FLUIDRA

WATER TREATMENT IN COMMERCIAL SWIMMING POOLS:

solutions for every challenge

WATER TREATMENT IN COMMERCIAL SWIMMING POOLS:

solutions for
every challenge

01 INTRODUCTION

Any pool operator knows that **achieving clean, clear water** is essential for success. After all, a spotless, healthy pool not only **attracts and retains customers**, but also has a direct impact on reducing **maintenance costs** and extending the **life cycle** of equipment and facilities.

Achieving meticulous control over water conditions means understanding the pool as a **complex ecosystem** in which a series of elements work together to achieve balance.

In this regard, in this ebook we will address the main elements of water treatment: first, we define the fundamental **concepts** and **technologies** for understanding a water treatment system; then, we outline some of the main **synergies** between the different elements and the keys to designing an effective water treatment system.

02 FOUR KEY CONCEPTS FOR UNDERSTANDING AND DESIGNING AN EFFECTIVE WATER TREATMENT SYSTEM

2.1 The basis for treatment: fresh water and salt water

With the variety of options available for treating and disinfecting pool water, it is important to know **the pros and cons of each type of water.**

Pool water is directly related to the available disinfection systems, which in turn have a major impact on **the user experience, sustainability** and **economic costs** for operators. Ultimately, choosing **the right type of water** is an important decision.

In this regard, it is important to understand that there are essentially two types of water:

2.1.1. Freshwater

Freshwater aquatic facilities are considered the **conventional model**, unlike saltwater pools, which we will describe below.

Contrary to what the name suggests, a freshwater pool is not necessarily a chemical-free pool or one that does not require chlorine for disinfection. From a technical point of view, freshwater is defined by the **amount of total dissolved solids** (TDS) it contains. According to the EPA (United States Environmental Protection Agency), freshwater is water in which this amount is below 500 parts per million.

2.1.2 Saltwater

Saltwater pools are still a lesser-known option, but their adoption is growing as their unique benefits become known. Unlike freshwater pools, saltwater pools require the use of **salt chlorinators**, also known as salt generators.

This equipment uses **electrolysis** to split salt into hydrogen and hypochlorous acid (the dissolved form of chlorine). The result is a **constant disinfection process** that does not require added chlorine, unlike freshwater pools, which need to have chlorine added from time to time.

Based on advanced salt treatment solutions such as **Neolysis, Nature Salt Plus** or **Easy Salt Next**, this process is much less chlorine-intensive, with additional benefits in terms of **user experience**: pool odors are reduced, so the overall atmosphere associated with chlorine in conventional freshwater pools is less intense.

It is also important to note that, although saltwater pools are salty in themselves, they only have around **3,000 parts per million (PPM)** of salt, a negligible proportion compared to the 35,000 PPM in seawater.

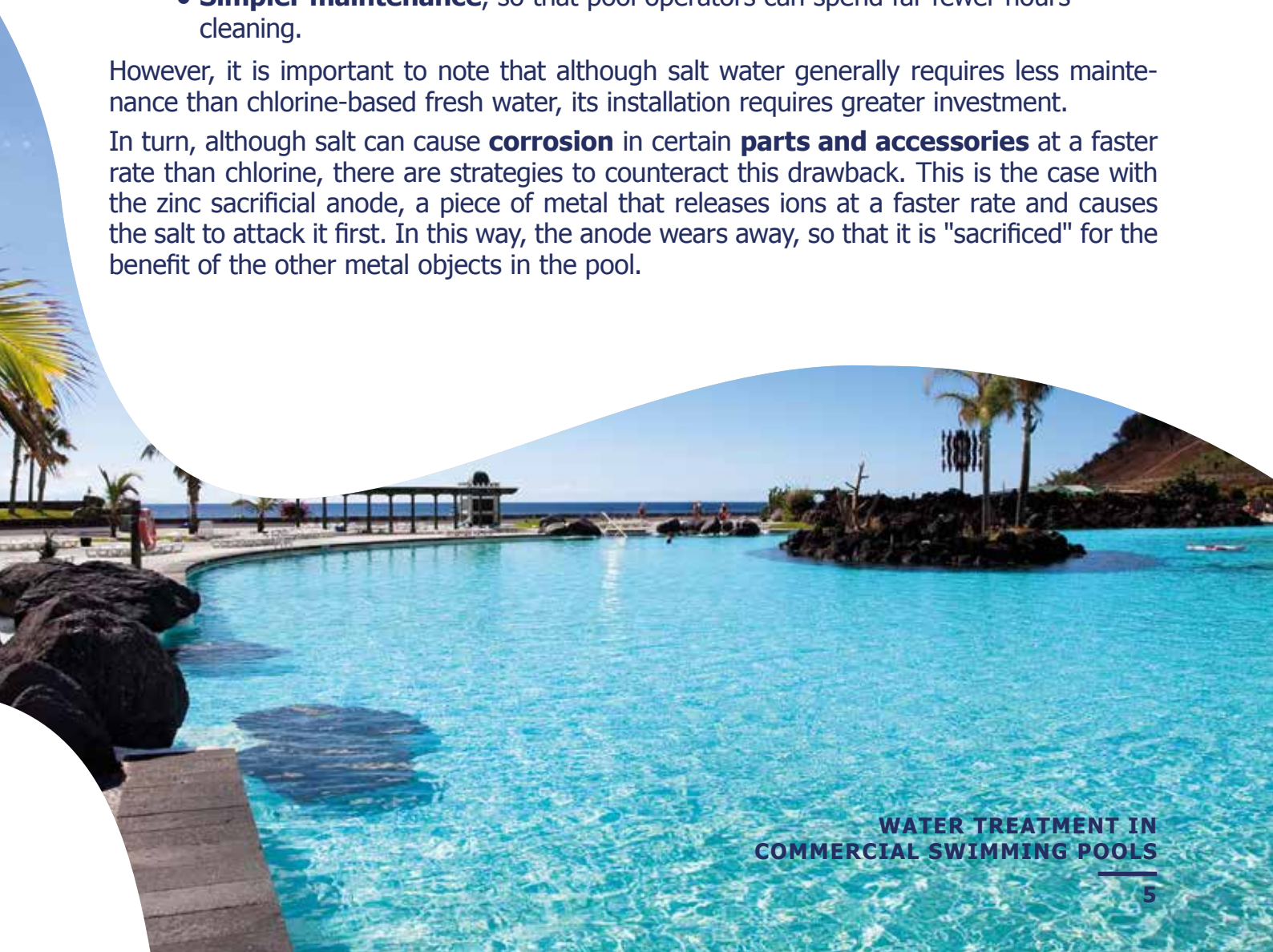
This reduced salt concentration ensures that swimmers find the water much less salty and sticky than seawater. On the contrary, users often enjoy a **smooth feel and texture without stinging eyes.**

Saltwater pools offer several important benefits in terms of treatment operations compared to chlorine treatment, including:

- **Reduced use of chemicals**, which are not used in treatment.
- **Simpler maintenance**, so that pool operators can spend far fewer hours cleaning.

However, it is important to note that although salt water generally requires less maintenance than chlorine-based fresh water, its installation requires greater investment.

In turn, although salt can cause **corrosion** in certain **parts and accessories** at a faster rate than chlorine, there are strategies to counteract this drawback. This is the case with the zinc sacrificial anode, a piece of metal that releases ions at a faster rate and causes the salt to attack it first. In this way, the anode wears away, so that it is "sacrificed" for the benefit of the other metal objects in the pool.



2.2 Filtration and elimination of turbidity problems: flocculation and coagulation

Filtration systems are responsible for removing **physical particles** from pool water. This is done using a process in which the water passes through mechanical filters, which trap solid particles.

There are different types of **filter media**, which also differ in the size of the particles they can retain and remove. Some particularly effective examples today are **sand filters, cartridge filters** and **regenerative filters**, the latter capable of removing particles as small as 1 micron without the need for backwashing.

However, there are scenarios in which filtration systems need additional help. This is the case with **excessively small** particles, which remain suspended in the water and can cause **turbidity**.

This is where **coagulation and flocculation** processes come into play, two independent techniques responsible for overcoming the forces that would otherwise stabilize the suspended particles.

Used in combination, coagulation and flocculation **increase the size of these** colloidal **particles**, both in suspension and in precipitation (i.e. sedimented at the bottom of the pool). **They group them into small masses** (flocs) so that they can be removed by the filtration system or a pool cleaner.

Additionally, if an automated dosing system such as Floc System is used, sedimentation at the bottom of the pool is prevented, as the process takes place in the water recirculation circuit.

The benefits of applying these techniques include:

- More **efficient and sustainable** water cleaning in terms of water and energy savings. For example, they avoid having to add water to balance the pool water parameters.
- **Reduced use of disinfectants** and other chemicals to keep the water in optimal condition for swimming.

There are several ways to dose and apply the flocculant, including **manual** and **automatic** processes, the latter being essential for water treatment in large public pools.

2.3 Achieving chemical balance: pH and alkalinity control

Controlling the **pH level** and **alkalinity** indicators of the water is another of the main challenges in water treatment. A balanced pH level can serve as a key reference for determining whether the water in a pool is safe and comfortable for swimmers.

The pH level measures the **concentration of hydrogen ions** in the water to describe its acidity or alkalinity. It is expressed on a scale of 0 to 14, with the recommended range being **between 7.2 and 7.8, with 7.4 being the ideal value.**

- pH levels within this range are considered neutral.
- Any value below 7.2 is considered acidic.
- Any value above 7.8 is alkaline or basic.

Water that is too acidic or too alkaline can cause a lot of problems, from skin **irritation** to **damage to** pool **equipment** and **green** and/or **cloudy water**.

The pH level **can fluctuate** due to several factors: from rainfall to temperature changes, the entry of external debris into the pool, use by swimmers, sunscreen residue, etc. Therefore, it is essential **to test** the water **periodically** to ensure that the pH level is within the recommended limits. Further on this ebook, we outline some of the main technologies currently available for taking this measurement.

Alkalinity control should complement pH level monitoring. Alkalinity is a key element in the pool water ecosystem and consists of measuring the presence of alkaline salts such as calcium or magnesium. In this regard, the recommended total alkalinity range for a pool is **between 100 and 150 ppm.**

Controlling these levels allows you to maintain the correct alkalinity, which in turn is essential for achieving balanced pool water. The first reason is that alkalinity has a direct impact on the effectiveness of disinfection treatments.

In addition, correct alkalinity levels **prevent sudden changes in pH**, as both parameters are **closely intertwined**: total alkalinity is the ability of pool water to resist pH changes. So, when a substance and other pool chemicals are added to the water, the total alkalinity reacts to keep the pH level of the water within the desired range (7.2–7.8). Conversely, high alkalinity can result in an uncontrolled increase in pH, with the problems that this entails.

In scenarios where high alkalinity is detected, it is possible to reduce it by adding **acidic compounds** and **pH reducers**, which come in liquid, powder, or tablet form. Once the alkalinity level begins to stabilize, it takes 48 hours to balance the pH levels of the pool.

On the other hand, correcting **low alkalinity** is more complicated and requires greater precision, as it can cause the pool's pH levels to fluctuate. This scenario is usually caused by malfunctioning **pool filtration systems** or lack of proper maintenance. In such cases, it is best to calculate the volume of water in the pool and its pH. Next, an alkalinity increaser (usually sodium bicarbonate) is applied according to the dosage instructions.

The pH level can fluctuate due to several factors: from rainfall to temperature changes, the entry of external debris into the pool, use by swimmers, sunscreen residue, etc.

2.4 Leaks and their impact on water treatment

Leaks are a significant problem in terms of **wasted resources** and operating costs and can even cause structural damage. When it comes to water treatment, leaks can also be problematic as they allow **untreated water** or contaminants to infiltrate, as well as altering chemical parameters or causing equipment overload.

Some of the **common causes of leaks** in swimming pools include:

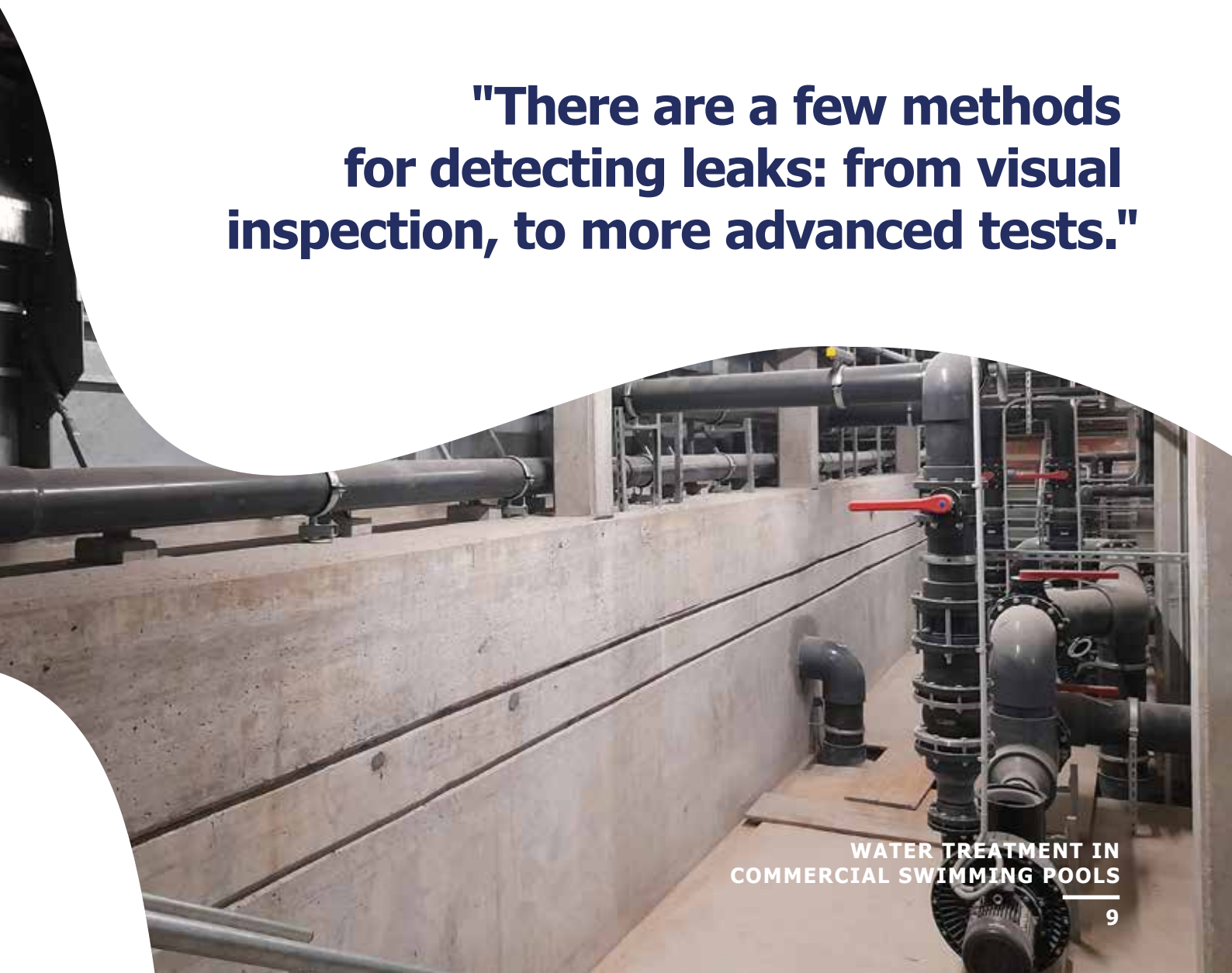
- **Cracks and fissures** in the pool structure, which may seem harmless at first but can gradually expand.
- **Hydraulic damage** due to the constant flow of water through pipes, fittings and connections.

There are a few methods for detecting leaks: from **visual inspection** for cracks, damp spots or algae growth, to more advanced tests such as **pressure testing** or **electronic** leak **detection**.

Similarly, once the source of the leak has been detected, there are several ways to address it: minor leaks can be resolved by applying a sealant, while problems in the hydraulic system may require professional repair or replacement.

In turn, **regular inspections** of the structure, hydraulic systems and pool equipment, as well as **regular maintenance**, are key preventive measures to avoid serious scenarios.

"There are a few methods for detecting leaks: from visual inspection, to more advanced tests."



03 KEY TECHNOLOGIES FOR WATER TREATMENT

3.1 Filtration systems

Efficient **filtration systems** are a cornerstone of pool maintenance. Above, we mentioned how filtration systems **remove physical particles**, ensuring clean water and reducing the need for chemical disinfection products.

In this regard, there are two basic pillars in the correct use of filtration technology so that the pool operates at full capacity:

- Choosing the **right type and size of filter**:

  There are a variety of filter media, but they are all made of granular materials such as **sand, perlite, diatomaceous earth, glass**, etc. Located inside the filter, this is where water debris is trapped.

  The fundamental requirement for the filter is to choose a size that is appropriate for the size of the pool itself.

  Commercial pools should opt for **fiberglass-reinforced plastic (FRP)** filters, which are highly resistant to chemicals and mechanical wear, giving them a longer service life.

  Regenerative filters are also worth mentioning. This is an advanced filter media option that traps particles down to 1 micron using the surface of flexible perlite-coated tubes. As soon as the perlite becomes saturated, the filter regenerates it by vibration, so it does not require backwashing. With regenerative filters, you can **save up to 50% energy, 90% water** and **reduce the use of chemicals** by up to 30%. In addition, thanks to its large filtration surface area, **it reduces the space required** in the technical room for installation **by up to 75%.**

- **Routine maintenance carried out correctly:**

  Regardless of the type of filter chosen, over time, limescale, organic debris and sediment accumulate, sticking to the filter media and reducing its effectiveness. To prevent this, it is advisable to carry out a series of maintenance activities, including:

  - **Backwashing**. A process based on creating upward water currents to sweep away dirt particles that have become trapped in the filter media and remove them. It is advisable to backwash every two weeks, at least once a month, depending on the size of the pool, its intensity of use and

the filtration system.

- **Air washing.** As an alternative to backwashing, this process reduces water consumption and can clean the filter media more effectively. Air is injected through a special connection at the bottom of the filter or through the backwash water inlet. This process only consumes electricity, hence its greater efficiency.
- **Changing filter media.** Pool operators should routinely check the filter media and ensure that its bed depth is sufficient, expanding as expected during backwashing. As soon as necessary, the filter media should be changed for better performance.

Finally, as mentioned above, **flocculation** is another way to improve the effectiveness and efficiency of water filtration systems. Simply put, this process involves enlarging the size of dirt particles, making them **easier to trap** in pool water filters.

Solutions such as **Floc System**, an automatic flocculation system perfect for commercial pools, are particularly noteworthy. It should also be noted that there are several options in terms of **flocculation media** (liquids, granulated solids, tablets, cartridges, capsules, etc.), each with different benefits and methods of use.

"The fundamental requirement for the filter is to choose a size that is appropriate for the size of the pool itself."

3.2 Water circulation equipment and technologies

Effective and sustainable water recirculation allows **pool water to be reused** and **reduces consumption**. To do this, contaminated water is collected, filtered, disinfected and returned to the pool.

Water recirculation also helps to ensure that disinfectants and other products **are evenly distributed** throughout the water. It also eliminates so-called "dead spots" of stagnant water, ensuring that the entire pool is clean.

The time it takes for the entire volume of water to pass through the pool's filtration system is called **the recirculation time**. Each country has specific regulations on the required turnover rate for commercial pools, as it is considered an essential indicator of the facility's ability to **maintain water quality**.

In terms of the **technology** available for water circulation, self-priming and variable speed pumps stand out as the optimal choice.

On the one hand, **self-priming pumps** combine water and air to produce an automatic pumping action, without the need for manual intervention. On the other hand, **variable speed pumps** are a more sophisticated and efficient option than single speed pumps for water recirculation, as they operate based on the real-time needs of the pool.

Their operation is based on a **variable frequency drive (VFD)**, which controls the electrical power supplied to the pump motor. This component provides more precise control of water circulation, filtration and other operations according to actual conditions.

In addition, the variable frequency drive can be **programmed based on specific parameters**, customizing it according to the size of the pool, the desired flow rate, the renewal time and energy saving objectives.

A variable speed pump offers the following benefits:

- **Energy efficiency**. By being able to operate at lower speeds when conditions allow, these pumps consume much less energy than single-speed pumps, saving up to 80% of energy.
- **Cost savings**. Although the initial investment may be higher compared to single-speed pumps, the reduction in energy consumption translates into lower electricity bills.
- **Noise reduction**. By operating at lower speeds, they generate less vibration and run more quietly.
- **Longer service life**. The ability to operate at lower speeds also contributes to a longer service life by reducing component wear.

The **Maxim VS** pump stands out as an advanced solution for commercial pools. Equipped with **Full Inverter technology** designed for **intuitive use**, this pump maximizes energy savings, ensuring both efficiency and sustainability.

In any case, the choice of circulation equipment should be based primarily on the size of the pool and its water volume, which will determine the appropriate pump size and speed requirements.

3.3 Automatic pH level control systems

When it comes to ensuring the optimum pH level of the water, **automatic control systems** allow large public or commercial swimming pool facilities to be controlled.

These technologies help operators to automatically **maintain optimal** water **pH parameters** at all times, making maintenance more efficient and sustainable, while providing peace of mind for operators.

Among the most notable technologies in this category today are:

- **The AP PR series.** Its integrated panels, which are based on controllers, make it a true 'Plug & Play' solution, as the system is supplied as a pre-assembled unit in a single panel to control pH, ORP and chlorine. This system is compatible with electrolysis processes to maintain water quality, contributing to the hygiene and sustainability of the pool.
- **Guardian Pool.** A platform that combines traditional control and dosing elements with total control of values through a digital platform. This technology facilitates the management of pool parameters and allows operators to analyze and detect possible errors using historical data.
- **Acqua Dos pH/ORP dosing pumps.** These pumps automatically dose pH correctors based on the pH or ORP reading.

"Automatic control systems allow large public or commercial swimming pool facilities to be controlle"

3.4 Disinfection systems

In addition to recirculating, filtering and treating the water to ensure an optimal pH balance, another fundamental basis for achieving crystal-clear, hygienic water in the pool is disinfection.

Disinfection systems work **by removing impurities and any potentially harmful substances** from the water. Today, there are two main options for this:

- **Chlorine.** The best-known and most popular disinfectant chemical for swimming pools, it helps to eliminate algae, bacteria and other elements from the water.

  Chlorine neutralizes these elements through a chemical reaction with water contaminants such as sweat, dirt, urine and sunscreen or body lotions. It can be dosed automatically or added manually once a week, either in liquid form, in tablets or in granules.

  One of the main drawbacks of using chlorine is the need for **active maintenance**, as this chemical reacts with certain substances, creating problems associated with so-called **combined chlorine** or **chloramines**.

  This reaction occurs when chlorine encounters **dirt particles** of various origins (dust, leaves or particles carried by the wind, bathers' sweat, skin oils, etc.).

  Once combined chlorine has formed, its disinfecting capacity is limited. In a sense, the combined chlorine has already been "used" to sanitize the water. Combined chlorine is also the cause of **the unpleasant chlorine smell** and the **eye** and skin **irritation** that pool water can cause. In addition to causing discomfort and ineffective disinfection, prolonged exposure to combined chlorine can lead to asthma, allergies and other health problems.

  There are several water treatment solutions available to **control chloramine levels** in swimming pools, including the process known as **overdosing or super chlorination**. However, the most efficient solutions today are alternatives such as **UV disinfection systems** like **Heliox UV** or **Neolysis**, which act as complementary systems and are explained in the following section.

- **UV disinfection and salt electrolysis.**

  This approach uses a combination of salt disinfection and ultraviolet radiation as a more natural and environmentally friendly alternative to neutralize contaminants without the use of chlorine.

  On the one hand, there is **ultraviolet technology**, capable of breaking down bacterial DNA on contact with water, thus reducing the need for chemical disinfection. This is the case with equipment such as **Heliox UV.**

  UV equipment used independently provides **complementary disinfection** to treatment with chlorine or other chemicals, as it destroys chlorine-resistant microorganisms and other contaminants, while reducing chemical consumption. In turn, as mentioned above, it can be useful for eliminating chloramines.

  However, their independent use does not guarantee that bacterial cells will not reappear. Unlike chlorine, UV disinfection equipment does not confer any disinfecting power on the water.

This is where the combination of UV and **salt electrolysis** comes into play, in treatments such as those proposed by **Neolysis**. This system combines UV water treatment with low salinity electrolysis in a single reactor that provides **disinfected and chlorinated water**, with the benefit that water treated with Neolysis is **completely natural**. Among its advantages are avoiding the addition of salt or chlorinated products, promoting water and energy savings, and improving bathing conditions.

Choosing electrolysis therefore means reducing the incidence of respiratory problems, eye and nose complications, and itchy eyes that can occur with chlorine treatments.

"UV equipment used independently provides complementary disinfection to treatment with chlorine or other chemicals"

3.5 Automatic vacuum cleaners and pool cleaners

Pool maintenance also includes cleaning the pool itself, i.e. the **walls** and **bottom of the pool**. What's more, in some countries, regulations require large commercial pools with many users to be **completely emptied once a year** to ensure water cleanliness, making it a good opportunity to clean the pool thoroughly.

For daily cleaning, **automatic** and **manual pool cleaners** effectively sweep the pool.

In turn, it should be noted that cleaning the pool involves a series of additional processes:

- For smaller, harder-to-reach areas, specific products should be used, applied with manual brushes or high-pressure descalers at least twice a week.
- It is necessary to keep **elements and accessories** (ladders, handrails, overflow channels, podiums, water jets, showers, lights, ornamental pieces, etc.) clean. All of these should be cleaned manually about twice a week with sponges and disinfectant products suitable for each material.
- **Hydraulic systems** and associated equipment, which help to control water quality, volume and temperature, must also be checked and cleaned regularly to ensure they are working at full capacity.

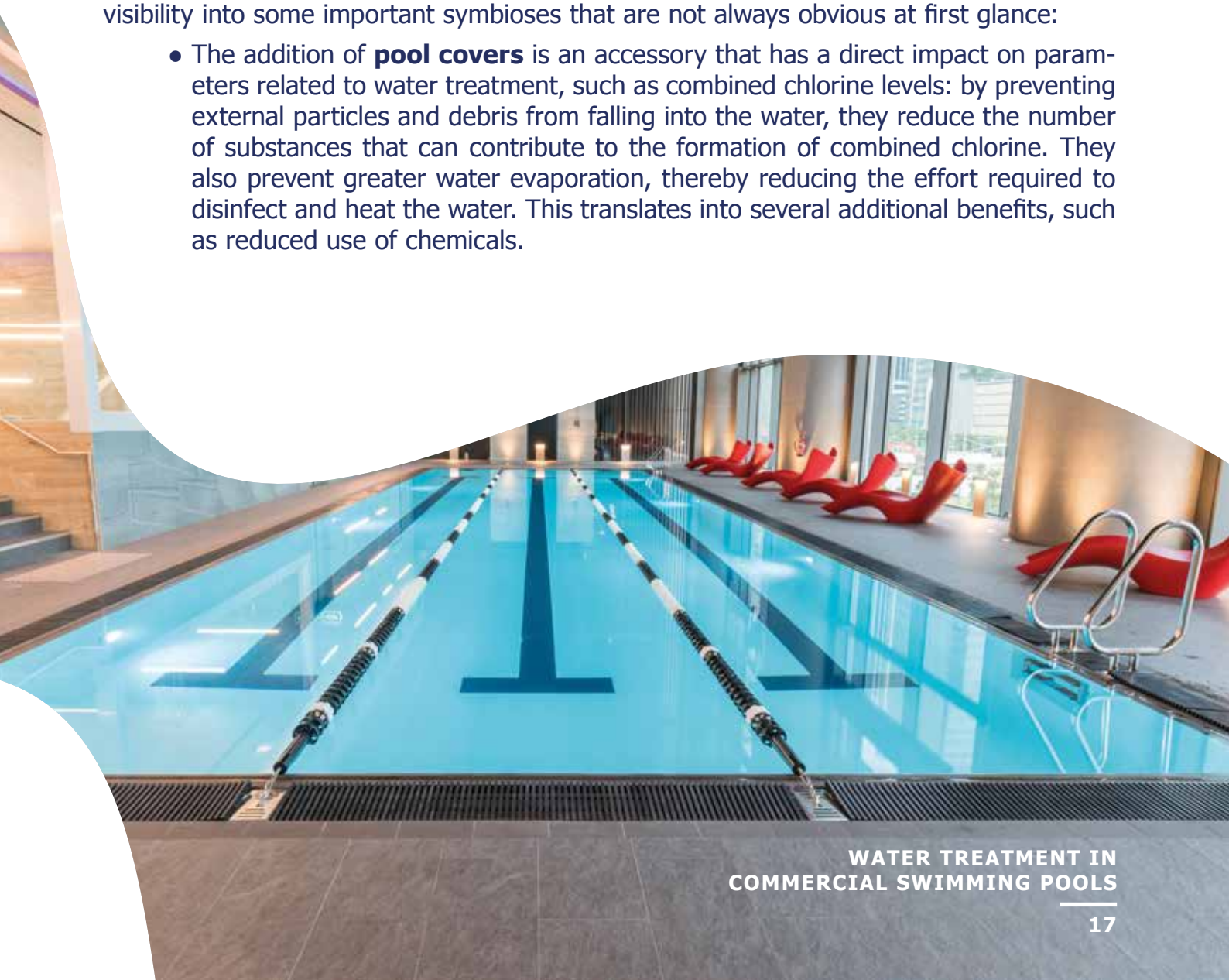
04 BEYOND TECHNOLOGY: UNDERSTANDING THE SWIMMING POOL AS A SYNERGISTIC HABITAT FOR EFFICIENT WATER TREATMENT

Among the many aspects that must be considered when designing a swimming pool, those related to water treatment are particularly significant due to their impact on water quality, as well as on operating costs and the sustainability of the facility.

In this regard, it is crucial that professional pool designers ensure that the system works as a whole, not only choosing the optimal equipment, but also ensuring that it is integrated.

In this sense, understanding the pool and water treatment as an ecosystem provides visibility into some important symbioses that are not always obvious at first glance:

- The addition of **pool covers** is an accessory that has a direct impact on parameters related to water treatment, such as combined chlorine levels: by preventing external particles and debris from falling into the water, they reduce the number of substances that can contribute to the formation of combined chlorine. They also prevent greater water evaporation, thereby reducing the effort required to disinfect and heat the water. This translates into several additional benefits, such as reduced use of chemicals.



- Decisions regarding **construction methods** will have a direct impact on the ease of cleaning the pool, floor and walls. Thus, if the pool is constructed with PVC or mosaic tile panels and **cladding**, cleaning is quicker and easier, as there are no joints or small areas that are difficult to access. In this regard, it is advisable to consider options such as Fluidra's Skypool in the early stages of design.

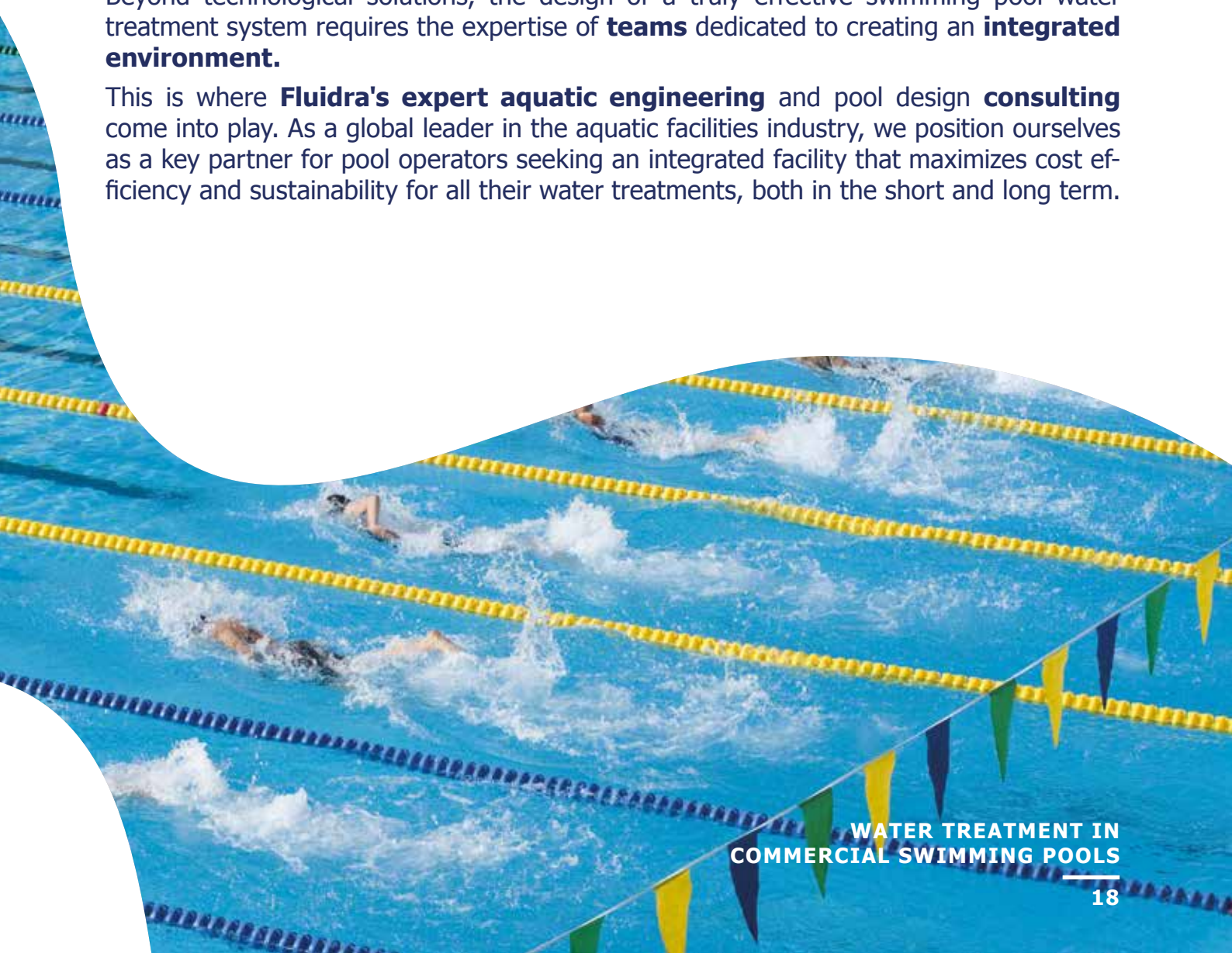
  In turn, this type of construction system is also key to preventing leaks, as it prioritizes **watertight integrity** from the outset using modular panels.

In the search for an efficient treatment system, the concept of **the "smart pool"** also emerges as a key ally. These types of solutions allow for the centralization of a multitude of aspects related to **water quality and cleanliness**, automating a large part of maintenance tasks through remote online access and action programming. These are platforms capable of managing water filtration and recirculation, the disinfection system, water levels, temperature, lighting and even aquatic elements such as hydromassage jets.

In turn, these solutions allow operators to access all key **indicator** information (humidity levels, water chemical balance, temperature, etc.). This develops **intelligence** around the pool that allows potential imbalances to be detected before they become a problem. In this sense, it becomes a key aid in ensuring **water quality 24/7**, but also in achieving cost savings, greater durability and a longer life cycle for equipment.

Beyond technological solutions, the design of a truly effective swimming pool water treatment system requires the expertise of **teams** dedicated to creating an **integrated environment.**

This is where **Fluidra's expert aquatic engineering** and pool design **consulting** come into play. As a global leader in the aquatic facilities industry, we position ourselves as a key partner for pool operators seeking an integrated facility that maximizes cost efficiency and sustainability for all their water treatments, both in the short and long term.



"This information contains general recommendations that must be taken into consideration on a case-by-case basis. This information is not an instruction manual and cannot be considered as such for any purpose. Any implementation or installation to be made must be made by a professional and under the appropriate guidelines. In this regard, each user is responsible for the application it makes of the information contained herein. Fluidra will not be responsible for its use. Consequently, under no circumstances will Fluidra be liable or responsible for any claim, damages or loss that may arise as a consequence of the use of this information".

FLUIDRA

www.fluidra.com

Fluidra Commercial Pool

Fluidra

Fluidra Group

Fluidra Tik Tok