Monthly Manager Moments – Article #22

Rio Olympic Diving Tank: What Went Wrong?

The 7th in our series on how pools work

Introduction – Last time we looked at how to calculate dosages for our pool by comparing it to the standard pool that weighs 1 million pounds; the 120,000 gallon pool.

This article will look at what might have happened in the Rio Olympic Diving Tank and how it could have been prevented. Because of the worldwide spectacle that this incident became, let's take a look at what might have caused the unsightly green pool. Here's a photo of the now infamous green diving tank.

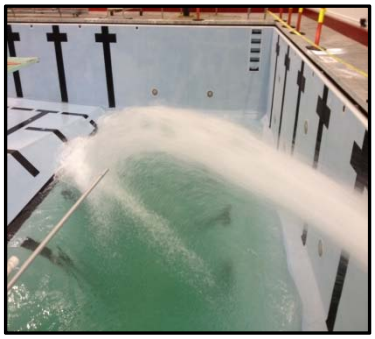
It was reportedly nice and blue before it suddenly turned green and somewhat murky. Reports from the Rio officials were that the operator(s) accidently added a large amount of hydrogen peroxide. Before we assume that hydrogen peroxide caused the water to turn green, let's get some perspective.

Hydrogen peroxide (HP) can be used as a weak and relatively ineffective disinfectant and oxidizer in a small pool or spa. It is often used in tandem with UV, to provide adequate oxidation. Most Health Departments will not allow HP as a stand-alone oxidizer. When used in a pool or spa, it is usually maintained at about 30-40 PPM. HP cannot be maintained with an ORP probe/controller, since it has no effect on ORP (Oxidation Reduction Potential). It's considered a "flat-line oxidizer" because of this characteristic. A feeder is set up on a timer to feed HP into the pool, but no real control is possible without frequent water tests for PPM. HP has other problems too – it dissipates rapidly, stores very poorly, and is dangerous/damaging if spilled. Today, most commercial pools that are on a liquid oxidizer use commercial bleach (sodium hypochlorite). It is much more effective than HP, and costs about 1/8 to do the same job!

Since we don't know what the chemistry of the Rio diving tank was at the time of the incident, we can only guess as to why it turned green. However, we can make an educated guess, based on the report that HP was put into the diving tank and it soon changed from pretty blue to murky green. If a pool has poor oxidation and/or filtration (especially poor oxidation), the water quality will deteriorate very fast. An algae bloom can appear in as little as one day without proper oxidation of at least 650 mV ORP. To keep the water pristine and blue, much higher oxidation is needed – around 850 mV ORP.

With this level of ORP, the water will be pristine; however, the filters must also work properly. The rule of thumb is 2/3 oxidation, and 1/3 filtration for pristine water. I've had algae blooms in my pools before, and they were always from improper oxidation; such as from adding HP instead of sodium hypochlorite (bleach). The interesting thing here is the assumption that the algae was what made the water green. It may have been, but most algae blooms are attached to the surfaces – the walls and bottom of the tank. It's my best guess that in the Rio pool, the color was simply from poor oxidation and filtration, allowing the ORP to fall far too low. Let's look at what my pool looks like before it is properly oxidized and filtered.

What does a pool look like when it's first filled up with water? It depends upon the source water, of course; but every time I've filled one of the commercial pools that I've operated, it has also been green and murky. The photo on the left is of the EWU Aquatic Center pool being filled with our well water - before proper oxidation and filtration. Note that it's quite green, and it's only about 8' deep at this point. Our pool is 18' when it's clear full. The photo in the center is the pool completely full before oxidation and filtration. Looks like Shrek should live in it!! The photo on the right was taken today, one month after oxidation/filtration. The Oxidation Reduction Potential (ORP) is at 852 mV now, and the DE vacuum filter system has been cleaned 4 times since I first filled it about a month ago.



This is the normal progression for filling a large commercial pool. This pool has a capacity of 285,000 gallons. A diving tank with a full set of towers, like the pool in Rio is more likely to be about 675,000 gallons. These pools are usually 16' deep and maybe 75' X 75'. When the Rio pool is first filled with make-up water, I would expect it to look just like mine does – green, murky, and gross.

Because the Rio staff drained the green water and replaced it quickly with water from a neighboring pool that was nice and blue, it seems like an algae bloom was not likely to be the culprit; since the water remained nice after that. If it was algae, it would likely be attached to the shell and still show up, but it did not. They had corrected the error in chemicals and regained their desirable ORP after adding the nice water – so it could remain nice. Moral of the story? ORP is the key. NEVER let your water live without it!!

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Ideas on the Rio Pool? Email me at leos@ewu.edu.