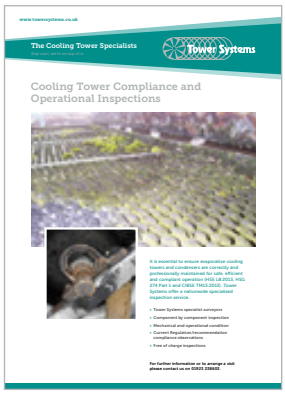
Maintenance Access



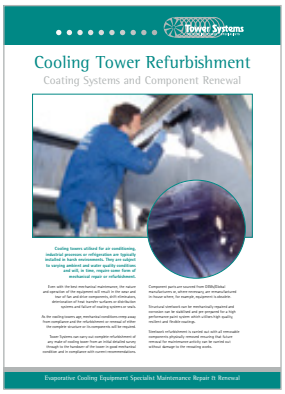
Safety Deck



Condition Surveys



Refurbishment



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TRAINING COURSE PROGRAMME 2020

WINTER PROGRAMME 2020

Tuesday 21st January	Practical Legionella Risk Assessment ** ●
Wednesday 22nd January	Cooling & Boiler Water Chemistry Part 1
Tuesday 4th February	Legionella Training for Duty Holders & Responsible Persons incorporating L8
Wednesday 5th February	Legionella Risk Assessment of Water Systems – Basic
Tuesday 11th February	Cleaning & Disinfection ●
Wednesday 12th February	Legionella Risk Assessment in Cooling Systems **
Wednesday 11th March	HTM 04-01 Water Hygiene Training: Managing & Controlling Risk of Waterborne Pathogens in Healthcare Water Systems ●
Tuesday 17th March	Temperature Monitoring, Sampling & Inspection of Water Systems for Technicians ●
Tuesday 31st March	Cleaning & Disinfection ●

SPRING & SUMMER PROGRAMME 2020

Tuesday 21st April	Legionella Risk Assessment of Water Systems - Basic
Wednesday 22nd April	Landlords & Letting Agents Legionella Risk Assessment Training ●
Tuesday 28th April	Foundation Course in Water Treatment Chemistry
Wednesday 29th April	Cooling Water Chemistry (Follow on) *
Tuesday 19th May	Management and Control of Closed Systems ●
Wednesday 20th May	Practical Legionella Risk Assessment ** ●
Tuesday 9th June	Spas and Swimming Pool Chemical Control and Management
Tuesday 16th June	Legionella Training for Duty Holders & Responsible Persons incorporating L8
Tuesday 23rd June	Cleaning & Disinfection ●
Tuesday 7th July	Legionella Risk Assessment of Water Systems – Basic
Wednesday 8th July	Temperature Monitoring, Sampling & Inspection of Water Systems for Technicians ●
Tuesday 14th July	Cooling & Boiler Water Chemistry Part 1
Wednesday 15th July	Boiler Water Chemistry (Follow on) *

AUTUMN PROGRAMME 2020

Tuesday 15th September	HTM 04-01 Water Hygiene Training: Managing & Controlling Risk of Waterborne Pathogens in Healthcare Water Systems ●
Wednesday 16th September	Monitoring the Risk of Waterborne Pathogens ●
Tuesday 22nd September	Practical Legionella Risk Assessment ** ●
Wednesday 23rd September	Legionella Risk Assessment in Cooling Systems **
Tuesday 6th October	Cleaning & Disinfection ●
Wednesday 7th October	Foundation Course in Water Treatment Chemistry
Tuesday 13th October	Legionella Training for Duty Holders & Responsible Persons incorporating L8
Wednesday 14th October	Legionella Risk Assessment of Water Systems – Basic
Tuesday 10th November	Temperature Monitoring, Sampling & Inspection of Water Systems for Technicians ●
Wednesday 11th November	Spas and Swimming Pool Chemical Control and Management
Tuesday 17th November	Managing the Risk of Legionella in Cooling Towers Systems
Wednesday 18th November	Management and Control of Closed Systems ●
Tuesday 24th November	Practical Legionella Risk Assessment ** ●
Wednesday 25th November	Cleaning & Disinfection ●
Tuesday 1st December	Legionella Risk Assessment of Water Systems – Basic
Wednesday 2nd December	Legionella Training for Duty Holders & Responsible Persons incorporating L8

WHERE INDICATED ● COURSE WILL USE THE WMSOC PRACTICAL TRAINING AREA

PTA PRACTICAL TRAINING AREA

* Delegates attending these courses should first attend the Cooling & Boiler Water Chemistry Part 1 course or have a good working knowledge of basic terminology.

** Delegates attending the Practical or Cooling Systems course will be asked to prove that they have previously attended the Legionella Risk Assessment of Water Systems – Basic course or equivalent.

It is generally agreed that training should be refreshed on a regular basis; the recommended interval is every 3 years. The WMSoc has replaced its refresher courses with revamped training modules using the Practical Training Area (PTA); this gives attendees the opportunity to prove an ability to follow instructions and demonstrate their ability to work safely under test conditions. Anyone who attended training more than 3 years ago would benefit from attending a course currently shown on the programme to refresh their training.

ALL OF OUR COURSES ARE

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CALL US ON: 01827 289 558 OR EMAIL: training@wmsoc.org.uk

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