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Clear thinking: water treatment for pools

The use of chlorine gas was phased out in swimming pools about the same time as Margaret Thatcher was in her political pomp. Some thirty years later Bob Judd considers developments in water treatment technology.

In the commercial pool, electronic monitoring and control of pH and chlorine have become commonplace and automatic controllers are regarded as a routine part of any new build. The growth in the use of chemical controllers within local baths dates from the decision to withdraw chlorine gas from the UK commercial pool market with the preferred alternative being sodium hypochlorite, with a liquid addition for pH correction.

Chlorine gas was a very effective disinfectant which was metered into the water via a device called a v-notched regulator and controlled by the turn of a knob. The correction of pH values was minimal and could be achieved by adding a product that was located within the main filter vessels. All this helped minimise the handling of chemicals and increased the ease of operation but the introduction of liquid sodium hydrochloride and acid called for new ways to monitor and dose the pool water, hence the development of chemical controllers.

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The first units to appear in our pools were of the type that had been employed in either drinking water plants or industrial water processes and the choice was minimal and expensive. However, the change from chlorine gas to liquid dosing also coincided with the fall of electrical component prices, a time when, for example, four-function pocket calculators went from costing two hundred pounds to twenty.

A new generation of chemical controllers evolved with operation terms and menus bespoke for swimming pool water control. Notes taken during a design meeting held in the early eighties indicated that the functional design should address the increased emphasis on what was called "operator and operations interface", a fancy term that referred to how easily the end-user could understand and use the equipment. The developments were innovative and were seen as a huge step forward.

In an article written in 1990 the rapid developments in technology led the author to claim "that adding chemical by the scoop will seem as backward as pounding the laundry on a flat rock". In retrospect, when we look at the advancements in chemical controllers today, these first steps seem quite basic. However, setting aside the developments made in electronics and the ability to write programs on an ever-smaller chips, it is the industry's ever-increasing understanding of water chemistry and pool hydraulics that has brought these products to a new level of performance.

Although pool dosing equipment is now automatic, just as a car needs the oil, water and fuel topped up and the tyres and battery checked to run efficiently so the operators of chemical controllers need to check total alkalinity, calcium hardness, the level in the day tanks and the condition of the injectors on a regular basis. As with a car system, pool dosing systems need regular services to check calibration, probe performance, flow regulators and metering pump or feeder operation. All system safety devices, such as flow switches or pressure switches, should also be checked and only flow switches that fail safe should be used.

Before going into detail on some of these developments we should acknowledge that to provide good water quality we must get the basics right: the correct chemicals for the local mains water, the correct size of filters to meet the bathing loads, appropriate chemical storage and handling, and the proper level and quality of staff training. All these are precursors to achieving and maintaining good water quality and are covered fully within the Pool Water

Treatment Advisory Group (PWTAG) guidance document and the SPATA standards. Reference to these two publications is a must prior to drawing up a specification of a new project. The SPATA standards contain not only advice on installation but also some trouble-shooting guidance.

Ultraviolet light (UV) systems are now being employed in a number of commercial facilities and UV systems fitted with medium pressure UV lamps offer a wide energy spectrum range and enable the breakdown of combined chlorine. They also prove to be very effective in the inactivation of bacteria, viruses and protozoa, such as cryptosporidium and giardia. Chemical controllers are now available which offer the function to control the power output of these UV lamps using the technology of a membranous total chlorine sensor which enables a combined chlorine set point be selected. As the combined chlorine level increases above the desired set point the output is increased until such time as the set point is restored.

In the move to reduce energy costs variable-speed drives are now being used to turn pumps down during periods of non-activity. Chemical controllers are now available that will interface with such devices, using either a water quality measurement or a basic time clock. A word of caution with such equipment: ensure that the reduced flow is capable of maintaining the desired flow rate across sensing probes and also that the flow is capable of performing the backwashing of the filters.

With regards to backwashing, controllers are now available that work in conjunction with a turbidity meter rather than using filter pressures to instigate a backwash. Once the pool water exceeds the desired turbidity level the filter is backwashed automatically, thus ensuring filters are backwashed when required, measured against a water quality parameter.

Another cost-saving feature now available is the ability to monitor via the internet, which allows off-site monitoring and adjustment together with a reduction in the need for a service engineer to attend. This not only brings down operating costs but it also reduces the carbon footprint of the facility by reducing the number of site visits. Many facilities are reluctant to network systems due to fears over security but the annual cost of a dedicated telephone line per year is less than the average call-out charge.

Controllers are now available which enable data logging of all of a system's operating parameters, including pump running times, alarms and untoward events (which might indicate that someone has tampered with the unit). Monthly reports can be generated which capture a record of pool values and can be used to help with chemical inventory.

The increasing sophistication of controllers available throws into relief the phrase 'operator and operation interface'. It is increasingly common to find that the 'operator' is being manufactured out of the relationship. There is a controller, for example, that enables comprehensive expansion options and will allow total plant and equipment room control and monitoring, including flow meter monitoring with display, variable speed drive (VSD) control, turbidity control with flocculation output, heater integration, total dissolved solids (TDS) and conductivity monitoring plus dilution control and auto top up. Total dynamic head monitoring of the main circulation pumps using pressure transducers is a must where entrapment may be an issue and it can also provide fully automatic backwash, with drain protection, water-safe mode, and data logging of backwash operation and water use. Such packages provide fully integrated water chemistry, filtration and circulation system control. The functionality of such products at last meets the design criteria for an automatic controller of pool water quality.

Having mapped the development of automatic chemical controllers within the commercial swimming pool sector and noted that it is now possible to purchase systems that negate the need for human involvement, the onus still remains with the operator to validate all results. The Health and Safety Executive's publication Managing Health and Safety in Swimming Pools" – known in the trade as HSG179 – makes it clear that manual checking of the water by taking appropriate tests for disinfection and pH levels together with other chemical tests that are recommended by PWTAG are a fundamental requirement for all pools.

Where pools are fitted with automatic controllers that measure the amount of disinfectant and the pH of the pool and then vary the dose rate in accordance with the readings (and the devices can be relied upon for their accuracy) then manually testing the water before the pool is used, after the cessation of use

and one intermediate test may provide sufficient monitoring. A good-quality test kit should be used but ensure the tablets being used are compatible with the test kit; keep the test tubes clean and remember that test kits need to be re-calibrated periodically.

The use of automatic controllers has moved forward at a pace unthought of thirty years ago with the human element being reduced to that of a double-checking mechanism. However there is one exception: it will always be a human being who specifies, sources and orders the equipment and these decisions are the ones that have to be correct.

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This article is part of a series of articles on swimming pool management published by *The Leisure Review* in association with SPATA . Other articles in the series include:

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