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Pool Tip #18: Use of Carbon Dioxide for pH Control

Gaining popularity in the past few years, carbon dioxide is rapidly replacing muriatic acid as the product of choice for lowering pH in public pools using sodium hypochlorite or calcium hypochlorite as the primary sanitizer – oxidizer.

Carbon dioxide is often delivered to swimming pools in 50 pound, high pressure tanks which require the operator to frequently move and exchange cylinders. Single and dual tank feed units and regulators are sold. Rapid need for CO_2 can cause the injector to, literally, freeze up.

Most heavily used pools opt for purchase of a permanently installed, 400 pound or greater, low pressure, bulk, stainless steel cryogenic tank. The tanks are sold with non freezing regulators and pressure gauges. The tanks are typically 20 to 24 inches in diameter and 5 to 6 feet tall. The pool owner then signs up to have the bulk tank refilled or topped off on a weekly or regular basis by a carbon dioxide supplier. The cost of purchasing the bulk tank and related equipment is in excess of $2,000.00, but the price of bulk CO_2, including delivery, is less than 35 cents per pound.

The CO_2 regulator is connected to the pH/ORP controller, and carbon dioxide is injected on demand into the pool return line. The injection point should be last in line after the pump, filter, heater, and chlorine injection port. Or more appropriately, using a booster pump and an efficient gas transfer Venturi injector, the carbon dioxide should be fed into a slip-stream of water which then joins the main return stream.

Carbon dioxide when mixed with water produces carbonic acid, a fairly mild acid which acts to reduce the pH of pool water. If a controller or feeder malfunction occurs, the water will become carbonated, or fizzy like a soft drink, but the mild acid doesn't give off fumes, and won't be quite as corrosive or damaging to the pool environment and bathers, as a more acidic pH adjustment product would be.

Since CO_2 gas is odorless, and heavier than air, the chemical storage room should be mechanically ventilated, with exhaust vents located near floor level. Like any pressurized gas tank, the CO_2 tank must be bolted or securely chained to the wall. For safety reasons, the chemical room door should always remain open when the pool operator is inside the room. If a leak should occur, there is a danger of carbon dioxide displacing the oxygen, causing the operator to suffocate.

Unfortunately, carbon dioxide when added to pool water also forms bicarbonates, and causes a rise in total alkalinity. The total alkalinity then needs to be lowered with sodium bisulfate or muriatic acid, the purchase and storage of which the pool operator tried to eliminate by using carbon dioxide for pH control in the first place. The sodium bisulfate or muriatic acid used to lower total alkalinity then causes a drop in pH, which the controller then interprets as being too low. The controller sends a signal to the CO_2 regulator to inject CO_2 to bring up the pH, which raises total alkalinity… For this reason, use of carbon dioxide is not recommended for all pools. Pools using calcium hypochlorite as their primary chlorine product, pools with oversaturated water problems, pools with source water high in total alkalinity and calcium hardness, might be better off remaining with muriatic acid for pH control.