

## **UV Treatment of Aquatic Waters**

Adam Donnellan & Jim Tanner

This year, my family took the plunge and became the proud owners of a new pool. Since I'm in the ultraviolet (UV) water disinfection business as well as an owner of a spa tub, I thought that maintenance would be a no-brainer. I thought that I had everything under control.

Well.... let's just say that it was and is a learning experience.

Anyone who has had a pool knows that maintenance is both extremely important and time consuming. We weekend swimmers take a lot for granted. Whether we're going to the public town pool or over to a friend's house, we assume that the water is safe to swim in.

In order to get a better handle on what I needed to know about pool maintenance, I contacted Jim Tanner, one of the UV experts in Siemens' leisure aquatics business, for an education in Pool UV 101.

The information that he provided helped me get my home situation under control and helped me better understand how the larger pools handle these same and more complex issues.

From what I've learned, there are two situations where UV can be effectively used in a pool environment. One is for disinfection and the other is for the destruction of chloramines (smells and chemical odors).

### ***Disinfection***

The use of UV to treat swimming pool water is similar to using UV light to disinfect drinking water. The UV lamps used for germicidal disinfection produces a portion of its light in the 254-nm wavelength and can be either low- or medium-pressure technology.

The 254-nm wavelength is in the UV-C range of light. At this wavelength, UV light destroys bacteria, protozoa, viruses, molds, algae and other microbes. This includes fecal coliform and such waterborne diseases as E-coli, hepatitis, cholera, dysentery, typhoid fever as well as many others.

Using UV for swimming pool disinfection does not necessarily mean the complete elimination of chlorine. A residual is still required, but using UV for disinfection will lower chemical cost and usage, provide instantaneous disinfection (chemicals require a residence time), lower disinfection by-products (that occur when chemicals interact with organics and have been associated with cancer) and provide for less intensive maintenance.

#### BENEFITS OF UV DISINFECTION FOR SWIMMING POOLS

- Lowers chemical usage
- Reduces chemical cost
- Quicker disinfection [Head with a verb, like all other bullets]
- Lowers maintenance
- Reduces disinfection by-products
- Creates healthier swim environment

Once installed, UV will be effective at destroying waterborne disease-causing microorganisms. UV systems are sized with the idea that the water will be turned over at least four times a day.

Depending on the pool, chlorine can be reduced by 50%. This treatment is effective for home pools, municipal pools and indoor aquatic centers.

#### ***Chloramine Reduction***

Chloramines are a significant problem for indoor aquatic centers. Their formation is responsible for the chemical smells that we associate with indoor swimming pools.

My assumption had always been if it smells like chemicals, then the water has to be clean. However, it turns out that what we think is a chlorine smell is actually chloramines.

Chloramine formation occurs when there is not enough free chlorine in the pool. Free chlorine will oxidize organics (sweat, body oils, fecal contaminants and ammonia/nitrogen compounds). Without enough free chlorine, you can't oxidize these compounds. What happens is that the chlorine actually bonds with these organic materials and forms the chloramines. This is why you get odors which also cause eye, skin and respiratory irritation.

UV light has the ability to destroy chloramines in the same basic way that it does microorganisms. The main difference is that chloramine destruction requires a different type of lamp. While 254-nm is the effective wavelength for germicidal disinfection, chloramine destruction requires 250-385 nm. These particular wavelengths come from medium-pressure lamp technology.

Medium-pressure systems can provide both germicidal as well as chloramine reduction in the same system, which makes them attractive for all swimming pools. When correctly applied, chloramines can be reduced by 75%.

### ***Municipal Regulations***

When treating home pools, you can work with your water technology professional to design and install a system without too many issues. When dealing with public pools, you need to look at NSF standards.

NSF, the health and safety testing organization, has established a protocol for validating UV systems for swimming pool use. NSF/ANSI Standard 50 – Circulation System Components and Related Materials for Swimming Pools, Spas/Hot Tubs – is the validating standard for UV usage for public pools.

With more than half of the states requiring NSF 50 for public pools, it is critical for the public entity to look for the NSF 50 mark on its UV systems. The validation protocol tests for construction, efficacy (biological testing) and operational issues and will ensure that swimming center is getting an appropriately designed system.

### ***Conclusion***

After numerous trips to the pool store, lots of chemical concoctions, test kits and strips and a nicely tinted green pool, we took Jim's advice and installed a UV system. I got a 50 gpm commercial unit out of stock and plumbed it inline after my filtration unit. I piped it using 2" PVC piping and plugged it in.

The first test, a birthday pool party for my six-year-old and 20 of his closest friends. The result, a great day for the kids, fewer chemicals and no more green water.