NATURAL POOL INFO 2024

The FLOW - the first natural pool in Brussels Photo: Pool is cool

NEWS+FACTS ON NATURAL POOLS

ABS
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Editorial

Natural Pool Info Editorial

Dear Readers,

It has now been 25 years since natural swimming pools have been established in Germany. Much has proven itself over these years, and much has been further developed and improved. Six years ago, the Nature Pool Info was founded to address and introduce the most important topics in the field of advancements and innovations. There is still so much new happening that we can only cover a portion of the topics. We hope to have made an exciting selection.

This time, we would like to extend our special thanks to the authors of our guest contributions:

- Paul Steinbrück from the „pool is cool“ initiative reports on the first Brussels natural swimming pool, which is also the first outdoor pool in Brussels. A particularly exemplary project, in our opinion.
- Dr. Georg Krafft deals with questions regarding personal liability in natural swimming pools. A very important topic, on which he already gave a lecture at the last ABS conference.
- Daniel Sasse from Naturbad Troase presents his ideas for the pool of the future. An exciting perspective from practical experience.

In addition, we report on the first floating natural swimming pool, which uses both biological water treatment and seawater – the Millennium Pool in Gothenburg. We examine the role of cyanobacteria („blue-green algae“) and plants, and the role of art in natural swimming pools. Furthermore, we take a look at a new technological development from Switzerland and Austria, which could play a greater role in public facilities in the future: rapid filters - a technology that can reduce cleaning efforts by eliminating phosphorus.

We wish you much joy and inspiration in reading!

Hannes Kurzreuther, Stefan Bruns, Dr. Holger Kühnholt, Sandra Werb, Dr. Antje Kakuschke, Imke Petersen, on behalf of the Working Group for Swimming Lakes and Swimming Ponds (ABS)

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Natural Pool Biology

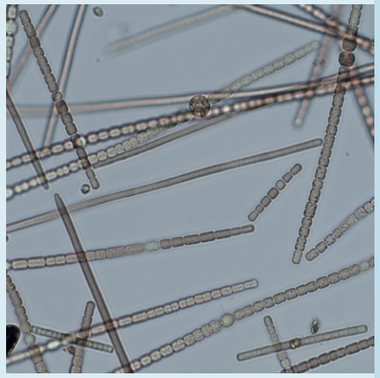
Cyanobacteria in bathing waters

Health Risks from ‚Blue-Green Algae‘

Cyanobacteria, commonly known as ‘blue-green algae,’ can produce a variety of toxins called ‘cyanotoxins.’ When cyanobacteria proliferate strongly in swimming waters (‘cyanobacterial blooms’), this can pose a health risk to swimmers. To reduce the health risk from cyanobacteria, the development of cyanobacteria in pool water, especially when visibility is reduced, should be regularly monitored. Low nutrient input and adequate water filtration counteract the strong proliferation of cyanobacteria.

What are cyanobacteria, and why can they be harmful to health?

Cyanobacteria, also known as ‘blue-green algae,’ are bacteria capable of photosynthesis. So, cyanobacteria, like algae and other plants, derive their nourishment from light, CO^2, water, and nutrients (such as nitrogen, phosphorus, magnesium, iron, etc.). Since cyanobacteria are bacteria, they are generally much smaller than other single-celled algae. These small organisms occur as individual cells, chains, or mats. Cyanobacteria that float in the water are counted as phytoplankton.



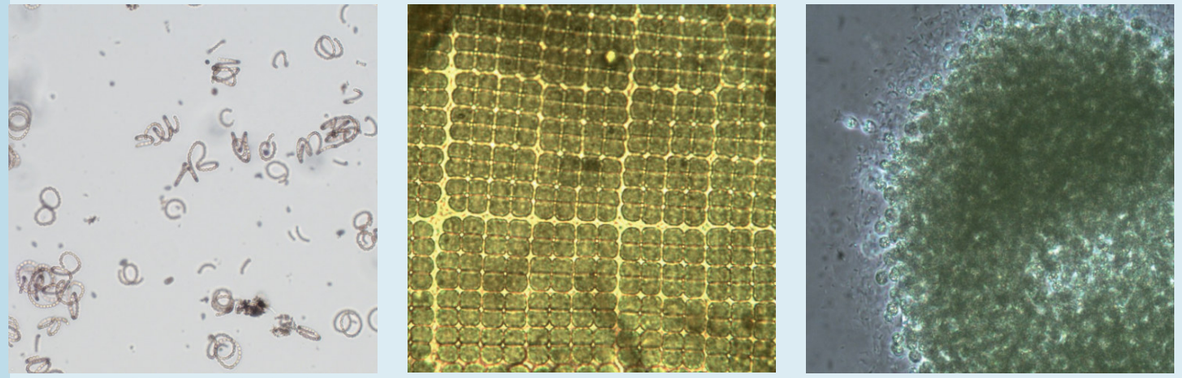
However, there are also forms that can grow on sediment and rocks in the water. Some species occur on land and colonize particularly moist surfaces where plants cannot root, such as stones, house walls, and terraces, or grow ‘epiphytically’ on other plants and tree bark. See Figures 1 on this page for illustrations.

With rising temperatures and higher light intensity in summer, there can be a strong proliferation of cyanobacteria in water bodies when there are also many nutrients available. In particular, the concentration of phosphorus in the water limits the growth of cyanobacteria. Since some species of cyanobacteria, unlike algae, can directly absorb nitrogen as dissolved gas, they have a growth advantage when there is plenty of phosphorus but few nitrogen compounds in the water. However, even at low nutrient concentrations, particularly small cyanobacteria species can outcompete other algae because they have higher nutrient uptake rates. Many species of cyanobacteria reach their highest growth rates at temperatures above 25°C. ‘Cyanobacterial blooms’ refer to high concentrations of cyanobacteria in water bodies resulting from rapid proliferation. These ‘blooms’ often have a deep green color, but in some species, they can also be brown, red, or blue.

Many cyanobacteria produce toxins called **‘cyanotoxins’**. A number of toxins have been identified, which are classified into the following categories: **Liver toxins** (hepatotoxins) damage the liver, causing internal bleeding, gastrointestinal disturbances, and loss of appetite. These include the toxins microcystin and nodularin. **Cell toxins** (cytotoxins) encompass a large group of cyanotoxins, including cylindrospermopsin, which cause cell death. Poisoning symptoms include liver and kidney damage, damage to the heart, lungs, stomach, blood vessels, or lymph system. **Neurotoxins** such as anatoxin-a and saxitoxin affect nerve cells, causing motor disturbances, muscle cramps, paralysis, and dizziness. **Dermatotoxins** cause redness, itching, burns, blisters, and swelling upon skin contact. Swallowing them can cause inflammation of the esophagus and digestive tract. Examples of these toxins include lyngbyatoxin and aplysiatoxin. Some of the toxins are additionally classified as carcinogenic. Furthermore, the cell walls of cyanobacteria contain **lipopolysaccharides**, which may have inflammatory effects.

It should be noted that while some cyanotoxins are highly toxic, records of health impairment of bathers by cyanobacteria only show mild illness courses, including respiratory problems, gastrointestinal complaints, and skin problems. Deaths in humans from cyanotoxin poisoning while swimming are not known.

The formation of toxins has been demonstrated in many species of cyanobacteria. Some of the toxins are initially contained within the cells and are only released into the environment upon death (e.g., microcystin), while others are directly released into the surrounding water (e.g., cylindrospermopsin and anatoxin-a). The formation of toxins can be variable and depend on environmental conditions, such as temperature, or the genetic type of the respective cyanobacteria. There is no complete list of toxic species and cyanotoxins. Caution is therefore advised as soon as a strong proliferation of cyanobacteria is observed. See Figures 2 on the following page.



Figures 1: Highly magnified images taken with a light microscope of potentially toxin-producing cyanobacteria. Far left: Filamentous or thread-forming cyanobacteria of the genera Dolichospermum (formerly Anabaena) and Planktothrix. The thickened cells are heterocysts, which can absorb gaseous nitrogen. Second from the left: Filamentous or thread-forming cyanobacteria of the genus Dolichospermum. This species forms coiled filaments. Third from the left: Colony of cyanobacteria of the species Mersimopedia elegans. Right: Colony of cyanobacteria of the genus Microcystis aeruginosa. (All photos: KLS)

How can cyanobacteria be identified and bathers be protected from cyanotoxins?

Cyanotoxins are harmful to humans only when they are exposed to certain **concentrations.** Stricter regulations apply to drinking water, which is regularly consumed in larger quantities over a long period, compared to bathing waters, which are only occasionally used and where water is ingested in small quantities. The risk of health impairment is also influenced by the behavior of the bathers.

Infants who ingest water and sand in larger quantities than adults, or individuals engaged in intensive water sports and swallow water, are at greater risk.
Bathing waters with low concentrations of cyanobacteria pose no risk to bathers. To avoid endangering bathers from cyanotoxins, bathing waters with high nutrient input or reduced visibility should be regularly examined. If higher concentrations of cyanobacteria occur in the bathing water, bathers should be informed, and if the concentration continues to rise, bathing should be restricted. **Various methods are used to assess the cyanotoxin contamination of a water body**, including measuring visibility, measuring the concentration of the photosynthesis pigment 'chlorophyll-a,' microscopic determination of the biovolume of cyanobacteria, and measuring the concentration of certain cyanotoxins.

Additional measures are recommended from 3 mm^3/L cyanobacterial biovolume onwards. The UBA advises against bathing when the biovolume reaches 15 mm^3/L. Studies indicate an increase in symptoms when cyanobacterial biovolume ranges from 2-11mm^3/L. In the guidelines for the planning, construction, maintenance, and operation of outdoor pools with biological water treatment (swimming lakes and swimming ponds) (Forschungsgesellschaft Landschaftsentwicklung Landschaftsbau e.V., Germany (FLL), 2011), the reference value for the biovolume of all phytoplankton species is ≤1 mm^3/L, with cyanobacteria only allowed as accompanying species.
However, even in clear waters, there can be a strong proliferation of toxin-producing cyanobacteria, with cyanobacterial mats forming on the bottom of the water body, such as on rocks or sediment,

Figures 2: Bodies of water with a high concentration of cyanobacteria. Left: Accumulation of cyanobacteria with blue and green coloring on the shore. Middle: Cyanobacterial bloom with green coloring. Right: Water sample with red coloring due to a high concentration of cyanobacteria of the genus Planktothrix. (Three photos: KLS)

Guidelines for the handling of cyanobacteria in bathing waters are issued by the World Health Organization (WHO) and the German Federal Environment Agency (UBA).
The **guidelines** are based on the current state of scientific research and provide indicators for different risk levels and appropriate measures. The 'Recommendation for the Protection of Bathing Guests from Cyanobacteria Toxins' (German Federal Environment Agency, Federal Health Bulletin) dates back to 2015 and is currently being revised to incorporate newer findings on the toxicity of certain cyanotoxins. Currently, according to the UBA, increased attention and informing bathers about health risks are advised when visibility is <1 m and cyanobacterial biovolume is >1 mm^3/L or when chlorophyll-a content is <5 µg/L. A high chlorophyll-a content can also be caused by algae and may not necessarily be related to a strong presence of cyanobacteria.
or cold-loving and light-shy species spreading in deeper water layers.
Improper treatment of cyanobacterial blooms with algicides should be avoided as some cyanotoxins are only released when cyanobacteria die off. The number and duration of cyanobacterial blooms worldwide are increasing due to temperature rises resulting from global warming and the increasing input of nutrients into water bodies. The risk of cyanobacterial blooms in outdoor pools with biological water treatment is minimized by thorough filtration of pool water by zooplankton and substrate filters and a reduction in nutrient input.
In addition to cyanobacteria, other single-celled algae can also produce toxins or cause allergic reactions. Particularly well-known are toxin-producing **dinoflagellates** found in salty (marine) habitats. The harmful effects of other algae are partly poorly researched. [Imke Petersen, KLS]

News from the Pool Operation

The personal liability of operators of natural pools

Liability risks in the operation of natural pools

About the Author: Dr. Georg Krafft is a lawyer who has been advising municipalities for years on matters related to duty of care. He is also a permanent lecturer at the German Judicial Academy on the topic of official liability and duty of care, and the author of the guide 'Verkehrssicherungspflicht an Badegewässern [Duty of Care at Bathing Waters]' published by the Bavarian State Ministry of Justice. Dr. Krafft has developed numerous safety concepts for natural pools throughout Bavaria. (Learn more at: www.KommRisk.de)

Preface

The case is likely still fresh in most people's minds.

Buoyant cyanobacteria of the genus Planktothrix (Photo: KLS)

Pleasure of bathing in natural outdoor pools (Photo: PK)

The risks remain consistently high

Since the COVID-19 epidemic, the local bathing opportunities in natural pools have been increasingly 'discovered' by the population. The pressure for local recreation is further intensified by the economic situation; vacationing domestically or 'at home' is becoming more attractive again. Moreover, considering the heatwaves in Germany, one might paraphrase Goethe 'why wander far, when the good lies so near.' However, a higher user frequency inevitably leads to a higher risk of accidents, especially considering that fewer and fewer people know how to swim. The decreasing willingness to accept accidents as misfortunes also reflects our society. In this context, operators of 'natural pools' find themselves in a dilemma, as they are understandably reluctant to expose themselves to personal liability risks.

A mayor was convicted of negligent manslaughter in three cases due to breaches of duty of care at a municipal bathing water facility in two instances. It was only in the final instance that an acquittal was issued, albeit a 'second-class' one. According to the appellate court, it could not be proven that the required precautionary measures would have prevented the tragic accident ('in dubio pro reo'). However, the appellate court expressly stated that the mayor had violated duty of care obligations.
The accident dates back to 2016, with the final judgment issued in November 2023. Considering that the final decision could have ended differently (as evidenced by the convictions in the lower courts) and given the approximately seven-year duration of the legal proceedings, this 'acquittal' does not mean that operators of bathing facilities can now relax. This naturally applies to 'natural pools' as well, i.e., pools with a certain bathing infrastructure where the water is biologically treated.

The risk of personal liability

For (swimming) accidents in 'natural pools,' liability arises when the accident is due to a culpable and causal violation of a duty of care that the operator is obligated to fulfill. A distinction must be made between civil and criminal liability.

Civil liability of operators

The consequence of civil liability is the financial compensation for damages (usually payment of compensation). The obligation to pay compensation to the injured party (or the heirs in the event of death) usually lies solely with the operator of the natural pool, in the legal form in which the natural pool is operated (municipality, association, GmbH, etc.). A so-called piercing of the corporate veil to the representatives of the operator (mayors, association executives, managing directors, etc.) is only conceivable in exceptional cases (e.g., intent) and practically never occurs.

The operator is covered by the insurance protection of the (municipal) liability insurance. The insurance coverage consists of defending unfounded liability claims at their expense and indemnifying the operator from payment obligations arising from justified liability claims. Financial burdens on the operator do not arise, except for a possible deductible.
Insurance coverage only lapses in exceptional cases, for example, if the operator knowingly and willingly violates his duty to ensure safety and an accident occurs as a result. However, in most cases, the operator will only be accused of negligence. The good news is that the risk of personal civil liability of the representatives of the operator, which is not covered by liability insurance, is 'close to zero.' But beware: this presupposes that there is liability insurance for the operation of the natural pool, and that the insurance coverage is sufficient!

Personal criminal responsibility of representatives/decision-makers of the operator

However, things are diametrically opposite regarding the criminal liability of representatives of the operator for the violation of duty of care obligations. The risk of criminal conviction cannot and will not be covered by insurance. It falls on the decision-makers of the operator personally if an organizational deficit led to the accident. These decision-makers may also include city or municipal council members who voted against necessary risk prevention measures at the natural bathing area of a municipality.
The accusation of criminal liability against the representatives of the operator boils down to an organizational deficit, namely, that there was no organizational effort to ensure that the need for risk prevention was recognized and the necessary measures were taken. Depending on how the rules of use for the natural pool are structured, an additional aggravation of the offense may be considered (official bodily harm, § 340 StGB). Civil and criminal duty of care obligations do not differ in content. Instead, criminal courts rely on the much broader civil case law.
Strictly speaking, in every justified civil liability case, there is also the risk of criminal prosecution. The reason why there are relatively few criminal prosecutions compared to the multitude of duty of care violations adjudicated by civil courts is that criminal investigations are usually only initiated when the consequences of the injury are severe or the victim dies. Many victims also have no interest in criminal prosecution, so no complaint is filed. Financial compensation is sufficient for them. However, it does happen that victims increase pressure on the operator by filing both civil lawsuits and criminal complaints, and even seeking contact with the press. This brings us to a significant negative side effect of (swimming) accidents, namely, that operators and their decision-makers are exposed to the sensational accusation in the press that they failed to take necessary risk prevention measures and are thus 'responsible' for the accident.

Reputational damage as a consequence of personal liability risk

When children have accidents in bathing waters or even die, it is regularly reported in the press. Such accidents are particularly tragic and therefore newsworthy. In the case of serious (swimming) accidents involving children, there is often the question of whether the parents have fulfilled their duty of supervision. In any case, responsible parents will always wonder (and have to wonder) whether they have done everything to protect their child from harm. Such a severe stroke of fate is often coped with by projecting possible own guilt onto others or by searching for a culprit altogether. Accidents without a responsible party, especially when personally affected, are not (no longer) accepted. All of this is understandable and comprehensible from a human perspective.
However, this is accompanied by a zeal for prosecution that primarily targets the representatives of the operator. If there are also alleged indications that they may have failed to take the necessary risk prevention measures, the 'hunt is on.'

Legal uncertainty as a consequence of legal matter

When a duty to avert danger exists and how it is to be fulfilled is anything but easy to answer. This is mainly due to the fact that the answer strictly depends on the accidents of the individual case. These can lead to the fact that an identical (!) source of danger does not have to be eliminated under certain circumstances, but must be in other cases.
Above all, non-lawyers criticize that there are no clear guidelines in the 'law of duty of care' on what exactly needs to be done for municipalities to fulfill their duty to avert danger. The bad news is that there can be no such guidelines in the case of natural pools, as the circumstances at such water areas are so different that blanket instructions must inevitably be deficient. They also contradict the clear requirement of the highest court rulings. The Federal Court of Justice consistently demands that the emergence, content, etc. of duty of care obligations be based on the specific circumstances of the individual case. Blanket instructions, e.g., in abstract guidelines, etc., logically cannot take into account the individual circumstances. This applies especially to laws or regulations.

So what is to be done?

The answer to this question is as simple as it is complicated in detail. The starting point is the case law of the Federal Court of Justice. It requires a so-called 'ex-ante' judgment of the duty of care holder. 'Ex-ante' means initially that the duty of care holder must assess before (!) the accident whether and what measures are to be taken. Furthermore, the Federal Court of Justice requires that the judgment must be 'expert.' However, this is precisely the problem. Because non-lawyers cannot (non-specialized lawyers only after intensive study of the matter) derive from the guidelines that the Federal Court of Justice provides what exactly needs to be done in the individual case. However, it is not enough for the operator to have made the necessary judgment. Because the judiciary, which judges the criminal liability, can come to a different 'ex-ante' judgment (Dieter Hildebrandt: 'It is of no use to have the law on one's side. One must also reckon with the judiciary.'). In these cases, it is crucial that the operator has documented how and, above all, based on what legal considerations he arrived at 'his' risk prevention measures. If the operator's 'ex-ante' judgment is considered wrong but reasonable by the criminal court or the law enforcement authorities, the criminal accusation is dropped. It goes without saying that only an individual and well-founded 'ex-ante' judgment by the operator can achieve such an exculpatory effect.

Conclusion

The good news in conclusion is that the risks of prosecution (and negative press coverage) can indeed be addressed. However, operators must make an expert and individual 'ex-ante' judgment for their natural pool and document it. Alternatively, the required 'ex-ante' judgment and its documentation can be delegated to an external third party who specializes in it. [Dr. Georg Krafft]

Natural Pool Biology

Green and Colorful

Plant selection and care for natural pools

Aquatic plants are an essential component of natural swimming pools. They ensure clear and hygienic water through various mechanisms. Turbidity in natural swimming pools is mainly caused by algae and hygienic contamination from bacteria and other microorganisms. The cleaning effect of plants is based primarily on four mechanisms:
1. Plants absorb nutrients from the water for their own growth. As a result, these nutrients are no longer available for the growth of algae, bacteria, and microorganisms.
2. Some aquatic plants release substances into the water that inhibit the growth of algae, bacteria, and microorganisms. This mechanism is known as allelopathy.
3. Plants provide retreat areas for zooplankton, which in turn feed on algae, bacteria, and other microorganisms.
4. Both the plants and their roots serve as colonization surfaces for numerous micro-organisms, which can compete with unwanted algae, bacteria, and microorganisms. They ensure a **high biological diversity**, which contributes to the high resilience of the entire ecosystem.
In addition to all these ecological benefits, plants offer another significant advantage for bathers. Plants provide **aesthetic enrichment** and turn the pool into a green and colorful aquatic garden, visited by various insects such as dragonflies.

Gargazon Lifeguard (Photo: PK)

Which plants should be selected?

Plants have adapted to specific ecological niches over the course of evolution. In different pools, there are many specific local conditions that **create their own ecological conditions, which should be considered when selecting plants.** These include primarily the phosphorus content, water hardness, light and shade conditions, region, altitude, temperature, salinity, and water depth.
Furthermore, it is also recommended to plant

different plants together according to their ecological families to create optimal growth conditions. To make the right selection, Ellenberg indicator values can be used (Ellenberg, Leuschner 2010). An adaptation of Ellenberg's results to swimming pond construction can be found in Schwarzer and Schwarzer (2008). To facilitate the selection process, Polyplan-Kreikenbaum has **developed a planting planning module within the online expert system for natural swimming pools DANA** (www.dana-control.de).

Based on all the parameters mentioned above, the appropriate plants for a pool can be automatically selected here. The program can use both current pool water data and predicted data calculated based on fill water data. It is always advisable to make as diverse a selection as possible, both for ecological and aesthetic reasons.

Is enough light reaching the plants? Based on the specific cause analysis, measures should then be taken. To integrate the monitoring of plant growth as effectively as possible into the operational process, it is recommended to conduct monitoring in August, as this is when the strongest growth is observed.
If measures are required, there is enough time to plan adjustments for the next season. During regular maintenance, it is especially important to remove dead plant parts regularly. At the end of the season and before the plants die due to weather conditions, the plant parts above the water surface should be pruned. This has the advantage that nutrients bound in the plants can be completely removed from the system through pruning. [Hannes Kurzreuther, PK]

Plant tiles from the DANA Expert Plant Program (Source: www.dana-control.de)

My beautiful water garden - The importance of plant care

Just as every garden must be cared for, if one does not want to eventually have a jungle, **the planting areas in natural swimming pools must also be regularly tended to**. This is not only necessary for aesthetic reasons but also for ecological reasons, as only well-developed plants can fulfill their cleaning function. Dead and algae-covered plants can also lead to poorly circulated areas and promote the growth of Pseudomonas aeruginosa. The first step toward a well-developed plant community is a thorough observation of the plant growth - plant monitoring. Here it is recommended to observe various things: total coverage of the filter area by plants, plant heights, plant diameters, vitality, parasites, overgrowth by filamentous algae, and dying plant parts. If growth does not develop optimally, the causes should be identified. Are the plants suitable for the ecological conditions? Is there a lack of nutrients? Are the plants too close together? Is the planting substrate suitable?

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Standards and Regulations

FLL enters the next round

FLL-guideline for natural swimming pools with biological water treatment

The FLL guideline for pools with biological water treatment (natural swimming pools) by the Forschungsgesellschaft Landschaftsentwicklung Landschaftsbau e.V **[Research Society for Landscape Development and Landscape Construction]** is being revised. The responsibility for the new version will be taken over by the **DGfdB (German Society for Bathing)** which has assumed the work from the FLL. The FLL will continue to be involved in the work to represent the green industry well. The transfer was made by the FLL because the FLL guideline for pools with biological water treatment has increasingly taken on a technical and hygienic character, which was inherent in the nature of the subject.
The editing of the corresponding FLL guideline is carried out at the DGfdB through the **technical working group for pools with biological water treatment**, led by Mr. Stefan Bruns. The DGfnB (German Society for Natural Swimming Waters), represented by its deputy Mr. Maximilian Colditz, is also strongly involved in the editing process.
Within the framework of the new FLL guideline for pools with biological water treatment, the **state of the art** (basic investigation) in Germany is being accessed, which has emerged in the planning and implementation of natural swimming pools as well as in their operation. In addition, focus has been placed on the state of the art in Austria and Switzerland, where in recent years **high effectiveness of rapid filters** in the biological water treatment of private, small-scale bathing waters has been evident. For this reason, the Swiss and Austrian associations for natural swimming waters are also involved in the current revision of the FLL guideline.
In the course of this collaboration, efforts are now being made to integrate the topic of rapid filters into the new FLL guideline, provided that this technology appears capable of meeting the conditions for hygiene (reduction of germ contamination) and phosphate elimination.

Your opinion matters!

If you, as readers of this article, have further **ideas and suggestions** for the revision of the guideline for pools with biological water treatment (natural swimming pools), **please let us know, so we can incorporate them into our revision accordingly.** [Stefan Bruns, PK]

News from the Pool Operation

Pool is cool

Natural pools for Brussels

Pool is cool - the organisation

Brussels is likely the only major city without a single outdoor swimming option. There are no public pools, bathing lakes, or other swimming areas. POOL IS COOL has set out to change that and **make outdoor swimming an everyday activity in Brussels again**, as we believe that swimming and bathing outdoors make an essential contribution to the quality of life in a city. Swimming is a pleasure for everyone, regardless of age, economic circumstances, or background. POOL IS COOL emerged as an **initiative of a handful of people** living in Brussels but from diverse backgrounds. We come from France, Poland, Italy, Spain, Switzerland, Germany, or other places in Belgium. What unites us initially is having grown up with outdoor swimming as something ordinary. On a hot day, we would grab our swimwear, a towel, and a few friends or family members to spend the afternoon at the outdoor pool, lake, or beach.
In Brussels, we independently discovered that this was inexplicably not possible. Those seeking cooling off either have to drive an hour and a half to the North Sea, go to swimming spots in the outskirts of Brussels, have the financial means for a private pool in their garden, or jump into one of the city's fountains, which is only tolerated for children. In the past, there were four outdoor pools in Brussels. However, the last one closed in 1978 after several cold summers and as a construction from the thirties reached the end of its life. Since all the pools were private commercial initiatives, there is little information in archives about the disappearance of the pools. There was hardly any significant societal outcry. Politicians' plans for new outdoor pools quickly disappeared into drawers, often discredited

by new political majorities after elections and questioned, for example, with the proverbially bad weather. Yet, the weather in Brussels is no better or worse than, for example, in Paris or London - cities with a rich outdoor swimming culture.

Faced with this situation, the various initiators of **POOL IS COOL came together in 2014/15 with the desire to change it.** Besides our personal bathing experiences from our youth, what most of us shared was a professional background as architects and urban planners. From our experience, we are familiar with the processes and relevant actors necessary for transformations of urban space and urban functions. **We wanted to use this expertise to bring outdoor swimming back to Brussels.**

However, the first actions in 2015 were rather playful. We jumped into existing ponds or fountains with friends and initial supporters, still unconcerned about water quality, just to test swimming and gather reactions. At the same time, we worked on a strategy to address the issue because the assumption that we only need to show some nice pictures of bathing spots in other cities and the politicians will immediately react and build outdoor pools proved to be naive and unrealistic.
This led us to officially establish **POOL IS COOL as an association in 2016** and since then, we have structured our work into four categories, a combination of **‚Actions,' ‚Projects,' ‚Research,' and ‚Debate.'**

‚Actions' are activities that only take place briefly, from a few minutes to a few days, and are primarily intended to generate images and experiences to communicate our ambitions and the fun and quality of life of outdoor swimming. ‚Actions' included guerrilla swimming in the early days, swimming in the Brussels Canal as part of the European Big Jump event, or the realization of the 'Super Dry Pool,' a dry pool, at a large family festival.

‚Projects' take place over a longer period and are prototypes that allow us to test various aspects of outdoor swimming, such as the role in the urban context, the possibilities of existing bodies of water, management principles, bathing rules, technical aspects, or general public interest. The first project was a paddling pool at the canal, followed by Brussels' largest, and only, outdoor pool in a container in the city center. An expedition over several summer weekends to various existing bodies of water to test their 'swimability,' leading to FLOW, Brussels' first real outdoor pool since 2021.

‚Research' aims to find answers that will inevitably be asked sooner or later when it comes to outdoor swimming. This targets policy and administration, but also the public and media. ‚Research' covers topics such as water quality and legislation, technical principles and ecological aspects, equipment and capacity, operation and personnel, socioeconomic aspects and social opportunities and risks, or costs and financing. Important tools include international reference projects, a broad network of partners, experts, and like-minded organizations, as well as academic projects with universities or self-initiated summer schools and workshops.

However, all of this would be nothing without **‚Debate.'** These are the moments when we share our ambitions, experiences, and projects with the public and political actors. Ultimately, we need them as convinced allies to **achieve broad societal support for future outdoor swimming in Brussels.** ‚Debates' can be symposiums with various speakers but also, for example, bike tours to potential sites for outdoor swimming in the future. This in addition to communication through social, digital, and traditional media.
The separation into these four categories is, of course, rather fluid. **So, every project is also a ‚research instrument,' and actions in public space stimulate societal debates.**

POOL IS COOL deliberately positions itself between the stools. On the one hand, we define ourselves as **activists** who draw attention to grievances and ask uncomfortable questions of those responsible. On the other hand, we are **partners of politics and institutions** to support change and to get support for our projects ourselves. Currently, our work is mainly characterized by the **operation of FLOW**, which takes up most of the time. In the future, however, we would like to think strategically again about the possibilities of reviving the outdoor swimming culture in Brussels.

FLOW - The Outdoor Pool

With FLOW, together with partners we have implemented the first and only fully-fledged, albeit temporary and small outdoor pool in Brussels, and have been operating it for over 3 years now, since the summer of 2021. An end is not in sight for the time being.
With a pool measuring 17 x 8 meters at a depth of 1.20 meters and a capacity of a maximum of 30 people simultaneously in the water, FLOW is naturally not a solution to the glaring lack of outdoor pools in a city with almost 1.5 million inhabitants. Instead, we see it as a **prototype and 'proof of concept',** demonstrating that outdoor swimming in Brussels is possible, that there is a **very high demand** for it, that swimming can be organized safely and comfortably, and that it plays an important social role in urban life. Around the FLOW pool are the associated facilities such as changing rooms and sanitary facilities, footbaths and showers, but also a kiosk and sun terraces as well as rooms for staff, equipment, and technology. Visitor access is from a bridge closed to traffic over the canal, at the highest level of the swimming pool. The sun terraces, kiosk, and sanitary facilities are accessible to everyone indefinitely and without a ticket. However, access to the swimming area directly around the pool is restricted to 25 to 30 swimmers and is organized in 45-minute time slots, which can be reserved online and at the pool in advance. Those lucky enough to find available slots can also come for last-minute swimming, although luck is often determined by the weather.
For FLOW, we have defined **five specific ambitions:** FLOW should be temporary but durable enough to function for several years. FLOW must offer more than just swimming, providing other **cultural or social activities** to play a sustainable societal role. FLOW must simultaneously attract people from all over Brussels while also being anchored in its **neighborhood.** FLOW must be **inclusive and accessible to everyone** at a low threshold and be **implemented and operated collaboratively**, with a focus on engaging **youth** in socioeconomically challenging environments. FLOW should use **natural processes for water treatment**, as a sustainable alternative to traditional chlorine pools.
After three years, we are pleased to announce that all ambitions have been fulfilled. There are various articles about this on our website. Particularly the last point - **natural water treatment** - gave us more headaches than expected.
When designing the water treatment system with Polyplan-Kreikenbaum from Bremen, Germany, and Ecoworks from Vilvoorde, Belgium, we, as well as the responsible environmental authority, assumed that natural water treatment could receive a **special permit as a test project** since existing legislation required chemical disinfection. However, after legal examination, it turned out, just 3 months before the planned opening of FLOW, that this would **not be possible**. Instead, the entire **legislative decree of the Brussels government on the operation of swimming pools in general would have to be adjusted.** A political process that would take months, if not years. Therefore, in the first and second years, we had to resort to traditional chemical and mechanical water treatment, which we could rent as a complete system from a French provider of temporary pools for the summer months.

FLOW - the first natural outdoor pool in Brussels (Photo: Pool is cool)

Meanwhile, the Brussels government, in collaboration with the Brussels environmental authority responsible for swimming legislation, has kept its promise and developed and adopted a **new decree** within just under two years, **allowing swimming pools with natural water treatment in time for the summer season of 2023.** Various rules in Flanders, Germany, and France served as starting points in the legislative process.

After this success, in late spring, based on clear legislation, we were finally able to **finalize natural water treatment** with our partners. To accommodate FLOW's temporary nature, the filters were installed in three shipping containers next to the existing structure. For this purpose the covers of the containers were removed and EPDM sealing was installed. No adjustments had to be made to the pool itself. The water flows gravitationally over skimmers to the middle container, which combines an **submerged filter** with **hydrobotanics**. From there the water is distributed to the two side containers with **Neptune filters**. At the bottom of the filters the cleaned water is collected and pumped back to the pool by three pumps. In addition a phosphorus separator is part of the water treatment. The entire construction of the pool and filter is above ground. This was the only way to construct it on the property near the canal, with the financial resources available.

After initial teething problems, which had little to do with the filters but mainly with other existing parts of the pipeline network, the filter ran smoothly. However, it is apparent that FLOW, with a volume of only 160 m^3, is very small for a public swimming pool. And weather-dependent, sometimes very intensive use can push the capacity of the natural filters to their limits. While the classical system of the first years had to be dismantled after the summer, requiring the pool to be emptied, the natural system now runs **continuously throughout the year.**

This gave us the opportunity to offer winter or **cold-water swimming for the first time this winter.**

We were very positively surprised by its success, with an average of 150 swimmers within 2 hours every Sunday morning. Currently, we are planning the **fourth summer season**, probably from late June to early September 2024.

This will again invite people seven days a week for free swimming, as well as swimming lessons, group swimming, fitness and yoga classes, and various **cultural events** such as readings, concerts, or film evenings.

The role of natural water treatment in Brussels' future

Today, Brussels has no single opportunity for outdoor swimming, and one pool alone will not be an adequate solution. Brussels is a metropolis with approximately 1.3 million inhabitants. Taking Berlin with more than 25 swimming options for 3.9 million inhabitants as a benchmark, 9 outdoor pools or bathing areas would not be an exaggerated luxury. To achieve this perspective, all urban but also technical possibilities must be considered. Pools with natural water treatment, ranging from bathing lakes without technical infrastructure to classical pools with mechanical-chemical water treatment, are one of several options.

Due to a lack of corresponding bodies of water, simple bathing lakes are probably not an option within Brussels. We see classical filtration systems as a relevant option for pools in dense urban contexts with consistently high visitor numbers. Natural pools seem appropriate where sufficient space is available, for a large bathing area with a correspondingly low visitor density and additional space for the filter area. If possible, but not necessarily, integrated into a green environment.

Natural pools also provide an answer to the question of costs, which is the first concern with all projects. Existing and proposed pools in Belgium and elsewhere are often questioned due to high operating costs and investments for construction or repairs of technical equipment for water treatment.

Furthermore, pools and filter zones are also natural habitats and can thus play a role in expanding **ecological ambitions** for urban development and specifically act as **effective means against ‚urban heat islands',** in addition to the direct refreshment in the water. The fact that these properties are relevant is shown by the fact that **three out of four projects for permanent outdoor pools in Brussels are based on natural water treatment.** We see these projects as a result of our years of effort.

However, they are at different stages of development: from mere expressions of political ambitions to ongoing building permit procedures. The realization of all these projects also depends on the elections, at all political levels, in Belgium in 2024, and the question of whether future political decision-makers share the existing ambitions for outdoor swimming in Brussels.

Nonetheless, even in the best case, there is still enough work for POOL IS COOL in the coming years to establish a new bathing culture in Brussels. [Paul Steinbrück]

FLOW - the first natural outdoor pool in Brussels, offering a diverse range of events and activities

(four Photos: Pool is cool)

News from the Pool Operation

Art in Baths

Sculpture group 'the three at the shower' in the Flehingen Natural Pool

Come rain or shine, a small group of people stands under the showers at the Flehingen Natural Pool (see below). Theres a man equipped with a swim cap, goggles, and flippers, eager to 'do laps,' a woman blissfully feeling the sunshine on her face, and little girl 'Leni' with a swim ring, her gaze full of anticipation directed towards the pool.
The sculpture **'The Three at the Shower'** was created by artist **Helga Essert-Lahn**, who, after studying painting, sculpture, and art therapy at the Alanus University near Bonn, has become well-known for a variety of artworks in public spaces. Other sculptures by her can be found in Oberderdingen: 'The Reader' in the library, 'Lichtmessreiter' (Light Meter Rider) on the town square, or 'Fly a Kite' at the ‚Art on the Billboard' exhibition.
In 2021, Mrs. Essert-Lahn specifically created the showering trio for the natural pool, **representing gender and age diversity**. It aims to encourage every swimmer - young or old - to shower before using the swimming pool. The natural pool operates without chemicals, relying on natural filtration systems to clean the water. As the bathers themselves are a significant source of bacterial and nutrient input, it's essential for everyone to clean themselves thoroughly beforehand. The artwork not only encourages this but also brings a smile to viewers' faces, as they feel caught or reminded of how often they've bypassed the showers.
Just this artwork alone makes a visit to the natural pool worthwhile, which can be crowned by a dip into the refreshing, chlorine-free waters.

Art in Pools - Mural sought for Swimming Pool!

Large walls in indoor and outdoor swimming pools are often used for artistic creations. These are usually commissioned works, closely tied to the building's function. Unfortunately, these artworks don't always receive the attention they deserve. They're often seen 'in passing,' and in rare cases, details about the artist are known. In some instances, it's the artists themselves who fail to document commissioned works or include them in their biographies or catalogs. For example, in the estate of Dresden painter, muralist, and university lecturer **Prof. Alfred Hesse** (1904-1988), there's a **mural design for a swimming pool** (see below) Unfortunately, there are no inscriptions, documents regarding this work, or reviews in the press, but verbal hints from the family suggest that Hesse was artistically involved in a swimming pool.
Applied art was always a part of Hesse's artistic practice, who would have turned 120 years old this year. In 1958, Hesse was appointed as a lecturer in art education at the Dresden Academy of Fine Arts, and in 1965, he was appointed as a professor of mural painting. He left behind an extensive estate, managed by the **Alfred Hesse Archive**.
The archive is **grateful for any information about this artwork.** It would be a very special gift for his 120th birthday if the **whereabouts of the mural** could be clarified through this avenue.
[Dr. Antje Kakuschke, KLS]

Sculpture 'The Three at the Shower' by Helga Essert-Lahn (Photos: KLS)

Mural design for a swimming pool by Prof. Alfred Hesse - Artwork with an unknown current location (Source: Alfred Hesse Archive, Germany)

Research and Development

Fast or Slow?

Use of rapid filters in natural swimming pools

What is a Rapid Filter?

In bathing waters with biological water treatment, the term 'rapid filter' refers to an overgrown fixed-bed reactor filled with surface-rich substrate for bacterial growth. The biofilm-coated filter medium serves as an **effective means to bind phosphate** (PO4). The entire reactor is backwashed approximately every two to six months, depending on the loading density, to detach a large portion of the grown bacterial biomass from the filter material. The biomass dissolved by the backwash, along with the bound PO4, is removed from the system. Backwashing of the rapid filter is either operated directly with raw water or preferably with the clean water from a pre-filtration soil filter. In order for biomass buildup and thus phosphate removal to occur, the **deficient nutrient, in this case, carbon, usually needs to be added.** Possible carbon sources include alcohol or sugar.

Rapid filters have the potential to significantly increase phosphate uptake compared to slow-flowing filters such as hydrobotanic systems, submersible filters, and Neptun filters. This makes it possible to minimize the formation of biofilms on pool walls through phosphate limitation, thereby **greatly reducing the effort required for cleaning and maintenance of pool walls.** Additionally, rapid filters offer new possibilities to design biological water treatment systems in a more compact manner.

Fast vs. slow: a performance comparison

With a loading rate of 300 m^3/m2/day, rapid filters can achieve a degradation performance of both phosphate and microbial load (E. coli) by 10%. Unfilled filters (e.g., Neptun filters), on the other hand, are operated with theoretical loading rates of 10 m^3/m2/day (Neptun filters up to 15 m^3/m^2/day due to a corresponding performance certificate from the University of Hanover), with phosphate degradation performance doubling to only 20%. **In terms of water volume and filter area, rapid filters thus have approximately 15 times more effective phosphate degradation performance than unfilled filters.**

It should be noted, however, that unfilled filters have a much higher degradation performance (90%) of pathogens (E. coli). In smaller-sized private pools, the use of rapid filters has shown that a **ratio of filter surface area to the surface area of the pool liner of 50/1 achieves good filtering performance, where microbial load reduction can also be sufficiently achieved.**

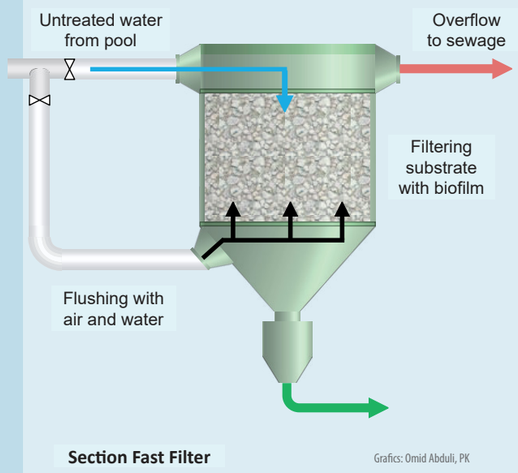
However, there is still no corresponding evidence for this, as hygiene measurements are not carried out in private facilities. It now needs to be clarified whether rapid filters can achieve comparable filtering performance to established slow-flowing filters in larger-scale natural swimming pools and thus be elevated to the state of the art (new FLL standard). It is expected that only a combination of slow and rapid flow filter systems will be sufficient to meet the urgently required requirements for the water quality of natural swimming pools. To bring more clarity to this R&D area, the Polyplan-Kreikenbaum Group, in cooperation with Polycon GmbH, is currently designing a new generation of rapid filters to test their filtering performance in selected natural swimming pools.

What is being researched?

In the design of rapid filters, one aspect is the comparison of different filter media, with particular emphasis on the properties of total grain surface area and surface structure. **The surface of the filter medium must offer optimal conditions for bacterial growth while allowing the bacterial biomass to be easily detached during backwashing.** Furthermore, there must be sufficient permeability to **prevent the formation of anaerobic zones** within the filter medium, which would inhibit bacterial growth. Methods for reliable dosing of carbon and inoculating bacterial pure cultures will also be tested. **An important research goal is to make the buildup of bacterial biomass controllable and thus predictable.**

For the planned study, experimental reactors will be used to determine phosphorus removal and reduction of microbial load per pass as a function of flow rate. **Based on this data, the optimized operation of a rapid filter will be compared to state-of-the-art unfilled filter systems (e.g., Neptun filters) in terms of energy requirements and operating costs through a cost-benefit analysis.**

The planning and implementation of this Research and Development project are carried out in close collaboration with ASC Switzerland, ASA-Bau GmbH, Germany and KLS-Gewässerschutz, Germany. We will report on the first experiences and results in the next issue. [Dr. Holger Kühnhold, PK]



News from the Pool Operation

The Bath of the Future

Experiencing nature on all levels

The four pillars of Troase Natural Pool Trossingen comprise: Movement, Experiencing nature, Diving and Snorkeling, Photography.

1. Movement reduces stress, prevents diseases, and can even heal them

Regular physical activity not only benefits the body but also profoundly relaxes the mind. Movement in water is considered one of the healthiest forms of exercise. It strengthens all muscle groups, keeping the body fit and healthy. Our elderly regular guests at the bath are a prime example, as they not only move physically and strengthen their muscles but also enjoy socializing with other bathers. Outdoor movement is preferable to indoor movement. And here comes the second pillar into play.

2. Experiencing nature

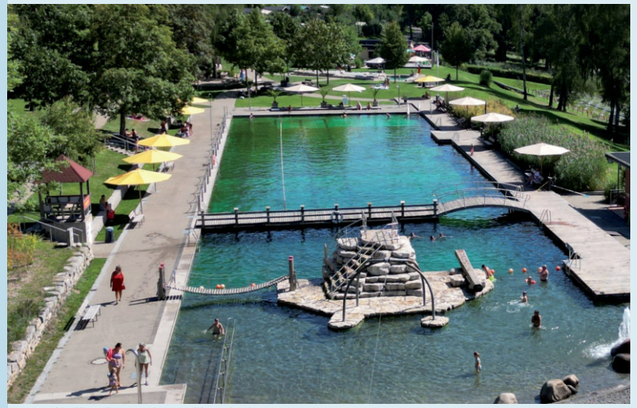
Light plays a significant role, as sunlight on the skin stimulates the body to produce vitamin D. Even a short break in nature significantly lowers stress levels, reducing the cortisol hormone level. Experiencing nature has a relaxing effect on both body and mind. Outdoor movement contributes to physical and mental health. Take the freedom to discover new worlds. Let's go on a discovery tour together and capture and experience beautiful extraordinary moments.

3. Diving and Snorkeling

Water and experiencing nature can be combined in diving or snorkeling, the third pillar. The first breath through a regulator underwater, the overwhelming feeling of calmness when surrounded by water from all sides, diving is often compared to meditation for a reason. Nature can be experienced up close, learning to dive step by step without danger and with trained personnel in Germany, ensuring this extraordinary experience is safely enjoyed. Be inspired.

4. Photography

How better to capture the beauties of nature, movement, and water than through photography? How better to convey and share the passion for this unique, fragile, and worthy of protection nature than through one's own perspective with the camera? Or present yourself in your best light. Let yourself be photographed and enjoy your pictures. Pictures that you will still look at in 20 years and that will bring joy to you and your loved ones. Impressive moments, dreamlike light moods, and the beauty in the simple things of life contribute to balancing a hectic everyday life. Both above and below water can be photographed. Daniel Sasse brings not only his knowledge of photography but also his experience and expertise in nature conservation in an inspiring and playful way. Thus, every camera experience and every picture becomes a success. [Daniel Sasse]



Natural Pool Troase Trossingen Germany (Photos: Sasse)

News from the Pool Operation

Millenium Pool Gothenburg

Floating pool with fresh and saltwater

As part of the redevelopment of the former **Free Trade Port in Gothenburg, Sweden,** a master plan was created for the city. In parallel with this master plan, pilot projects were developed, constructed, and operated on the former industrial wasteland. The goal was to understand how the implemented projects would be received by the public. As one of the **pilot projects, the first floating pool with biological water treatment** was planned in 2007 in collaboration with Polyplan and Raumlabor (Berlin).

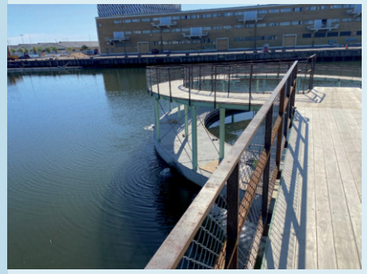
Following an initial test phase, it was decided to continue and expand this project in the long term. The pilot facility consisted of a floating pool structure made of steel, flanged to concrete floats on the sides. The water treatment involved soil filters installed in container barges and sprayed with water. A technical container housed the rest of the facility's technology. Admission was generally free, but visitors had to register online for a one-hour time slot due to high demand.
This pool was so well received by the Gothenburg population (250-500 bathers per day with a pool size of only 15m x 6m (90m^2) t**hat the city of Gothenburg decided to include a more extensive facility in the master plan.**

From 2021 to 2022, the facility was newly planned. From July 2022 to June 2023, the larger pool complex was constructed. **As a world-first, the Baltic Sea's saltwater, lying beneath the freshwater layer, was tapped.** The planned pools are open at the bottom and extend deep into the saline water layers. During operation, the freshwater is evacuated from the pools, and the heavier saltwater from the deeper layers with a salinity of 10 to 32 g/l rises. The ascending Baltic Sea water offers bathers a 'window into the ocean' with **clear, clean water featuring the typical saline water biocenosis.**

While the surrounding surface water is heavily contaminated by anthropogenic influences (E. coli up to 8000 CFU/100 ml), the concentrations after complete pool sealing from September 1, 2023, are below 100 CFU. Since the two pools are operated as bathing areas according to the EU Bathing Water Directive, E. coli concentrations up to 1000 CFU are permitted. However, during construction, the city reduced these to 100 CFU/100 ml, necessitating additional pool adjustments.

Salinity - measured here as conductivity - shows interesting effects and best describes the high dynamics in estuaries. The breakdown of **salinity in the pool** (a drop from 30,000 to 45,000 µS to 3000 µS) occurs whenever the halocline stratification collapses. The halocline stratification refers to the layering of the water column in areas with different salt concentrations. In this case, it means that the volume of the underlying saltwater layer nearly completely escapes. This always happens when strong west winds in front of the freshwater inlet into the Baltic Sea make the **underlying saltwater** front so massive that the **outgoing freshwater** can no longer flow into the sea. This then dynamically raises the water level in the entire harbor basin by 80-100 cm. This accumulated water then pushes the saltwater down, which flows back into the Baltic Sea, causing the halocline stratification to collapse suddenly.
Additionally, extreme changes in currents occur, particularly during these periods, exerting varying loads on the structure. **The continuous alternation between saltwater and freshwater** increases the requirements for corrosion resistance. The pool structure was built from a PE curtain, connected in sections. The connecting elements were made of particularly saltwater-resistant stainless steel, which was largely additionally encased in PE. The exposed screw connections are maintenance connections that require annual inspection and replacement if necessary. An annual inspection by divers is carried out for this purpose.

Construction began in the fall of 2022 and continued even in winter at temperatures down to minus 25°C. To realize this construction project, many construction companies (including Polycon, Bluet, Sernike) delivered outstanding performances despite the adverse weather conditions.
The dynamic operation is monitored via an automatic sensor system. The data is collected and evaluated in the project cloud DANA 2.0.
A globally unique project was realized, serving as a model for many more locations.
[Stefan Bruns, PK]



Millenium Pool Gothenburg Sweden (all Photos: PK)