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Therapy pools and spas do not need a stark appearance in order to be effective for fitness and rehabilitation. Aquabilities, Birdsboro, Pa., for example features murals all around the perimeter walls.

Warm Water Works — Maintaining Spas and Therapy Pools Does Not Have To Be Problematic

The operator responsible for maintaining a spa or therapy pool knows that the time and effort required to properly maintain a warm-water pool greatly exceeds that needed for sustaining even a much larger traditional swimming pool.

The high-density bather load to water volume ratios and elevated water temperatures common in spas and therapy pools cause a rapid buildup of chloramines and total dissolved solids (TDS), organic loading, foaming, rapid chemical dissipation, difficulty in balancing water and a heavier demand on filters. Warm, aerated pools also provide favorable conditions for bacterial growth. Also, because bathers' pores are likely to be open, there is the increased risk of disease transmission.

Maintenance problems for spas and therapy pools generally fall into four

main categories. Do you know what causes a spa to foam, why it sometimes is impossible to maintain chlorine residuals or reach breakpoint or how terrible staining can be prevented? Read on!

Low Residual Chlorine Levels

Because most warm-water therapy pools and spas are small in gallonage relative to traditional swimming pools, a tiny number of bathers can have an enormous and immediate effect on the water quality. For example, 10 bathers will have the same impact on a 1,000-gallon spa as 3,600 bathers do on a typical 360,000-gallon community swimming pool. Because relatively high levels of bather wastes are imparted to the small pools, sanitizer residuals must be maintained at elevated levels in order to achieve the same effectiveness. The installation of ozone generators usually helps oxidize — or

burn out — organic contaminants. Ultraviolet light or, preferably, corona discharge ozone systems help maintain acceptable water quality in heavily used vessels.

Pool/spa water will both smell and taste better when ozone is used in combination with halogen products. Sanitizers, particularly chlorine, have a tendency to dissipate in warm water much more rapidly, therefore minimum levels in the 3.0 to 5.0 ppm range are recommended. However, bathers will not be harmed with free chlorine levels maintained at even 10.0 to 15.0 ppm. Because bromine does not dissipate until temperatures near 105°F, sodium bromide or bromochloro-dimethylhydantoin is a good choice for sanitizing warm-water pools.

However, maintaining proper sanitizer levels has less to do with the quantity of chlorine or bromine added to the water

and more to do with having enough sanitizer in the water to achieve the chemical reaction that removes harmful bacteria and waste products. To determine whether sanitizer levels are adequate, knowledgeable pool operators will monitor the oxidation reduction potential (ORP) of pool/spa water. ORP, a standard method of measuring the chlorine or bromine or ozone or other sanitizer-oxidizer ability to remove undesirable products from the water, takes into consideration all water constituents, including chemicals, oil, grease, dissolved solids, cyanurates, decaying matter and organic waste contaminants introduced into the water by bathers and is a true measure of water cleanliness.

Organics typically include sweat, urine, cosmetics, hair products, soaps and deodorants. According to research done by the German DIN, chemicals should be introduced in quantities needed to maintain ORP levels at a minimum of 750 millivolts in commercial pools and spas.

Automated pH/ORP controllers should be installed on all commercial spas and therapy pools to constantly monitor and regulate pH and ORP levels simultaneously and make chemical adjustments as necessary. Controllers use probes to sense the pH and ORP levels in a slip

stream of water off the return lines and compare them to a set standard or set-point range.

If the levels are not within set parameters, the controller sends a signal to

Indoor, warm-water pools and spas are especially prone to high levels of chloramines and their damaging effects.

the appropriate chemical metering pump, erosion feeder or chemical injection system to impart the appropriate chemical to the water.

When the correct level is achieved, the controller signals the chemical injection process to cease imparting chemicals to the water. In this way the controller acts, as does a thermostat with a heater and temperature, to keep chemicals within acceptable levels. Peaks and valleys are avoided, as are periods when the pool is

without adequate sanitization to kill harmful pathogens.

Joseph Woitkowski, maintenance supervisor at the Christoph Memorial YWCA, Waukesha, Wis., is responsible for maintaining two heavily used warm-water pools: a 35,000-gallon pool maintained at 90°F used mostly for pre-school water adjustment classes and arthritis and aqua fitness classes for the elderly and an older 65,000-gallon pool kept at 85° to 86° that is used for learn-to-swim classes, water safety instruction, water fitness, lap swimming and recreational programs. He tests the water in both pools at least twice a day using color-comparator test kits and a colorimeter.

"Our chlorine levels vary extensively from test to test. Chloramines always seem to be high, so we shock frequently. We're looking into the use of non-chlorine oxidizers. We try to keep a steady pH of 7.6. (The pools) have a tendency to quickly build up high TDS levels, so we frequently dispose of two inches of water from the pools and replace it with fresh water to dilute the solution. In order to consistently maintain a 730 to 750 mV ORP, we need to keep our FAC levels between 3.0 ppm and 10.0 ppm.

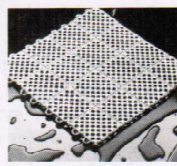
"Before taking the National Swimming Pool Foundation CPO course, I didn't un-

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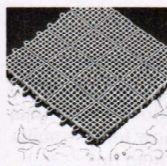
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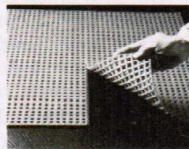
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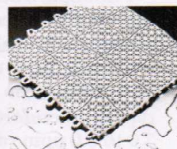
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derstand why our paper records showed high chlorine spikes correlating to high bather loads," he said. Older model controllers are installed on both pools, but new controllers with a direct ORP read-out are being purchased.

Difficulty Reaching Breakpoint

Normally, when hypochlorous acid (HOCl), the active sanitizing ingredient formed when chlorine and water mix, reacts with ammonia in the water, monochloramines and water are produced. Hypochlorous acid then reacts with mono-chloramines to produce di-chloramines and water, and the HOCl and di-chloramines react to produce tri-chloramines. If "breakpoint" is reached during superchlorination, HOCl and tri-chloramines react to form nitrogen, chloride salt and water. But in pools with high levels of ammonia, adding free chlorine to the pool water may only form more tri-chloramines or nitrogen trichloride.

The pool operator first should make sure any unpleasant odors, eye irritation, itchy skin or mucous membrane irritations are not caused by water imbalance, sun reflection, high levels of particulate matter in the water or poor ventilation in the natatorium. The operator also should make sure that chloramine levels

are not elevated because ammonia is added to the source water, incorrect calculation of the required dosage of chlorine, circulation "dead spots" that may prevent the chlorine from reaching all areas of the pool or not allowing enough time for the chlorine to reach breakpoint before lowering chlorine to "normally low" levels using sodium thiosulfate.

Kent Williams, aquatic consultant and author of the new National Recreation and Park Association Aquatic Facility Operator (AFO) text, said that pool operators should not permit free-chlorine levels to drop to zero. Remedies he suggested for eliminating nitrogen trichloride include:

- Maintaining high chlorine levels — above 10 ppm — for several days;
- Superchlorinating, de-chlorinating with sodium thiosulfate; and
- Re-establishing normal FAC levels.

According to Dave Knoop, applications manager, technical service at Olin Corp., Stamford, Conn., research done recently by the company indicates that shocking the pool with 75 percent available calcium hypochlorite will eliminate a nitrogen trichloride problem.

Bruce LeFew, Wellness Director of the Glenwood Wellness Center, West Monroe, La., operates a 500-gallon spa and a

60,000-gallon shallow, warm-water, hospital-affiliated pool. The facility caters to deconditioned adults who want to exercise and get in shape to improve their overall health.

One the most common complaints LeFew receives is about unpleasant odor and irritating water. Chloramine levels have remained consistently high, regardless of what the staff tried.

"We shocked the pool with calcium hypochlorite at different levels but couldn't get rid of the chloramines. We checked the ventilation, performed sodium fluorescein dye tests to check correct flow, monitored the TDS problem, drained the pool annually and diluted by draining and replacing water every week. Non-chlorine oxidizers seemed to work at first but didn't alleviate the problem. Now we're checking for tri-chloramines," he said.

Foaming

Foaming in warm-water pools and spas is caused by soft water, quaternary ammonia algicides, body lotions and suntan oils, tile cleaners, high TDS levels, air pollution and bathers' secretions. Foaming water usually indicates that the water in the pool or spa needs to be changed. Water should be drained and

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replaced when the TDS level exceeds 1,500 ppm.

To control TDS buildup dilute the water regularly with fresh water. If drought conditions prohibit draining and refilling the pool, a nanofiltration system can be installed to purge the water of dissolved solids. Defoamers should not be used continually because they change the water surface tension and hide the problem.

Brent Jewell, operations director, The Sporting Club at Aventine, La Jolla, Calif., has experienced foaming problems with their three spas. The facility has two indoor spas inside the locker rooms and an outdoor spa next to the pool. Each spa contains 1,100 gallons of water.

"We recently renovated the spas, converting from a system using 3-inch trichlor tablets to BCDMH in the two indoor spas. This reduced the eye irritation and smell. Now, we drain the spas twice a week, instead of three times a week. We used to drain the spas during operating hours. Now we can decrease the frequency of draining and perform maintenance tasks during off-hours.

Between drainings, we add a defoamer diluted 5 to 1 with water. At the request of members, we increased the hydrotherapy jet power in the spas. To compensate for the extremely heavy bather

loads, we increase the size of circulation pumps and the diatomaceous earth pressure filters to permit 5½ minute turnovers," Jewell said.

Mineral Staining

Minerals tend to be a big problem in the maintenance of warm-water pools and spas. Metals are introduced into pool water in a variety of ways:

- Through source water used to fill the pool;
- As algicides or sanitizers;
- From ionizers;
- As a result of electrolysis;
- From low-level electrical discharges from pool lights;
- From water moving through recirculation pipes in excess of recommended velocities stripping metals from pipes, impellers and heater elements; and
- As a result of aggressive, acidic water conditions.

The pool operator should monitor the amount of dissolved metals in the water. Color comparator test kits, colorimeters and dip-and-read test strips can be used to determine the amount of metals in the water. Sequestering or chelating agents also may help neutralize or remove hard metals from the water and prevent staining. If the problem is severe, acid wash-

ing or the use of non-draining, acid-wash products may be warranted.

Jewell also had unpleasant experiences with metal staining. The plaster surface of the outdoor spa was ruined within months of the facility opening. The spa was replastered, but within a couple of years the surface became stained again. A fiberglass surface was recently installed in the spa. The two indoor spas are tiled and tend to be easier to clean, he added.

Maintaining high dissolved mineral levels, for instance over 0.2 ppm for iron or 0.3 ppm for copper, can result in water discoloration and surface staining.

Operators of spa and warm water therapy pools undertake a big job to keep their facilities in optimum condition for a wide variety of patrons. But with careful attention to the constantly changing conditions in the water and a conscientious preventive maintenance program, their likelihood of experiencing a chronic problem can be reduced.

Alison Osinski, Ph.D., is the principal consultant with Aquatic Consulting Services, San Diego, Calif., and president of the International Association of Aquatic Consultants.

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