

The Sustainable Pool

One Day Conference

23 November 2023, Eastwood Hall, Nottingham NG16 3SS



**POOL WATER
TREATMENT
ADVISORY
GROUP**

08:45	REGISTRATION	Refreshments and Sponsor stands open
	SESSION 1	Chair – Colin Day
09:30	Colin Day <i>Chair PWTAG</i>	Welcome, introduction and PWTAG update
09:45	Nic Bryant <i>Space & Place Architects</i>	St. Sidwell's Point Leisure Centre, a world first
10:10	Stephen Platt <i>Director Teal Consultancy</i>	Delivering the UK's first Passivhaus Leisure Centre
10:35	Q&A	
10:50	BREAK	
	SESSION 2	Chair – John Lee
11:05	Tom Devin¹ & James Coombes² <i>1 Director PWTAG and Director Devin Consulting; 2 Senior Project Engineer Devin Consulting</i>	Net Zero Carbon – setting targets, modelling designs and Passivhaus
11:30	Sarah Dack <i>UK Health Security Agency</i>	Chlorate – the rise of chlorate in water
11:55	Q&A	
	SESSION 3	INTERACTIVE DISCUSSION
12:05	Susanne Surman Lee¹ & Rachel Chalmers² <i>1 Legionella Ltd; 2 Public Health Wales</i>	Are there conflicts between sustainability and microbiological safety? The topic will be briefly introduced by the moderators and then opened for discussion among the audience
12:30	LUNCH BREAK	Sponsor stands open
	SESSION 4	Chair – Ian Ogilvie
13:30	Andy Gee¹ & Lester Simmonds² <i>1 UK Business Development Manager Total Pool Chemicals; 2 Technical Consultant Pool Sentry Ltd</i>	Assessment of Ceramiflo in the UK and its impact on sustainability
13:55	Ole Gronborg <i>Ultraaqua/inBlue</i>	An alternative to traditional filtration. The inBlue holistic concept with drum filters, practice in Denmark and Sweden
14:20	Q&A	
14:30	BREAK	
	SESSION 5	OFFERED PAPERS Chair – Sarah Dack
14:50	Joanne Kite <i>Microbiology Consultant to Surespa Ltd</i>	The use of Active Oxygen as a more sustainable alternative to chlorine in domestic hot tub sanitation
15:05	Stef Desmet <i>Founder of NoviNato, member of the Belgian commission on Best Available Techniques</i>	Reducing chlorine by combining it with Electro Disinfection: the disinfecting principles of ECD, the practical implications for use in swimming pools and the cost-effectiveness
15:20	Martin Wood¹, Lester Simmonds¹, Fed Ramirez¹, Rachel Chalmers² <i>1 Pool Sentry Ltd; 2 Public Health Wales</i>	Effect of PAC dosing rate on removal of particles by sand filters in commercial swimming pools
15:35	Q&A	
15:50	Ask the Experts	Interactive session A panel of all the speakers and the PWTAG Directors will answer questions from the audience. Questions can be sent in advance or asked on the day
16:20	Colin Day <i>Chair PWTAG</i>	Winding-up comments
16:30		Meeting Closes

PWTAG reserves the right to alter speakers and/or titles of papers if circumstances dictate.

PWTAG Member - £75+VAT

Non-member - £89+VAT

www.pwtag.org/2023-conference/

Ask the Experts

Participants will be asked to send written questions in advance for the last session but will also be able ask questions on the day.

Speaker Abstracts

St. Sidwell's Point Leisure Centre, a world first

Nic Bryant

Space & Place Architects

I will describe the architects view of St.Sidwell's Point Leisure Centre in Exeter, the world's first multi-zonal Passivhaus Leisure Centre. What was our brief and how did our team go about delivering this unique facility to the local community? With a bias towards the architecture is this the approach for all clients?

Delivering the UK's first Passivhaus Leisure Centre

Stephen Platt

Director Teal Consultancy

In this session, Stephen will share from his experience of leading the multi-disciplinary engineering design for the St Sidwell's Point Leisure Centre in Exeter. Speaking from a Building Services engineer's perspective, Stephen will cover a broad range of interconnected topics including space planning, construction standards, environmental control and ventilation. You will also hear about some of the surprises encountered along the way, from negotiations with the Passivhaus Institute to design team culture and collaboration.

The centre, which is built to the highest building fabric standards and uses the latest innovative technologies to deliver best in class energy performance, has attracted significant interest from the leisure industry and widespread admiration from the people of Exeter. Stephen will share some of the fundamental principles which underpin the energy efficient operation of the centre and will outline the holistic approach which was taken by the project team to driving improvements, both in terms of energy performance and customer experience.

Stephen is a keen supporter of Passivhaus and believes that the standard will play a significant role in helping councils and leisure operators to deliver a zero carbon future – he is always pleased to share from personal experience about the benefits of Passivhaus certification and debunk myths surrounding the standard. Stephen shares openly and honestly about the successes of his past projects but is also happy to share about things that could be improved, to try to help others to deliver even better in the future.

Net Zero Carbon pools – principles, practice and Passivhaus

Tom Devin¹ & James Coombes²

¹Director PWTAG, Director Devin Consulting; ²Senior Project Engineer Devin Consulting

The PWTAG guideline on Net Zero Carbon Pools comprehensively sets out what can be done to provide net zero carbon in the design and operation of a pool water treatment system, while at the same time providing a safe and appealing environment for bathers and staff alike. Crucial to all of this is establishing realistic targets and then designing and operating to achieve these. In excess of 20 design measures alone are identified that can reduce energy consumption.

There are two parts to this paper. The first will look at the key principles as set out in the PWTAG guide. The second will look at the hydraulic modelling we carry out at Devin to assist in the design of minimum headloss systems to minimise energy consumption. There are some crucial findings from the modelling, not least being that there are many ways to achieve Passivhaus targets.

Chlorate – the rise of chlorate in water

Sarah Dack

UK Health Security Agency

Chlorate accumulates in a swimming pool because it is not volatile, does not react further with free chlorine and is also not easily biodegradable. Reducing the concentration of chlorate can therefore only be done by diluting the pool water.

The presence of chlorate is due to chlorate being produced as a breakdown product of free chlorine (hypochlorite). The source of chlorate could be source water, treatment product/storage or breakdown in the pool. Swimmers are exposed via dermal contact or ingestion, and health effects can result in thyroid effects including decreased iodine uptake and the formation of methaemoglobin. Therefore minimising chlorate in a pool is required. This presentation looks at sources of chlorate and ways to mitigate the effects.

Interactive discussion session

Are there conflicts between sustainability and microbiological safety?

Moderators - Susanne Surman Lee¹ & Rachel Chalmers²

¹Legionella Ltd; ²Public Health Wales

While it is clear we must make changes to the way we manage pools and leisure facilities to reduce energy and water consumption and move carbon zero some of the solutions might compromise the control of microbial hazards with a consequent increase in the risk to health. Is this a real risk? If so, is it necessary to accept an increased risk or do we have to accept some compromising of our sustainability targets.

The topic will be introduced by the moderators and then opened for discussion among the audience.

Assessment of Ceramiflo in the UK and its impact on sustainability

Andy Gee¹ & Dr Lester Simmonds²

¹ *UK Business Development Manager Total Pool Chemicals;*

² *Technical Consultant Pool Sentry Ltd*

Outline Total Pools involvement in the supply of microfiltration to the UK market. Present our experience within the pool industry and the installation process for the refurbishment market.

Outline the system operation and its positive impact on energy, water and gas usage.

How does MF work? – comparison with traditional sand/glass media

- Removal of particles
- Removal of Crypto
- Removal of turbidity

How does MF perform?

Impact on sustainability

- Circulation pump energy savings
- Heat loss savings
- Chemical savings
- Water savings

An alternative to traditional filtration. The inBlue holistic concept with drum filters, practice in Denmark and Sweden

Ole Gronborg

Ultraaqua/inBlue

The inBlue concept is a holistic Scandinavian approach to pool water treatment based on gravity filtration with drum filters, ECO-tanks and gas strippers. The design concept incorporating gutters, balance tank, filters, pipes and returns result in a maximum one meter total head loss. Furthermore, the approach produces insignificant chlorine by-product concentrations in both water and air. With more than 100 public pools in operation, some for 15 years, the inBlue concept has become a real water treatment alternative for public pools which are under pressure to economise, being some of the most expensive buildings to operate in communities. The presentation introduces the thinking behind the concept and presents some examples from pools in operation.

The use of Active Oxygen as a more sustainable alternative to chlorine in domestic hot tub sanitation

Joanne Kite

Microbiology Consultant to Surespa Ltd

The primary challenge in maintaining water sanitation in domestic hot tubs lies in the potential for biofilm formation due to infrequent and inadequate cleaning. *Escherichia coli* (*E. coli*) and *Pseudomonas aeruginosa* (*P. aeruginosa*) in particular are commonly found in hot tubs and can cause a risk to user health if left untreated. Traditionally, chlorine has been the preferred biocidal treatment, but many hot tub owners are seeking alternatives due to issues such as; odour, skin irritation, and potential for ecological harm when discharged into the environment.

This study assessed the effectiveness of an Active Oxygen-based sanitiser (eco3spa), specifically designed for domestic hot tubs. The suitability of the sanitiser was evaluated by testing its biocidal and biofilm prevention capabilities across various common hot tub water temperatures and pH levels. Results demonstrated that the product effectively prevented the growth and biofilm organism of both *E. coli* and *P. aeruginosa* at or below the recommended dosage at a comparable level to that of a chlorine based sanitiser. Furthermore, the sanitiser was effective at all temperatures and pH levels, and notably, exhibited rapid biocidal activity (5 minutes post application) that remained active for at least 7 days.

In summary, this research performed in collaboration with Swansea University confirms that eco3spa is a highly effective sanitiser for domestic hot tubs, offering comparable efficacy to traditional chlorine-based sanitisers.

Reducing chlorine by combining it with Electro Disinfection: the disinfecting principles of ECD, the practical implications for use in swimming pools and the cost-effectiveness

Stef Desmet

Founder of NoviNato, member of the Belgian commission on Best Available Techniques

Electrochemical disinfection has been widely reported in the literature for killing pathogens. The reports on the mechanism of microbial killing show the direct effect of electron transfer in an 'electric field' causing irreversible permeabilisation of cell membranes and impact on intracellular coenzymes. The combined effect with the generation of 'Reactive Oxygen Species' by hydrolysis makes this disinfection very effective.

Long-term projects (2015-2023) supervised by the Belgian Public Health Agency in different types of public swimming pools have shown that free available chlorine levels can be reduced to 0,20-0,40 ppm and 0,05-0,20 ppm combined chlorine with trichloramine levels in the air of < 144 µg/m³ and AOX in the effluent < 200 µg/l.

In all studies, a gradual decrease in the chlorine level was continuously monitored by ORP measurement as an indication of the disinfection capacity of the water. The decrease was

combined with laboratory pathogen analysis to confirm the safety of the installed level. Two variables determine the safe level: the number of visitors and the turnover rate. The following water parameters are required: pH 7.0 - 7.2, bicarbonate > 100 mg/L, conductivity < 2000 μ S/cm and, depending on the type of filtration system, regular backwashing.

The average reduction in chlorine consumption was 70%. Due to the increase in the cost price of chlorine in the EU as a result of the covid-19 and energy crisis, the ROI in a TCO is now in the range of 7,5 to 18 years. The difference is caused by the effective chlorine price, the daily chlorine consumption and the difference between the original and the new chlorine level.

Effect of PAC dosing rate on removal of particles by sand filters in commercial swimming pools

Martin Wood¹, Lester Simmonds¹, Fed Ramirez¹, Rachel Chalmers²

¹*Pool Sentry Ltd, Dale Cottage, Stanton Dale, Ashbourne, DE6 2BX;*

²*Cryptosporidium Reference Unit, Public Health Wales Microbiology and Health Protection, Singleton Hospital, Swansea SA2 8QA*

The aim of this project is to build on the pilot-plant study of Lu and Amburgey (2016) and the preliminary findings of Stauder and Rödelsperger (2011) and, using continuous measurement of turbidity and particle counts, measure the performance of PAC at different rates of dosing in two typical UK indoor pools. This aim is being achieved using the Pool Sentry state-of-the-art mobile laboratory which measures continuously the counts of particles in different sub-millimetre size categories together with turbidity of the pool water.

Other factors contributing to filtration performance are being managed by (i) using one filter medium - sand (ii) using a single (measured) filtration velocity (iii) using the same backwashing procedure each time (iv) making measurements at the same stage in the backwash cycle (to take account of the effects of filter ripening). Records are also being kept of pool water chemistry and bather loads during the study.

Pool Sentry will test their recently-developed simulation model of the impact of bathing load on pool water turbidity by using the measured data to validate the model (Simmonds et al, 2021).

The project should deliver three outputs of direct relevance to the pool industry:

1. A validated simulation model to predict diurnal fluctuations in pool water turbidity for any particular pool based on hourly bathing load data, circulation rate, and filtration efficiency.
2. A practical method for assessing the efficiency of filtration based on pool water turbidity measurements.
3. Evidence of the sensitivity of the effectiveness of PAC to dosing rate.