Case Study

Combined Chlorine & Disinfection By-Product Reduction:
Clear Comfort AOP vs. Medium Pressure UV

CLEAR COMFORT

Background

Commercial aquatic facilities constantly struggle to provide clean, clear and safe water for their patrons that meets health code regulations. In the Los Angeles area, two similar recreational facilities, with a total of seven bodies of water, were studied to compare the benefits between two pool sanitation methods: traditional medium pressure ultraviolet (UV) and a leading Advanced Oxidation Process (AOP). Specifically, the study focused how well each method reduced harmful *combined chlorine* (chloramines) and other *disinfection by-products* (DBPs). While testing found that both methods improved the facilities' overall water and air quality, **the AOP systems successfully reduced — 55% more combined chlorine and 22% more DBPs — than the UV systems did.**

Quick Facts:

- **Pools Studied:** Lap, Instructional & Spa *(Indoor)*
- **Bather Loads:** High
- **Chlorine:** Sodium Hypochlorite
- **Chlorine Management:** Acu-Trol ORP/pH Controller
- **Location:** Southern California
- **Data Collection:** May 2017 to February 2018

Purpose

This study compared how well different secondary sanitation pool methods resolved operational challenges at two similar recreational facilities. The first tested method was a patented hydroxyl-based Advanced Oxidation (AOP) Clear Comfort system and the other was a medium pressure UV system.

The first facility use Clear Comfort AOP for its two pools and one spa and the second facility used medium pressure UV for its three pools and one spa.

Method

The two facilities started with new water and were then studied over the next six months. Both the Clear Comfort AOP and UV systems were allowed to run, with similar chlorine and bather load levels, for two months before the first water samples were tested.

After the systems ran for two months, combined chlorine levels were measured poolside with digital spin tests and DPD tests. Samples from all bodies of water were collected and sent to an independent laboratory for DBP levels. Both systems were then turned off and allowed to run for two weeks, at which point combined chlorine levels were measured and samples were again collected and sent to the same laboratory for DBP level comparison analysis.

Combined Chlorine Reduction:

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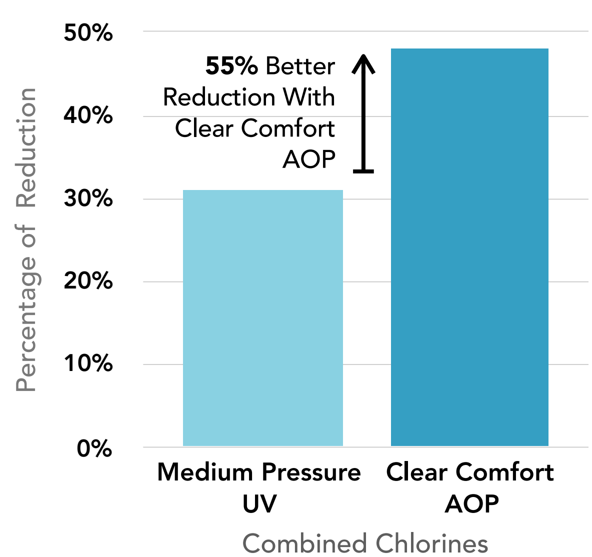

Clear Comfort

Disinfection By-Product Reduction:
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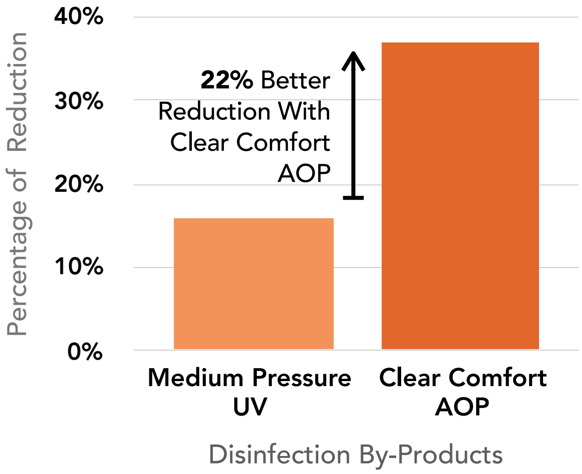

Results

Testing results found that both methods effectively reduced combined chlorine and DBPs, but the Clear Comfort AOP method outperformed UV in various areas.

Highlights:

- Clear Comfort AOP was 22% more effective than UV when looking at the average reduction of contaminants of all measured factors.
- Clear Comfort AOP eliminated 94% of the DBP Haloacetic Acids (HAAs), while UV reduced 83% of HAAs.
- Clear Comfort AOP outperformed UV in all categories where measurable DBPs were detected.
- Both systems had significant impact on overall DBP reduction.
- Both were well within the maximum allowable levels for Trihalomethanes (THM) drinking water standards. Clear Comfort AOP produced a 45% better result in controlling THM levels than UV.

Considerations

While this study proved that both Clear Comfort AOP and UV successfully reduced combined chlorine and DBPs, there are other comparative operational factors to consider.

Please note: these UV operational considerations also apply to UV and ozone combination systems.

Cost to Operate

In addition to the initial upfront cost, the continuous expenses needed to maintain sanitation systems can drastically differ. In comparison, the total cost of operating a Clear Comfort AOP system is up to 60% less than a UV system. A real-life case study confirmed that compared to UV, Clear Comfort AOP uses 50% less chlorine expenses, 90% less energy to operate and 38% less annual maintenance costs.

Simplicity of Maintenance

The Clear Comfort AOP system requires one simple cartridge exchange per year and typically takes up to 10 minutes to perform. Alternatively, UV systems can require two manual cleanings and wiper repairs a year, each taking two to four hours to perform. This service can require pool downtime and requires trained, skilled labor to handle fragile and expensive quartz lamps and sleeves. This work must be done with caution to avoid breaking the bulb and getting quartz and liquid mercury into the pool plumbing.

Installation

Installation requirements are important factors for facilities to consider. Typically, the costs of UV installations can run three times the cost of a Clear Comfort AOP installation.

Chlorine Consumption

To help enhance swimmer comfort and water and air quality, the Clear Comfort AOP system can reduce up to 30% to 50% of an aquatic facility's typical chlorine levels. UV does not reduce chlorine levels, and in some cases UV systems consume 12% to 15% more chlorine than traditional chlorine systems.

Clear Comfort would like to extend a special thanks to the staff and volunteers who participated in this study. For more information on the Clear Comfort AOP systems, please visit clearcomfort.com/study.

REFERENCES

Purdue, Ernest R. Blatchley, PhD, WAHC 2014