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Chlorine And pH Controllers

by John Chadwick

Basic operating knowledge improves performance

There is a problem writing or commenting on any electronic type of device – the rate of new product development is so fast that what is true today is out of date tomorrow. This is equally true of chlorine and pH controllers. With this in mind, the following comments will be generally true for most (but not all) controllers three or more years old, and only some of the more current models.

On my visits, over the years, to many different pools with chlorine and pH controllers, the facilities tended to fall into two broad categories. There were those pools where the controllers worked well, and the operators couldn't say enough good about them; and then there were those pools where the controllers didn't work, and according to these operators "were pieces of junk", "never worked", and "cost too much to maintain", etc.,etc.,etc. There was one common theme, however. On those pools where the controller worked well, the operator almost always had a good understanding of both the function of the controller and basic pool water chemistry, including O.R.P. (oxidation reduction potential). On those that didn't work, a large percentage were truly broken down, usually due to a lack of maintenance or mishandling, and the operator usually lacked basic operating knowledge and/or instruction manuals. It did not matter the make of model – if the operator did not understand the machine, sooner or later it would not work.

Most chlorine and pH controllers consist of two units, a chlorine controller, and a pH controller, with or without interlocks between the two functions. For each function there is a sensor (probe) in the pool water that produces a minute, but measurable, millivoltage. This millivoltage changes with certain changes in the pool water, telling the controller how to respond.

In almost all cases, the operators have little or no difficulty with the pH side of the unit. The controller tracks the pH easily and requires little, if any, "standardizing" to a known test kit reading. Most of the apparent controller problems involve the "chlorine" side with the controller read-outs jumping all over the place and the controller requiring constant standardizing to make it match the operator's test kit. It is the "chlorine" side of the controller that we will examine.

Most Chlorine Controllers Do Not Measure P.P.M.

Contrary to the name, most (but not all) "chlorine" controllers do not sense or measure p.p.m. (parts per million) of the chlorine in pool water. The dial may say p.p.m. chlorine, the meter may say p.p.m. chlorine – but it is not necessarily so.

Before going any further, it is necessary to understand p.p.m. (parts per million), O.R.P. (oxidation reduction potential) and the conventional D.P.D. test kit.

Parts per million could be compared to a parking lot with one million black cars, and five white ones. This would be five p.p.m. of white cars. It does not tell you anything about the make of quality of the cars.

Oxidation reduction potential could be loosely described as the ability of the particular oxidizer to do it's job. It could be any oxidizer, i.e. bromine, iodine, but most commonly, a chlorine product. O.R.P. is measured in millivolts. A higher O.R.P. (millivolt) reading has more oxidizing potential than a lower O.R.P.

Think of O.R.P as the quality measure of your oxidizer and p.p.m. as the quantity measure.

Most pool operators are aware that as pH rises, the effectiveness of the "chlorine" in the pool water goes down, as as pH falls, the effectiveness goes up. That is to say as pH rises, th O.R.P. goes down, and as pH falls, the O.R.P. goes up.

This brings us to the nub of the matter. Most operator test kits measure p.p.m. (parts per million) and most (but not all) controllers sense and measure O.R.P. (osication reduction potential), and therein lies the problem. The test kit measures on e thing, the controller another. For a given p.p.m. the O.R.P can cary up or down depending on the pH. The controller senses the O.R.P. and may produce a read-out that does not agree with the p.p.nm. test kit. You may have a body of water with a measured and tested p.p.m. of chlorine, and without any change in the p.p.m. , if the pH is lowered, the controller will show this as an increase in whatever units it reads out in , be that O.R.P. or p.p.m.

How significant is this? As an example, I have seen pools using sodium hypochlorite (which has a strong upward pressure on pH) where the controller properly activated the chlorine pump. As the sodium hypochlorite was added to the pool the pH was driven up, therfore lowering the O.R.P. with the result that the controller kept calling for more sodium hypochlorite. This like the dog, chasing it's tail. The more sodium hypochlorite added, the higher the pH, the lower the O.R.P. etc., etc. Unless the controller has build-in and properly functioning hi-limit and overfeed protectors and an adequate pH feed system, it could keep feeding until the sodium hypochlorite solution container is empty.

“Standardizing” the controller is the process of adjusting the controller to match a test kit reading, and this is where the first error enters the process. If the cotnroller display meter (or L.E.D.) scale reads p.p.m., it will be at a specific pH, uisually 7.5, and the pool water should be adjusted to 7.5 pH before standardizing the “chlorine” side of the controller. The operator must also be aware that the display reading will move higher as pH goes down and lower as pH rises with a constant p.p.m. in the water.

Some controllers display the actual O.R.P. in millivolts, which is what the probe is sensing. In this case, the operator will use a graph (usually supplied by the contoller manufacturer) to convert their test kit p.p.m. and pH readings to the tcorresponding millivolt reading. Most of these graphs are adequate for normal operating ranges, however, they should be used with caution at the outer limits.

Over the past 10 – 15 years, there have been serveral controller models introduced that sense both the O.R.P. and pH of the pool water and through and integral microporcessor, convert this information into a relatively accurate parts per million read-out. Some of these unis have been highly successful, while others have left a lot to be desired.

This brings us to the second error in the process: that of the operator and the test kit. Most D.P.D. test its commonly in use today are colourimetric, where you pop a tablet into the water sample vial and compare the resultant colour to a colour standard. Using this method, it is almost impossible to obtain an exact result. If you asked five people to read the same sample, you will likely get five different answers that can range up or down by 0.5 p.p.m. The fact that a large percentage of males have some degree of colour blindness, and that most of the testing (to standardize the controller) is done in a poorly lit equipment room, only increases the chance of error and results in inconsistent readings. I have seen pools where three or four different operators would do water tests on the same day, oftern using different test kits, and each would “re-standardize” the controller at each test. This has the same result as constantly adjusting your heating thermostat; the termperature is all over the place – and never rith.

The third common problem usually is a result of the first two, and that is the operator constantly “standardizing” the controller, attempting to “fine tune” it. You have probably observied that when you set the cruise control on a car, it does not track the speed exactly – the speed varies up and down slightly, responding to the changing road conditions. The same is true of the pool conrtroller – it will move back and forth over tis set point, but will average out if left alone.

Problems are Easily Overcome

Fortunately, all of these problems are easily overcome. For the first problem, that of th the O.R.P. /p.p.m. relationship, bring the pool to the desired operating pH and at that pH, do the p.p.m. test. And standardize the "chlorine" side of the controller. Any subsequent standardizing adjustments should be done at this pH.

On the second problem, assign the task of standardizing to one operator only, and do all tests for standardizing under uniform conditions, i.e. same lighting, same pool water temperature, same test kit, etc.

Finally, let the controller do its job. Try not to be continually standardizing. **When a pool is first started up and just filled, and has had a large terperature change or when new probes are installed, it may require standardizing every day or two for a week or so. After that, once a week should be more than adequate and once a month is not unusual.**

The simple moral of this rather lengthy story is to set the controller right the first time and leave it alone to do its job.

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