

# The Air in There

## *Enhancing an Indoor Pool Environment*

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**Parker Recreation Center, Parker, Colo.**

At the Parker Recreation Center, problems with maintaining properly balanced water chemistry at the indoor pool complex were causing undesirable side effects. For years, frequenters of the facility complained of foul-smelling air as well as irritated eyes, skin and sinuses. Only through the adoption of a new process control system have air- and water-quality problems been eliminated at the facility.

### **Brief history**

The City of Parker Recreation Department opened the center in mid 1994 to serve the City of Parker, a growing suburban community south of Denver. The 46,000-square-foot recreation building sits on 12 acres and houses two indoor pools, a weight training gym, an aerobics studio, cardiovascular equipment and a sauna. Outdoors, the department maintains soccer fields and basketball courts, along with a skateboard course, playground and picnic area.

The facility's 25-meter, 188,000-gallon main pool features a unique zero-depth entry section. An adjacent 14,000-gallon splash pool with slide, is also popular with the center's younger members. All levels of swim lessons are offered at the center, conducted by experienced, licensed instructors. In addition, the Mile High (U.S.S.) and Parker High School swim teams conduct their practices in the main pool. Water aerobics are offered as an alternative to more conventional exercise programs. Open swims are also squeezed into the pool's busy daily schedule. And, in the winter when neighborhood and other outdoor pools are closed, the number of swim teams utilizing the center's main pool increases.

During the center's busy season, bathers can easily number from 500 to 800 daily. In response to the popularity of swimming by members, the pools are open every day from 5:30 a.m. to 9:30 p.m.

### **Imprecise water chemistry brings bad air**

The facility's two pools utilize the same filtration system but have separate water chemistry control systems.

Initially, bromine was used for water sanitation, but operators found the chemical sanitizer could not keep up with bather loads during peak use periods. A switch to calcium hypochlorite improved water quality and clarity, but air-quality problems associated with undesirable by-products of chloramines persisted. An overwhelming "chlorine" smell had plagued the facility since it opened.

High levels of chloramines in pool water cause skin, eye and respiratory irritation as well as bleached bathing suits. In an indoor aquatic facility, the problem is compounded because chloramines vaporize into the air and remain in the confined area, resulting in foul odors and corrosion of pool equipment. In Parker, lowering high (1+ ppm) combined chlorine levels in an attempt to reduce volatile chloramine formation proved difficult, and the problem was compounded by the facility's high fluctuation in bather load.

During a four-year period, guests of Parker Recreation Center consistently complained of skin irritation and eye burn. Patrons also attributed sinus and bronchial infections to swimming in the pool. As a result of the complaints, center management spent a lot of time sending pool water out for laboratory testing and filling out Health Department reports. In addition, the center had the Health Department come to the facility on a regular basis to verify that the pool water was safe for swimmers.

At the same time, the indoor pool facility's total air handling system showed marked deterioration due to the presence of high chloramine levels in the air. Even the facility's dehumidification system condensate was displaying high levels of combined chlorine (0.6 to 0.8 ppm). Only a year and a half after startup, the fans and coils on the ventilation and heating system showed visual signs of corrosion, and a bearing had blown on one of the main fans.

Around the pool area, signs of corrosion showed on the general hardware and plaster. Although the pool plaster was scrubbed daily, guests reported that the bottom of the pool felt slimy. Additionally, every piece of chrome had to be cleaned each day to remove rust spots. In the harsh environment, the



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overhead lighting hardware and even the door hardware were deteriorating. One time, a sheet of glass covering a fire extinguisher case suddenly fell and shattered on the tile floor during the middle of the day because mounting screws had become so corroded that they broke.

Center management knew that a solution had to be found in order to maintain memberships and attract new members as well as to protect the recreation department's investment in the swimming pools and equipment.

### Searching for solutions

Throughout this period, management took numerous steps to try to alleviate the problem. An aggressive superchlorination program was initiated that shocked the pool water every three weeks while the facility's air-handling system was turned up to supply 100 percent fresh air exchange. During this time, the pool was shut down for 24 hours. This procedure brought combined chlorine levels down to 0.5 ppm, but within four days or less, combined chlorine was back up to 1 ppm, and after four days, levels would continue to climb well beyond 1 ppm. With these poor results, center management soon determined the shutdown and superchlorination procedures were a waste of time and money.

An ozone system was implemented in an attempt to alleviate the combined chlorine from the facility's air. The 0.45 gram/hour system was removed from service after a year of unsuccessful application. Nonchlorine shock (potassium monopersulfate) was routinely applied



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at twice the recommended dosage in an attempt to control combined chlorine. Despite these attempts, combined chlorine levels measured in the condensate from the dehumidification system still ranged between 0.6 and 0.8 ppm.

At the same time, a number of consultants were retained to assess the facility's combined chlorine problem. Some of the consultants believed that the recreation center should superchlorinate the pool every night, which was simply not feasible. Others believed better ventilation and dilution with outside air would solve the problem – their experience in outdoor pools fostered the belief that combined chlorine problems in the indoor pools could be solved by increasing air flow.

As much as possible, the air handling system at Parker Recreation was operated at 100 percent. Additionally, air circulation devices were blown across



the top of the pool. At the same time, the center continued to superchlorinate the pool up to two times a month, with 24-hour post-superchlorination shutdowns. Despite these efforts, combined chlorine levels continued to run high, and air quality at the facility remained poor.

### Precise, automatic control

Frustrated, the center's managers were preparing to invest in larger air-handling equipment when a possible solution was brought to management's attention. On the advice of the pool's contractor, the center decided to try a new process control system, which is designed to provide precise control for pool water chemistry and air quality in indoor aquatic facilities. A Stranrol Environmental Control System (ECS), manufactured by USFilter's Stranco Products in Bradley, Ill., was installed at Parker Recreation Center in November 1998.

The ECS controls the rate of oxidation and also the types of oxidation reactions that take place in pool water. In doing so, the system is designed to feed the optimum concentration of oxidizer in order to prevent the formation of volatile chloramines. This is accomplished utilizing high resolution redox (HRR) technology, which directly and continuously measures the rate of oxidative disinfection that can be affected by organic load.

The formation of volatile chloramines is prevented by the optimized and controlled rate of oxidation of all organic nitrogen compounds entering the pool. Bathers contribute organic-based nitrogen



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substances to pool water that contains complex substances which release by-products into the water as the substances oxidize. These by-products impose a demand on chlorine. Conventional chlorine control systems typically respond slowly to sudden changes in demand and may overfeed during low demand. Both situations increase operating costs and provide for less than desirable results. By measuring true demand, ECS technology ensures the appropriate amount of oxidants are present, resulting in optimum air quality and clean, clear pool water.

The system also calculates the Ryznar Index, which indicates the corrosive tendencies of the water and computes the required chemical addition needed to properly balance pool water. The benefits of maintaining the proper Ryznar Index include reduced maintenance costs associated with extending equipment life, cleaning pool surfaces and resurfacing of the pool.

At startup of the new system, the water balance was optimized to achieve a Ryznar Index of 6.5. Within seven days of operating the new system, and after years of never experiencing chloramine-free air, Parker Recreation's pool air quality problems were eliminated. The technology provides for a sustained Air Quality rating of 100 percent.

With the ECS, combined chlorine levels in the dehumidification system's condensate are undetectable. This translates into prolonged equipment life and less maintenance caused by breakdowns and corrosion of pool and facility hardware. Additionally, the new system

consistently maintains combined chlorine levels in the pool water at <0.4 ppm. The improvement in water and air quality has completely eliminated the need for superchlorination, thus eliminating costly and inconvenient shutdowns.

### Problems gone

Guests and instructors have complemented the center's management on both the water and air quality. Complaints of skin rashes, eye burn and bleached bathing suits have been eliminated.

The recreation department has also found cost savings in terms of chemical consumption. With the new system, a reduction in the amount of chemicals needed to maintain optimum water and air quality has resulted in the system paying for itself in approximately one year.

The improved air quality has enabled center management to reduce the air handling system damper settings at the facility from 100 percent to a more efficient setting of approximately 15 percent. In the past, the center had been forced to keep the air conditioner compressor turned off because the air conditioning system could not keep up with 100-percent airflow. This year, with airflow at 15 percent, the center ran its air conditioner compressor, resulting in a higher level of patron/client comfort on hot summer days.

**Barb Klobberdanz is the former aquatics coordinator for the Parker, Colo., Recreation Department. She is now aquatics director for Wheat Ridge, Colo.**

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