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A Sanitizing Assist
Helping To Clean
BY ERIC HERMAN

MANUFACTURERS IN THE portable spa industry have made a splash in recent years with the introduction of UV systems as a sanitizing aid, allowing less halogen use in the tub. Proponents of the technology are quick to point out that UV fits perfect for the job, given the demands of the hot water environment.

"We've been selling UV systems to portable spa manufacturers for about 10 years with an increasing number moving in that direction over the past two to three years," explains Jeff Boynton, general manager at Delta UV, a manufacturer of UV systems based in Gardena, Calif. "Today we're manufacturing about 20 different sizes as an OEM to accommodate different flow rates in various spa models."

"It's definitely a growing part of the business," he adds. "One that's keeping up with other markets that are also turning to UV."

The Internet, oddly enough, has been a helpful boost to the growth and acceptance of UV in spas. Boynton believes that younger consumers accustomed to researching everything and anything online are pushing the trend. "We've become a society of what I call 'information viruses,' he says. "Consumers interested in the technology seem to be a younger breed; they consume information about how UV actually works."

"When you combine that with the overall trend toward green technology and the benefits of UV treatment, we have a situation where the technology is becoming better known, understood and now manufacturers are responding to that increase in demand."

A REGISTRY OF BENEFITS

When consumers do their research or are otherwise educated by the industry, here's what they are likely to learn:

- REDUCED HALOGEN USE: As is the case in swimming pools, one of the biggest benefits of a UV system is that it can dramatically reduce use of chemicals, specifically chlorine or bromine.

  "People are looking for a cleaner way to treat water," explains Boynton. "They don't want to add anything to the water, or as little as possible. UV helps move you in that direction."

  And that direction lines up neatly with spa manufacturers looking to capture consumers concerned about the effects of traditional halogen treatment. "Our goal using UV technology is to achieve a 75 to 80 percent reduction in the chemical load of the vessel," explains Jerry Keller, product development/customer care manager for MAAX Spas, a portable spa manufacturer based in Chandler, Ariz. "It affects the water in a positive way without adding anything; it doesn't take anything away from the water, so in that regard, it's benign."

- SANITIZING BYPRODUCT REDUCTION AND ODOR ABATEMENT: UV has the ability to inhibit the formation of combined chlorine and bromine, which in conjunction with lowered chemical consumption can reduce or even eliminate foul-smelling halogen byproducts.

  The ability to prevent chloramines and bromamines from forming is especially important in a spa, notes Boynton. "The warmer water increases evaporation, which in turn can lead to bathers inhaling more sanitation byproducts," he says. "When less chlorine or bromine is used, less combined chlorine and bromine will be produced. "The bottom line is that if you use less halogen, you're going to generate less byproduct. It's really just common sense."

  By reducing chemical use, then, manufacturers are able to sell on the premise that in a UV-equipped spa, the of-
A selection of spa UV systems. Applying UV systems to spas requires proper sizing and system selection based on circulation flow rate in order to achieve the full benefits of chemical use reduction, chloramine control and overall water quality.

offensive odor associated with halogen by-products will be drastically reduced along with eye and skin irritation.

“Number one concern for consumers is the use of chlorine and the associated odor,” explains Keller. “For the most part, consumers don’t really understand the difference between chlorine and chloramines. They smell chlorine and think it’s too much. It’s difficult to change their minds on that.

But it’s much easier for them to understand that we’re taking the chlorine that they’re using and making it more effective. That’s essentially what UV does. So in their mind, they see a large reduction in chlorine use and they’re not experiencing the smell.”

RAPID TURNOVER: Because UV treatment depends entirely on direct exposure of the water to UV light in the system’s contact chamber, the rapid turnover commonly found in spas compared to pools enhances these positive effects.

“With spas, you have a situation where the water is turned over two, three, four or even up to ten times per hour, so we have the potential for the water being sanitized dozens or even hundreds of times each day,” notes Boynton. “The more often wa-
ater passes through the system, the greater the reduction in chemical use.

- HIGH BATHER LOADS: The rapid turnover rate helps UV systems contend with one of the biggest burdens of spa sanitization: the high ratio of bathers to water volume, a factor that is exacerbated even further by higher water temperatures in spas.

  “Not only do you have a higher bather-to-water ratio than you do in pools, but people sweat more in spas and introduce other bodily contaminants,” Boynton says. “The smaller volume and higher temperatures elevates the need for constant treatment.”

- STEADY WATER BALANCE: By reducing halogen use, UV has the indirect effect of helping keep water balance in line. Because the treatment is passive, the systems add nothing to the water and therefore have zero impact on pH, total alkalinity, calcium hardness or TDS.

  All of these factors conspire to create beneficial synergistic effects: By reducing the sanitizer demand and therefore halogen byproducts, odor and other forms of irritation are likewise reduced or eliminated. That, combined with the rapid turnover in spas, further enables the system to help contend with bather contamination.

  More importantly, UV has been proven effective in killing pathogens that have shown resistance to chlorine, such as the now infamous cryptosporidium. This crucial benefit has helped drive UV’s popularity in both pools and spas, and lead to its growing acceptance among health departments and public health agencies such as the Centers for Disease Control.

MAKING THE MARK

Like all sanitizing technologies, however, UV treatment has its limitations and must be sized and maintained properly in order to achieve the benefits. And not all UV systems are created equal. “There are UV lights that do not generate the kilojoules required to properly sanitize water and will do very little,” says Boynton. “There’s a huge difference in price between units that effectively kill bacteria, viruses and other microorganisms, and those that are just decorations.

  “The flow rate is critical when we talk about optimizing the effect of the technology,” says Keller. “The bulb should be sized to the flow rate, so that it will do an effective job treating the water, which in turn is tied to the overall size of the spa. For example, the unit we use on our swim spa is probably four to five times the size of the units we use on small hot tubs. It’s a different application and requires a different spec.”

Boynton agrees, noting that in the past improperly designed and sized UV units have resulted in systems that don’t perform as advertised: “If you undertreat the water with a system that’s too small, you won’t have the same benefits of reduced chemical consumption,” he explains. “On the other hand, if you overtreat the water, it will strip out some of the halogen and you could actually wind up increasing chemical consumption.”

In addition to proper sizing rela-
tive to flow rate, the output of the UV lamps used is essential in eliminating target pathogens. "We design our systems to generate 30 millijoules," Boynton adds. "At that level, the UV will eradicate cryptosporidium and other harmful pathogens, such as cholera. We're slightly overshooting the output to err in favor of bather safety. But at that level with a proper flow rate, there's no danger of stripping halogen."

As for halogens, although the main benefit of UV technology is the reduction of necessary sanitizer residuals, even the staunchest supporters of the technology are quick to point out that UV must be used in conjunction with some form of sanitizer that provides a chemical residual.

UV does not provide bather-to-bather protection and when the system is off, it does nothing at all, ergo a chemical sanitizer, albeit at a lower level, remains necessary.

Specific conditions will dictate just how low one can go with sanitizer levels. In all likelihood, residential spas will require a lower residual than will commercial vessels that might receive many times the batherload.

SUSTAINED ACCEPTANCE

Although UV in pools and particularly spas is arguably a newcomer to the water treatment equation, advocates of the technology believe it's here to stay.

"It's something we see tremendous potential moving forward," says Keller. "The technology is going to continue to advance. UV is here to stay for us because we believe this is the right answer for our product. We have absolutely no intention of getting away from UV."

Comments or thoughts on this article?
Please e-mail eric@aquamagazine.com.

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**BEYOND TOGETHER**

UV and ozone generation are widely used together in hot water applications, both in portable spas and in-ground gunite spas, both in commercial and residential settings. The synergistic relationship between the two technologies stands as its own scientific field, known as advanced oxidation process, a complex set of chemical reactions through which highly oxidative and extremely short lived chemical species known as hydroxyl radicals are formed.

Although not covered in this discussion, AQUA examined the relationship between UV and ozone in our July 2014 issue in "The Quest for Synergy."

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Keeping Pace with Technology

BACK IN LATE October of last year, AQUA Executive Editor Scott Webb asked me to research and write a story about UV sanitation systems in spas and hot tubs. That piece, which appears in this issue, is essentially a follow up to a feature I wrote for our July 2014 issue covering alternative sanitizers, specifically ozone, UV and ionizers.

I've always been fascinated by water chemistry and water treatment technologies, and as is the case with each technology I cover, my research about UV and its growing acceptance in the pool and spa industry was more than a little edifying. I like many oncoming technologies, UV systems do appear to provide builders, servicers and facility managers with a tool they can use to meet client demands for quality water, especially so for those trying to reduce sanitizer levels.

Yet there's one interesting aspect to the UV discussion. While the technology may be new to the pool and spa industry, it's long been accepted in other industries that rely on clean water, including the wastewater treatment industry.

I first became familiar with the technology in the late '90s when covering the pond and stream market for another publication. At that time, many a word was spoken about UV in the pool and spa industry, but the systems were already commonplace in bodies of water that contain fish and aquatic plants. Later on in the early 2000s, I started hearing about UV being used in pools, and the movement into UV rapidly gained momentum after years of being virtually ignored.

That acceptance curve reminded me of what the industry experienced with electrolytic saltwater chlorine generation systems. Those systems, which originated in Australia, started appearing in the U.S. pool industry in the mid-90s — but like UV, wouldn't gain widespread acceptance until years later.

Again, when the industry embraced the benefits of saltwater systems, they quickly became extremely popular. It's certainly not unusual for newer technologies to take awhile to catch on in our industry. After all, the pool industry is one that has relied on a fairly static set of technologies for years, and professionals are naturally cautious when considering products and systems they haven't used before.

Besides what might be considered understandable lag time in embracing technological concepts, there's also a cautionary tale to consider. Using the saltwater systems as an example, the momentum those products experienced in the early part of this young century came with a price. While professionals were eager to embrace the benefits of the systems, the technology was marketed by some firms as chlorine-free and virtually maintenance free, neither of which is true.

The hype created unrealistic expectations on the part of consumers and many would argue a lackadaisical approach to service and maintenance on the part of some professionals. That over-selling of salt systems resulted in a backlash that stemmed from problems in maintaining proper water balance and corrosion of some masonry materials and stainless steel equipment components.

Like all technologies, it turned out that saltwater chlorination wasn't perfect, not the end-all, be-all method some once touted. The systems did require maintenance and some tempering of homeowner expectations for service and maintenance.

As I studied UV technology in light of its relatively recent entry into pools and spas, comparisons to salt systems began to emerge, at least in my mind. Specifically, both systems do provide innovative benefits in water treatment schemes and both have their limitations.

In the case of UV, proponents of the technology point out that these systems must be used in conjunction with some other type of sanitizer, simply because UV only treats what is as its flowing through its contact chamber. And, these systems must be sized properly in terms of water flow and light output. When applied properly along with properly calibrated expectations, these systems perform as advertised.

The potential drawback is that with the growing popularity of the technology, some in the industry may shortcut proper sizing, installation and service, just as some did in the case of saltwater chlorinating systems. The problem wasn't with the science or technology, per se, but with the way it was marketed and applied. We're a smart bunch; I'll bet we get it right this time.