Which Is The Better Choice For pH Adjustment In Aquatics Facilities, Liquid Acid Or CO_2?

Written by:
Blue-White® Industries
714-893-8529
www.blue-white.com

While chlorine level is often considered the most important measurement in commercial swimming pools, as well as water features such as waterparks, the water's pH is just as critical. In addition to ensuring swimmer comfort, proper pH levels are key to mitigating cloudy water and scale formation, and in protecting pumps and other equipment from corrosion.

The most important role pH plays is to maximize chlorine efficiency. When the pH level drops too low (acidic), chlorine becomes more active and can dissipate quickly. If the pH is too high (alkaline), chlorine becomes less effective, allowing bacteria, algae, and other pathogens to thrive.

For years, commercial aquatics systems have relied on liquid acids to adjust pH, particularly muriatic acid, also known as hydrochloric acid. Liquid acids are highly effective pH adjusters and, when paired with the right chemical feed pumps, can aid in ensuring pH stability.

However, an increasing number of aquatics systems managers are turning to carbon dioxide (CO_2) dosing for pH control. CO_2 has a number of benefits that make it an appealing alternative – or, in some cases, an addition for pH balancing.

Figure 1. The Blue-White® CO_2 feed system maintains commercial swimming pool pH levels by directly injecting carbon dioxide into the water supply to create carbonic acid. This lowers the water's pH level naturally without hazardous chemicals such as muriatic acid or sulfuric acid. Flow is adjusted via the Blue-White® F-440 adjustable flow meter for accurate and consistent pH control.

Advantages Of CO_2

The greatest appeal of CO_2 for pH reduction is its high chemical stability. When CO_2 enters water, it becomes carbonic acid. Carbonic acid can further dissociate into hydrogen ions and bicarbonate ions, the former of which lowers the pH. When the pH drops below a certain point (about 6), the chemical reaction reverses to reform carbonic acid. This helps maintain the pool's pH. More importantly, it means that equipment operators cannot accidentally over-dose the water.

Additional advantages include:

Safety. CO_2 is less hazardous for maintenance personnel to handle than acids, which often require workers to use protective equipment. If released into the air, CO_2 is chemically neutral, making it generally safe to work with and reducing the risk of accidents and exposure to dangerous chemicals and their fumes.

Facilities with seasonal worker turnover may benefit from the reduced training and safety protocol requirements of CO_2.

Reduced Corrosion. CO_2 feeder systems typically result in less corrosion of pool equipment and infrastructure when compared to acids.

Minimal Impact on Total Alkalinity. Carbonic acid lowers the pH without significantly affecting total alkalinity. Total alkalinity acts as a buffer, helping to stabilize the pH level over time.

Ease of Use and Maintenance. Most CO_2 feeders are simple to install, operate, and maintain. They are typically comprised of a control box, valve, flow meter, and injection fitting. Unlike acids, which are comprised of salts, CO_2 will not cause buildup on the injection fitting, resulting in less maintenance over time.

Efficiency and Precision. Although there is no harm in over-dosing a pool with carbonic acid, there is no need or desire to waste it. As such, CO_2 feeders can be automated and finely controlled to maintain a specific pH level. Advanced systems, like those offered by Blue-White Industries (Figure 1), come with a built-in flow meter that measures the exact amount of gas being

dosed and can be used to help calibrate and validate dosing levels to reduce excess operating expenses.

Environmental Considerations. CO_2 is a naturally occurring compound and is not harmful to the environment. The use of CO_2 can align with sustainability goals and reduce the impact on local ecosystems.

Ease of Storage and Handling. CO_2 is typically stored in cylinders as a compressed gas. These cylinders are easy to handle and safe to store. Moreover, its chemical stability means CO_2 has an effectively unlimited shelf life, ensuring that product is never wasted due to expiration or improper storage.

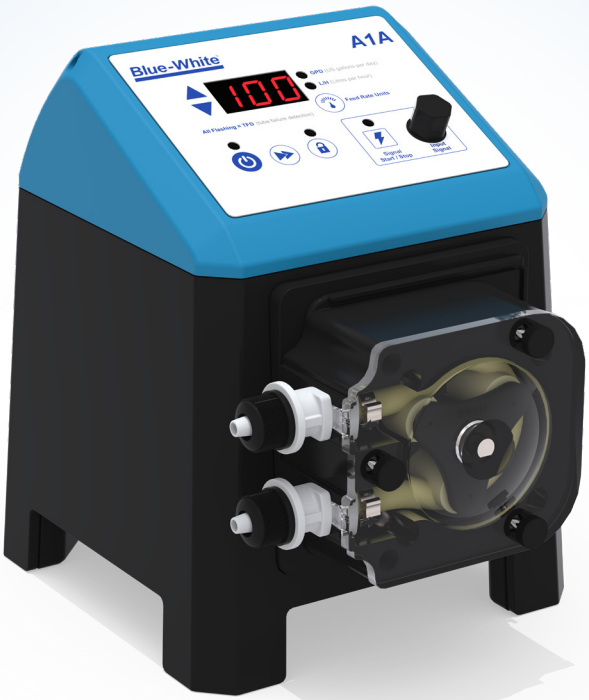

Figure 2. Blue-White's A1A.

Is CO_2 Better Than Acid?

While CO_2 boasts a number of advantages over liquid acid, the decision to switch from using liquid acid depends on a range of factors. For example, for large outdoor pools, substantial rainfall can cause pH levels to rise dramatically. In such cases, CO_2 may not act fast enough, and a large dose of muriatic acid may be a more effective solution. Availability can be a factor as well. Many aquatics distributors do not yet carry CO_2 cannisters; instead, they may need to be obtained from beverage manufacturing suppliers.

Conversely, some states have regulations prohibiting the transportation of chlorine and acid on the same truck. This can limit supplies or increase the number of shipments needed to restock.

In many instances, it may be beneficial for an aquatics system to use both CO_2 and acid for pH reduction and control. This offers the best of both worlds, allowing for efficient and stable pH control and the ability to apply a rapid correction when needed.

If the facility manager is unsure which to choose, it may be helpful to work with vendors that offer both types of systems. Such vendors can provide technical advice and support to ensure the most effective and economical solution.

Should the facility manager prefer the use of liquid acid, or choose to use both a CO_2 feeder and a chemical feed pump, Blue-White's FLEXFLO A1 chemical metering pump provides accurate and dependable performance, and requires very little maintenance.