

AQUATICS EVOLUTION -Challenging The Limits.....*AGAIN!!!*

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From the advent of the waterpark sector of the aquatics industry in the late 1970's it became obvious a rather new breed had been introduced to the industry which did not react to or follow many of the then prevailing standard practices and procedures for water treatment and quality control. Cut and try processes in operating these new inventions revealed a seeming contradiction with prior historically accepted and proven practices and process parameters. Wasn't water still water? Was technology just wrong? Were accepted processes just lucky guesses? Was new technology needed?

The first wave pools often experienced cloudy water at peak operating hours although circulation rates and filter sizing complied with previously effective design parameters. Chemical feed pump sizing was not adequate to hold residual disinfectant levels in activity pools and wave pools when waterparks were operating near their design capacities. More recently, the advent of the indoor resort hotel style waterpark has revealed difficulties dealing with combined chlorine and a seeming breakdown of clearly established criteria for dealing with this phenomenon. A broad assessment of these difficulties has shown they were associated with at least one common factor - confined spaces and closed conditions. The new attractions generated much higher demands on the chemicals and equipment due to the nature of activity in the various pools and very high loads generated by water loss, expanded water surface area and aggressive water movement.

Cloudy water in the wave pool has been dealt with by adopting turnover times about ½ the 'traditionally' accepted levels. Residual disinfectant during peak user activity is maintained by using design rules that dictate rated feed capacity about three times that which was very adequate in flat water pools. Other problems have been solved by simply applying multipliers to the good and safe practices which had proven effective in the traditional aquatic industry. The quality of the traditional processes was validated by making quantitative process adjustments based on hindsight.

Unfortunately, this approach has not seemed to work in indoor water parks or modern natatoria which have been experiencing ravishly persistent and seemingly unresponsive combined chlorine levels. Resort hotel after resort hotel and numerous public sector aquatic facilities with newer 'waterpark' type pools (now termed aquatic recreation pools by the NSPI) have found themselves in circumstances where combined chlorine levels grow to upwards of 1.5 to 2.0 ppm because the facility waters failed to respond to traditional break point treatment. Further, these same waters have thumbed their noses at fairly recent but technically sound alternative techniques.

At least one public sector program in Cobb County Georgia decided to take the battle first hand and did find, evaluate and prove a viable process for treatment of chloramines. After battling the chloramine problem for nearly 3 years, the Cobb County Recreation department found that commercially available UV water treatment equipment effectively and consistently reduced combined chlorine to minimal and very acceptable levels. (See sidebar for more information). Plagued by persistently high unbreakable combined chlorine in two new state of the art facilities Cobb County Parks and Rec Aquatics Manager Bob McCallister dubbed the condition "The Monster in My Pools" and aggressively sought the cause of the problem and a solution to it.

Before Bob's "Monster" reared its head and fangs, it seemed there just could not be a problem. Initial equipment design for both new facilities seemed to have a step up on the chloramines issue since original specs called for automatic continuous use of a monopersulfate non-chlorine oxidizer to minimize chloramine buildup. The process and hardware for this side stream treatment has proven successful in many circumstances and has generally proven to be a valid recreational water subsidiary treatment. Unfortunately, with the new system up and running, within a few days of the opening of each facility high combined chlorine readings and the attendant guest and competition team complaints started pouring in.

The first logical response to the condition was to break the chloramines with the old 10 times ruleit didn't work. That is often not much of a surprise - its just a matter of getting more air circulation over the pools. In this case, no number of open doors and auxiliary fans or use of the state of the art air handling system affected the response. Tis a mystery..... even the gurus at their the county's muni water plant lab could not break the combined chlorine in well controlled bench tests.

More a mystery was the buildup of combined chlorine in the first place. The automatic ratio mixing of monopersulfate and chlorine based disinfectant was a proven technique for controlling combined chlorine and, in many circumstances, has been shown to have the capacity to eliminated the need to use special spot treatment processes to achieve break point.

By early in the second year of operation, the Park District found that the 'solution to pollution is dilution'. They found that by continuously dumping a small continuous amount of water through the filter system manual bleed, sufficient makeup water was added to somewhat control (not eliminate) the chloramine levels. Somehow this was not conflicting with the idea Cobb had state of the art aquatic operations. In CPO and AFO school we preach good practices which minimize losing good treated and heated pool water to the sewer system.....maybe turn of the century "flow through " was going to make a come back!!

By the beginning of year three, Mac and his team were introduced to "zeolite", a relatively new pool filtration media offered by reputable industry suppliers. The media removed smaller suspended solids and offered a secondary "adsorption" process which captures nitrogen (ammonia type) products. By taking these products (contents of urine and perspiration) from pool water combined chlorine compounds cannot form in the pool thus reducing or eliminating irritation such as burning sensation in the eyes and mucous membranes. Although this media is more expensive than sand media (high rate filters), carrying an acknowledged shorter use life, and required an additional stripping and activation process, the Cobb County people decided to convert two of their three new pool filtration systems to this media.

The changeover was relatively painless.....the high rate sand hardware was totally compatible with zeolite so it was a matter of removing the sand and refilling with zeolite media. Circulation rates were lowered a bit to accommodate flow limitations dictated by the media and a process was added to permit salt reactivation (removal of adsorbed products) of the media. It seemed the pool waters had a bit more of a sheen once the new system was in established operation but there was no measurable impact on the combined chlorine levels/conditions. The passage of time produced no operational support for the new process. So far "dilution of the pollution" was the only partially effective solution observed. The flow through concept was definitely showing promise!

Networking and the sharing of open discussions on the matter led the County to the use of UV as a sidestream treatment which could deal with the chloramines by breaking them down after formation. In the past, the aquatics industry has recognized the effectiveness of the 'blue light special' as a powerful

disinfectant in pool water. However, aquatics managers did not consider its relatively high cost justifiable in circumstances where the dumping of bleach in the pool could do the same job. After several months of investigation and discussion with suppliers of UV equipment, the county decided to 'take another plunge' in an attempt to deal with Bob's "monster". The equipment modification was made during the normal annual/winter service down time. Pool water was not changed to give the new process a running start. It could be said UV started at a disadvantage because it had to deal with large combined chlorine buildup its first challenge and to clean up someone else's dirty work. After a few days of operation, the "monster" seemed to be prevailing. Going back to his corner between rounds, Bob was told to hold fast and be patient.....he only partially accepted the supplier's premise his monster slayer would respond once its attention was focused on the beast. He had heard it before: "Stay the Course"

His skeptical patience and somewhat blind faith paid off! Within a relatively short few additional days, the chloramine levels were dropping. The smell was going away. The complaints were fewer and were disappearing. After a fairly quick period of transition, the monster was not apparent. Evaluated with the use of a FAS DPD chlorine content titration test kit, free available chlorine and total chlorine readings were seemingly equal and holding and the continuous venting of water has been stopped. THERE SEEMED TO BE NO COMBINED CHLORINE. At the time of this publication, the process is holding. If there is combined chlorine in the pool waters, its level is consistently below the 0.2 ppm minimum reading level of the FAS process.

Great!!!! but why did this process solve the problem when other recognized and proven alternative processes seemed to have failed? Discussions with Bob offer a bit of rationale which deserves full technical evaluation and some further development of processes for dealing with combined chlorine. Just as the cloudy water and inadequate feed rate problems identified 20 years ago were attributed to the evolution and development of the zero depth, extensive shallow water and high user activity pools associated with the waterpark industry there might be a parallel to be evaluated in the present modern indoor aquatic facility, hotel resort, and indoor waterpark.

Ecological, economic, and political demands have brought pressures to the architectural, engineering, and construction processes by demanding tight buildings, minimum 'wasted space', improved energy efficiency, and relative freedom from maintenance. McCallister opines these super designs might have produced unanticipated consequences with one of them possibly being the development of an environment that negates old established approaches to the chloramine problem. He notes his new facilities have super tight building construction, minimal contained volume, nearly total internal air recirculation, super humidity control and treatment of interior air, and little provision for fresh makeup air. In the 'olden days' you turned on the exhaust fans, kicked on the makeup air, paid the fuel bills for heating and just let 'er rip. *The old approach was not too much of a departure from the 'dilution is the solution to pollution idea.*

Economy was realized by running the big blowers only during periods of heavy loads or when super chlorination was conducted. After all, these high load periods were relatively rare in the use cycle of many traditional aquatic facilities. One has to question whether indoor water parks and state of the art public and private sector indoor aquatic facilities are traditional in any respect especially when one accounts for the high use/bather loads newer facilities experience.

The industry's attractive new indoor facilities are under very heavy load nearly every hour they're open. Their super conditioned environment is designed to effectively recycle indoor air, minimize structure deterioration due to condensate, and provide safe and healthful air for building occupants. Given this

combination and established budgets It seems we don't have the equipment or the money to effectively ventilate the plant.....how do you identify and address the potential unplanned consequences?

In the circumstances encountered by Cobb County, Georgia, a problem seems to have been solved by the use of UV technology. While other alternatives fell short, it is not to be concluded they could not work effectively in different circumstances or with different control and process parameters. Absent more definitive investigation and testing, all of these technically sound alternatives must be kept in play and applied to each circumstance case by case. As a minimum, one viable solution has been identified and successfully applied in a specific set of circumstances and conditions.

It's the bottom line that matters.