World Class Pool Water

– A Masterclass on Achieving Best Practice in Swimming Pool Water Treatment.

POOL WATER TREATMENT ADVISORY GROUP

One Day Conference

6 November 2025, Holywell Park, Loughborough.

08:45	**REGISTRATION**	**Refreshments and Sponsor stands open**
09:15	**Ian Ogilvie *PWTAG Chair***	Welcome, Introduction and PWTAG Update
	SESSION 1 Chair – Janice Calvert	**Changing Pool Chemistry**
09:30	**Ian Nicks**	Alkalinity and the Effect on pH and Coagulation/ Flocculation
09:50	**Ian Ogilvie**	Storage Requirements and Delivery of Chemicals - EN15288
10:10	**Dr Sonia Guri**	CO_2-Based pH Neutralization: A Sustainable and Safe Approach for Swimming Pools
10:30	**Q&A**	
10:45	**BREAK**	
	SESSION 2 Chair – Amanda Craswell	**Impact of Poor Pool Water**
11:10	**Rob Johnston**	Pool Water Incident Investigations – it's not just a code brown incident that requires a response!
11:30	**Dr John Lee**	Microbiological Standards - Derivation and Meaning
11:50	**Dr Martin Wood**	Revisiting the Basis for Calculating Bathing Loads for Pools
12:10	**Q&A**	
12:25	**LUNCH BREAK**	**Sponsor stands open**
	SESSION 3 Chair – Dr Martin Wood	**Future Methods**
13:30	**Dr Alexander Kämpfe**	Public Swimming Pool Water Treatment according to DIN 19643
13:50	**James Coombes**	Energy Efficient Pool Water Treatment Design
14:10	**Colin Day & Jessica McKenna**	Future Water Testing
14:40	**Ahmed Abdalla**	Future Methods of On-line Monitoring
15:00	**Q&A**	
15:15	**BREAK**	
	SESSION 4 Chair – Professor Rachel Chalmers	**A Panel Event on Temporary Pools –** Creating Problems or Opening Opportunities?
15:40	**Mike Shuff**	What Everybody Should Know about Water Treatment in Temporary Pools
16:00	**Andy Heald and Amy Gilluley**	Lasting Impact: Proving Safety and Transformational Outcomes in Primary Schools
16:20	**Mike Shuff, Andy Heald, Amy Gilluley and Richard Lamburn**	Panel Q&A
17:00	**Ian Ogilvie *PWTAG Chair***	**Closing Comments**

The meeting venue will open at 08:00 for sponsors to set up their stands.
PWTAG reserves the right to alter speakers and/or titles of papers if circumstances dictate.

www.pwtag.org/pwtag-annual-conference-2025

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Speaker Abstracts

Alkalinity and the effect on pH and Coagulation/Flocculation

Ian Nicks
PWTAG Fellow

The message is still not being received by pool operators that the levels of chemicals needed for a successful operation are entwined, and it is apparent that the changing of a PAC drum or the balanced water test is still largely dealt with through ignorance. It is clear that assistance is still needed.

This paper will attempt to clarify the relationship between the various levels of chemical required to achieve a positive outcome. Experimental research has been carried out and is available for all to see, purely as an observation as a desktop operational experiment carried out by the Operations Manager of Barnsley Premier Leisure at one of their sites.

Safety, storage and delivery requirements of chemicals under BS EN 15288-2

Ian Ogilvie
Chartered Health and Safety Practitioner, Chairman PWTAG

This session provides a comprehensive overview of the safety, storage, and delivery requirements for chemicals used in swimming pool and spa operations, as defined by BS EN 15288-2. The standard outlines essential criteria for managing hazardous substances in leisure water environments, with a strong emphasis on protecting staff, patrons, and the wider public from chemical-related risks.

The talk will examine the key principles of chemical safety, including appropriate segregation of incompatible substances, secure and ventilated storage areas, and robust delivery protocols that minimise exposure and environmental impact. It will also address the importance of clear signage, spill containment measures, and emergency response planning in line with regulatory expectations.

Drawing on practical examples and case studies, the presentation will highlight common pitfalls and best practices in chemical handling, particularly in relation to pool water treatment agents such as chlorine, acid-based products, and coagulants. Attendees will gain actionable insights into how to implement BS EN 15288-2 effectively within their facilities, ensuring compliance while fostering a culture of safety and operational excellence.

This session is particularly relevant for facility managers, health and safety professionals, pool operators, and anyone involved in the design, maintenance, or oversight of aquatic venues.

CO_2-Based pH Neutralization: A Sustainable and Safe Approach for Swimming Pools

Sonia Guri
R&D Manager – Agrifood and Water Applications, Air Products

Recreational water disinfection is essential for controlling microbial activity, but it can have unintended consequences. Sodium hypochlorite is the most used disinfectant in swimming pools, but it tends to increase the pH of the water. To maintain optimal disinfection conditions (typically between 7.2 and 7.6), an acid is required to lower the pH. Hydrochloric acid is often used for this purpose, but it carries safety risks, especially when accidentally mixed with sodium hypochlorite, potentially leading to chlorine gas formation.

Carbon dioxide (CO_2) is a safer and more sustainable alternative for pH control. It eliminates the risk of hazardous chemical reactions, is easier to handle and dose, and allows for more gradual and precise pH adjustment. CO_2 also offers self-buffering properties as it approaches neutral pH levels, reducing the risk of overshooting into undesirable low pH zones. Additionally, CO_2 can be applied through fully automated systems.

CO_2 may also improve water and air quality. Studies suggest it can reduce chlorine consumption, leading to lower levels of airborne oxidants and trihalomethanes, both linked to healthier conditions for swimmers.
This session will present key insights and practical recommendations for implementing CO_2-based pH control systems in commercial pools. We evaluated critical factors such as water quality (hardness and alkalinity), pool design, and operating conditions to identify the most suitable injection systems. CO_2 performance depends on the injection method, plant operation, and water characteristics.

Attendees will gain practical guidance to support safe, efficient, and customized CO_2 integration in pool water treatment.

Pool Water Incident Investigations – it's not just a code brown incident that requires a response!

Rob Johnston
UK Health Security Agency (UKHSA)

Pools for the purpose of swimming, exercise, recreation and religious activities have been in existence for many years, with one of the oldest pools being some 5,000 years old and the remains of baths from the first century still in existence in the UK.

Today there are thousands of pools for swimming and recreation in the UK, ranging in size and volume and with footfall from tens of customers a day, in small hotel pools, to several thousands in complex leisure pools. This vast number and array of pools require effective design, construction, operation, and management to ensure the safety of water users.

On occasions there can be challenges to recreational water management resulting in public health incidents. While the complexity in reporting and investigation of incidents, such as outbreaks of infectious gastrointestinal disease and/or folliculitis can be complex, such investigations can assist operators and reduce the risk of further public health incidents.

This session will discuss pool water incidents and the reporting and investigative processes that assist organisations in pool water incident response and preventative public health mitigation measures.

Microbiological standards - derivation and meaning

John V Lee
Technical Adviser, Pool Water Treatment Advisory Group

Pool water should not cause infection. Microbiological methods, even modern molecular ones are too slow to be used to manage water quality in real time. Instead, physical and chemical parameters, such as pH and chlorine, are monitored continually as they directly influence microbial control and can be adjusted automatically in real time. None-the-less microbiological monitoring is essential to verify that disinfection is effective, and infection risks are minimized.

Most pathogens in bathing water are derived from human and animal pollution, particularly faecal contamination. Pathogens, if present, are usually in low concentrations and difficult to detect. Consequently, easily detectable microorganisms, termed indicators, occurring commonly in pollution are used, for example *Escherichia coli* to indicate the presence of faecal contamination. *Pseudomonas aeruginosa* is unusual in that it is a pathogen that grows naturally in water and can also be used as an indicator of microbial colonisation.

For chemically disinfected swimming pools, like municipal drinking water, realistic targets include very low overall microbial counts with no detectable indicators or pathogens. In contrast, natural bathing waters are not disinfected and subject to multiple pollution sources. Here, microbiological standards have been derived largely from volunteer studies worldwide linking water quality to health outcomes.
This presentation will discuss how the standards used for disinfected pool water were derived; how results of monitoring should be interpreted; whether the trend to use non-chemical treatments means the standards more akin to those for natural bathing waters are more appropriate.; and the potential for changes in methodology.

Revisiting the Basis for Calculating Bathing Loads for Pools

Martin Wood, Lester Simmonds and Fed Ramirez
Pool Sentry Ltd

This paper presents the highlights of a new technical note (TN) which explains how to calculate bathing loads and circulation rates for pools. Measurements of pool water quality used in combination with mathematical models to derive general principles provide the rational basis to match bathing loads and circulation rates for any pool.
Water quality is determined in part by the concentration of contaminants in the pool water that have washed off bathers using the pool, and the effectiveness of the water treatment plant in removing these contaminants. The rate of accumulation of contaminants is the difference between the rate of input and the rate of removal. With a steady and continuous influx of bathers the pool water will at some point reach a steady state, which in shallow pools can be less than 2 hours.

The circulation rate required must be sufficient to keep this peak equilibrium state below any relevant water quality standard (e.g. turbidity values <0.5 NTU). Data from busy pools shows that

over 90 % of particle removal has to take place while the pool is still in use by bathers (and cannot be deferred until after the pool has closed). For this reason, the maximum operational bathing load should be assessed on the basis of number of bathers per hour, rather than over a 24 h period.

Although a general rule was suggested in the current edition of Swimming Pool Water (2017), at the time it lacked scientific underpinning and the alternative concept of turnover time was embedded in the guidance. Whilst turnover times provide a very approximate guidance for circulation rates, this can now be refined using the general rule that 1.7 m^3 of water needs to be circulated per bather as a conservative value to ensure acceptable water quality. This brings the PWTAG guidance in line with the DIN standard and offers opportunities to minimise the amount of energy used to circulate water whilst maintaining excellent water quality.

Public swimming pool water treatment according to DIN 19643

Alexander Kaempfe
Head of Department Swimming Pool Water and Chemical Analytics, Federal Environment Agency, Germany

According to the Federal Infection Protection Act water quality in public swimming pools in Germany must assure the absence of any sorrow of health threats especially from microorganisms. To achieve this high level of health protection the federal environment agency has publish a document of recommendations and pool water treatment goals. However, these goals might be reached by application of the standardized methods according to DIN 19643 that in detail describes measures in planning and operation for hygienically save water quality. As the prompt measurement of microorganisms, like *P. aeruginosa*, *Legionella spec*. and *E. coli*, is not a realistic option despite their relevance a set of hygiene deputy parameters has been established comprising pH-value, redox potential and free available chlorine. If it appears for one or more of these that they are out of range immediate action is required. Additionally, microbiological parameters are determined anyway but with their usual delay and with a resulting retrospective character.
Further chemical parameters like combined chlorine, THM, sum of chlorite and chlorate, arsenic and bromate should not exceed upper values and reasonable measures must be undertaken to limit their concentration in a precautionary manner.

From a more technical point of view parameters like residual flocculant concentration, turbidity, acid capacity, nitrate and TOC should also be optimized despite less relevance in terms of hygiene. Together with pool hydraulics, fresh water dosage, filter back wash routine and mechanical cleansing an adequate pool water quality for public use may be sustained.

Energy Efficient Pool Water Treatment Design

James Coombes
Operations Manager, Devin Consulting Ltd.

Water treatment systems contribute a significant amount to the operating costs of any development involving aquatic facilities. However, frequently the design of the project does not prioritise the integration of these elements or considers them too late in the design process.
This is starting to change with the adoption of Passive House standards, PWTAG Net Zero Carbon Pools guidance and a greater project focus on sustainability.

To achieve an energy efficient pool water treatment system design, it is vital that the key factors influencing this are considered at an early stage including in the building layout. It is also critical to establish realistic energy targets and then designing and operating to achieve these.

Devin Consulting Ltd. have developed modelling tools to evaluate the correct energy saving design elements, balancing these against potential increase in capital cost. Our ECO (Green) design approach addresses up to 25 specific aspects of system design, including complete system head loss modelling, to provide for a fully optimised low-energy plant.

By considering energy efficiency throughout the design process, we are able to optimise energy usage and ultimately save the operator money.
This presentation sets out the key considerations that design teams will need to consider in optimising energy efficiency and saving operational cost.

Future Water Testing

Colin Day and Jessica McKenna
Sales Manager – Water, Lovibond, and Product Manager, Palintest

This joint presentation from Palintest and Lovibond explores the evolving landscape of pool water testing, highlighting how technological innovation and sustainability are shaping the future of water quality management. With over a century of combined expertise, both companies have played a pivotal role in the development of testing methods—from early visual comparators to advanced digital photometers.

We'll examine the current state of testing, including the enduring relevance of DPD and Phenol Red chemistries, and look ahead to emerging technologies that offer greater speed and connectivity. The talk will also introduce new parameters gaining importance in routine testing and discuss their implications for pool safety, chemical efficiency, and environmental impact.

As sustainability becomes a central industry focus, we'll explore safer reagent formulations, the removal of hazardous substances like boric acid, and innovations in product design that reduce waste and improve user safety. Connectivity and digitisation are also transforming how data is captured, stored, and used— so we'll also discuss how this enables smarter, more proactive water management.

This session will provide practical insights for operators, regulators, and manufacturers, offering a forward-looking view of how pool water testing can meet the demands of safety, compliance, and environmental responsibility.

Future Methods of Online Monitoring

Ahmed Abdalla
Xylem Water Solutions Limited

The online monitoring of pool water quality continues to evolve, with the industry gradually shifting away from reactive testing toward more predictive, real-time insights. This year's session explores how emerging technologies are enhancing the accuracy, responsiveness, and connectivity of measurement systems used in recreational water facilities.

Building on the foundation of traditional free chlorine and pH measurement and control, we now see the integration of self-diagnosing amperometric sensors, intelligent controllers with adaptive dosing logic, and expanded use of parameters such as turbidity, ORP, total chlorine, conductivity and temperature — all captured digitally and evaluated automatically. Modern controllers are increasingly modular and capable of managing multiple independent pool circuits, while digital turbidity probes now offer in-line measurement using ISO-standard nephelometric methods with built-in ultrasonic self-cleaning to minimise maintenance and maintain accuracy.

The ability to visualise, log, and act on this data in real time is another step forward. Cloud-connected platforms are now capable of gathering signals from chemical analysers, dosing systems, pumps, and flow meters to deliver actionable alerts, remote access, and even usage-based insights to prioritise maintenance. These technologies are helping facilities not only stay compliant but also operate more efficiently, anticipate faults before they arise, and optimise.

Temporary Pools; The Host Obligations

Mike Shuff
Vice Chair: Pool Water Treatment Advisory Group

The popularity of temporary swimming pools has risen dramatically over the last few years, and this is understandable as it brings the opportunity to teach and learn the art of swimming to a much wider audience. Predominantly, temporary pools are set in schools, where the location of the nearest public swimming pool; the cost of transportation and the availability of staff and parents to escort children can be prohibitive. So, if there is a possibility of the 'pool coming to the school' then it is not hard to see why such a structure is such an attractive alternative.

The pool would be set in a marquee, within the school grounds, enabling children to learn to swim at a time to suit the school, with no transportation costs, and with minimum disruption to the school timetable.

We would all encourage the learning of swimming at an early age, to promote safety, enjoyment; healthy exercise; etc. However, there are issues that should be addressed, before, during and after the temporary pool is installed and used.

The Pool Water Treatment Advisory Group has produced a 'Checklist for the Host', covering: Pre-contract; Documentation; Use of the Pool; Water Quality; Chemical safety; Accident/Incident Management and End of Contract.

This Checklist refers to the Hirer of the temporary pool as the 'Host', with the provider being referred to as the 'Installer'.

During Conference, we will be concentrating on this issues that are of concern to the treatment of water: Documentation; Water Quality; and Chemical Safety.

Temporary Pools, Lasting Impact: Proving Safety and Transformational Outcomes in Primary Schools

Andy Heald
Head of Strategy – Swim:ED

Amy Gilluley
Head of Swim:ED Operations

One in three children leaves primary school unable to swim 25 metres, a national safety crisis compounded by rising costs, shrinking pool access, and logistical barriers. Swim:ED is proving there is another way.

By introducing a fully managed pool to the school playground, Swim:ED has enabled children to experience swimming and water safety for the very first time. In the past two academic years alone, over 20,000 pupils have participated. The results are unprecedented: 83% make measurable progress, with many schools seeing children who had never entered a pool before grow in confidence and achieve 25 metres unaided within weeks.

Such an impact is only possible with a robust operational model. Every system, from ATP experimentation and digital photometry to microbiological piloting and portable pool-specific PSOPs, is designed for compliance, sustainability, and affordability. We have worked transparently with PWTAG, RLSS, SPATA, academic partners and other stakeholders to refine what “good” looks like for temporary pools and to ensure that sector-wide learning benefits from every provision. Yet demand far outstrips supply. With almost 300 schools currently on our waiting list, we are determined to enhance and scale our systems so more children and families in underserved communities can access this life-saving provision.

This presentation shares the provider’s perspective on how innovation, evidence, and collaboration can deliver safe and equitable swimming provision at scale. Swim:ED is not a replacement for leisure centres, it complements them, ensuring that no community is left behind.Head of Swim:ED Operations