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# AQUATICS

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## Sacrificing SAFETY?

Unprecedented budget cuts may be putting patrons in danger. But shrinking resources don't have to mean skirting safety.



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Understanding UV

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# Pressure Situation

Many operators are looking to UV sanitation to combat RWIs and chloramines. But are all UV systems created equal?

**F**ive to 10 years ago, our industry knew very little about ultraviolet treatment systems for recreational swimming environments.

Today UV is one of the top industry buzzwords. As a result, many new suppliers are attempting to enter what they consider a lucrative market, often promising fantastic results at unbelievable savings. They quote studies or parts of studies that benefit their sales pitches to the facility owners or designers. Adding to the problem, virtually every study cited is related to drinking water or wastewater treatment, not recreational water.

I have heard so many presentations that tout "studies," and they all assume disinfection and the destruction of chloramines in recreational water require the same equipment and the same processes as those used in drinking water.

Nothing can be further from the truth. Drinking water is treated 100 percent

before use. At no time is it mixed with the source water that is being treated. And the temperature of the water is 55 to 65 degrees Fahrenheit (ground temperature) the vast majority of the time.

What is the facility operator to do? Get educated. Do your research. Trust a reputable supplier who is not only going to sell you a system, but service it as well. Ask questions. Get answers.

If ultraviolet disinfection systems had been in use for drinking water in the United States for more than 20 years, why were they not introduced into the recreational swimming pools market at that time? Low-pressure (LP) UV manufacturers learned it was a different application with different conditions. If it was used in recreational swimming pools in Europe for 20 years, what did they use? What did they discover?

They discovered low-pressure technology

that was successful for drinking water did not work as effectively in pools. That led UV-lamp manufacturers to develop medium-pressure lamp (MP) technology. The recreational pool market for UV systems then quickly became successful.

Several significant factors in pool applications make LP lamp technology unsuitable for disinfection and the destruction of chloramines. They are as follows:

- The wavelength emitted by LP lamps is narrow — 254 nm. This radiation is capable of destroying monochloramine, which would be effective if the water were being treated in its entirety in one single pass.

That is not the case. Therefore, trichloramine and dichloramine, which are far less healthy, are produced from the monochloramine still in the untreated water. Once the tri and di appear, LP cannot effectively destroy them because di and tri compounds absorb

INSIDE LOOK A circulation system with UV sanitation in place (left); the view from inside a UV cylinder (right).



UV light at 297nm and 345nm, according to research from Purdue University.

■ The temperature of pool water is normally around 80 to 85 degrees; spas are in the 95 to 104 degree range. Low-pressure lamps have a relatively low surface temperature; therefore, the influence of water temperature is significant. The optimal water temperature for LP lamps is 68 degrees Fahrenheit (20 degrees Celsius). At temperatures above that, the UV output drops off significantly.

Medium-pressure lamps operate at a much higher temperature and can operate effectively in a much greater temperature range with no effect on the UV output, according to Dr. James Bolton of Bolton Photosciences Inc. in Edmonton Canada

■ Low-pressure lamps are vulnerable to photorepair when an organism is exposed to sunlight for a short period of time, approximately 30 to 180 minutes.

What does this mean? In swimming pools, the water passes through the UV chamber

after filtration and returns to the pool during the turnover cycle. At this time, the DNA that was broken down by LP lamps can repair itself. We are, in effect, showing that we are "destroying" the parasite when it passes through the UV chamber; it is, however, reappearing in the pool water only to

## LP systems use multiple lamps to achieve enough intensity to treat the water. This creates several issues.

be reactivated again. This is a cycle that repeats itself. However, studies have shown medium-pressure lamps break down the DNA and do not allow photorepair, according to a study published in the journal *Applied and Environmental Microbiology* by researchers J.L. Zimmer and R.M. Slawson.

■ Medium-pressure lamps break down organics, assisting in water clarity. Low-pressure lamps will not, according to the U.S. Environmental Protection Agency.

■ Low-pressure systems use multiple lamps to achieve enough intensity to treat the water. This creates several issues. Typically, several lamps are monitored by a single sensor to be able to verify the proper dose and intensity is being applied. One can only be sure that the flow nearest the closest lamp is effectively being disinfected. Second, if one of several lamps has failed, do you replace them all? How do you monitor the lamp hours? Do you number each one and keep a record of each?

With medium-pressure systems, you have a specific monitor for a single lamp, or a properly positioned monitor to accurately check two lamps, to be able to verify the calibrated intensity is being applied.

■ Multiple lamps with LP technology mean more maintenance issues. Most LP manufacturers do not provide automatic wiper systems to keep the quartz clean; they are simply not practical with multi-lamp LP systems. This then requires manual cleaning, which is very time-consuming. Again, when one or more lamps fail, do you replace them all?

# DON'T RISK AN OUTBREAK

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Research is an important tool in developing new products and testing existing products to meet the requirements of our industry. But it is important to review the results objectively rather than use those parts of the study to advance one's interests.

For example, several manufacturers have cited a recent study on the "Impact of Chlorine and Monochloramine on Ultraviolet Light Disinfection," from Duke University/University of North Carolina. They extract data from this study, trying to claim that LP technology is more effective than MP technology.

The problem with the extrapolation is that they fail to cite the conclusion arrived at or the conditions under which the study was conducted. The study involves dosing from 300 mj/cm<sup>2</sup> to 1500mj/cm<sup>2</sup> to find out if UV will degrade chlorine and monochloramine. The UV dose range for chloramine destruction and disinfection is from 40mj/cm<sup>2</sup> to 60mj/cm<sup>2</sup> in swimming pools.

The study concluded: "Chlorine and monochloramine in water decay steadily when

exposed to monochromatic (LP) and polychromatic (MP) UV light. However, total decay of chlorine and monochloramine are relatively small in the UV dose range that is generally applied for disinfection (15-130mj/cm<sup>2</sup>)."

The assumption that MP lamps burn

## The assumption that MP lamps burn more chlorine than LP lamps and thus are not as effective is simply misguided.

more chlorine than LP lamps and thus are not as effective is simply misguided.

What does all this mean? How does one make a decision that will be cost-effective while providing the risk management that the owner/operator needs?

- Ask for references.
- If a company makes a statement, ask for third-party documentation.
- When they size a model, ask how they determined the size.

- Are they an authorized distributor for start-up, training, parts and service?
- Ask for a typical service agreement so you know what it may cost to maintain the system.

- Does the manufacturer have UL and NSF approval for swimming pools?

- Is the control panel suitable for use in a wet-chemical plant room?

- Find out how many systems the installer has installed.

- Require a written warranty.

- If the unit must be validated per state code, require a validation certificate with the system.

Remember the old adage, "If something sounds too good to be true, it probably is." ■



**GET MORE** For a primer on UV sanitation, go to [aquaticsintl.com](http://aquaticsintl.com)

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