When Can Salt Be Added?

onBalance – Que Hales, Doug Latta and Kim Skinner

Although salt water has been used successfully for some time in cured plaster pools, there doesn't seem to be much scientific documentation on the effects salt may have (detrimental or not) on plaster when it is still curing. There seems to be some consensus to wait 30 days before adding salt, yet some say it is okay to add salt within a couple of days of filling the pool. So who is right?

To answer that question, let's take a look first at what happens in the initial days and weeks of a new plaster surface. When plaster is applied and a new pool is filled, the cement portion of the new, hardened pool plaster contains about 10 to 15% calcium hydroxide, the rest being primarily calcium silicates, aluminates and carbonates. These latter products are durable and relatively insoluble in water.

On the other hand, calcium hydroxide, having a pH of about 12, is softer, somewhat soluble, and can be dissolved from a plaster surface even by typical balanced tap water. Indeed, the Saturation Index that we are all so familiar with as a maintenance tool to protect calcium carbonate is not even applicable to fresh plaster (i.e., less than a few weeks old), because the pH that would be neutral to calcium hydroxide would need to be about 12!

This is why the pH of the water in a freshly filled pool usually rises noticeably as soon as the pool is being filled. High pH calcium hydroxide dissolves into the water, shooting its pH up. Once the new plaster surface is carbonated (which means the calcium hydroxide is converted to calcium carbonate) this process stops.

Since dissolved calcium hydroxide also converts to calcium carbonate in the pool water, this is the source of so-called "plaster dust" in new plaster pools. When undergoing a traditional start-up process, carbonation of the surface usually lasts about 1½ to 2 weeks… which is why new plaster dust is generated for that long – and then stops. At that time the pH becomes stable in the pool, since new hydroxide is no longer being dissolved into the pool water.

The onBalance team decided to conduct an experiment in a laboratory setting to determine what effects salt may have on fresh plaster and on the curing process. The following are the details and results of our simple experiment.

On Day 1, four good quality plaster coupons were formed and allowed to harden.

On Day 2 the coupons were placed into four separate water tanks. The water in all four tanks were balanced to the same parameters; Temp – 70°F, pH – 7.6, TA – 160 ppm, CH – 200 ppm. The tanks were capped to slow down carbon dioxide out-gassing. (When water loses CO_2, the pH rises with no change in TA).

Day 3, after 24 hours in water, the pH of the water was recorded and in all four tanks the pH rose to 8.4, indicating that some hydroxide from the plaster surface had been dissolved away and into solution. (Note that this occurred even in balanced water).

Then Tanks 3 and 4 had 3000 ppm of salt added. Acid was then added to all water tanks to lower the pH to 7.5.

On Day 4, the pH in Tanks 1 and 2 rose slightly to 7.7. But in Tanks 3 and 4, the pH had risen much higher to 8.6, indicating a significant effect on the plaster surface material. Acid was added to Tanks 3 and 4 to lower the pH back to 7.5.

On Day 5, the pH in Tanks 1 and 2 was 7.8, but in Tanks 3 and 4 the pH rose to 8.4. Again, the pH raised more in the Tanks that had the salt added. Acid was added again to all Tanks and lowered to pH 7.6.

On Day 6, the pH in Tanks 1 and 2 was 7.7, but in Tanks 3 and 4 the pH was 8.2. The pH was not adjusted downward.

On Day 11, the pH in Tanks 1 and 2 was 7.8; the pH in Tanks 3 and 4 was 8.4. At this time, 3000 ppm of salt was added to Tank 2.

On Day 17, the pH of Tank 1 was 7.8; the pH of Tank 2 was 8.0, the pH of Tank 3 and 4 was still at 8.4. This data shows that the salt added to Tank 2 after 11 days had a slight effect on the plaster coupon in comparison to Tank 1. The pH is all tanks were lowered to 7.7.

On Day 21, the pH of all tanks was identical at 7.8.

	Tank 1	Tank 2	Tank 3	Tank 4
Day 1	Formed plaster test coupons			
Day 2	Added to water with starting pH of 7.6			
Day 3	8.4	8.4	8.4	8.4
			added salt	added salt
	Adjusted pH to 7.5			
Day 4	7.7	7.7	8.6	8.6
			Adjusted to 7.5	
Day 5	7.8	7.8	8.4	8.4
			Adjusted pH to 7.6	
Day 6	7.7	7.7	8.2	8.2
Day 11	7.8	7.8	8.4	8.4
		added salt		
Day 17	7.8	8	8.4	8.4
	Adjusted pH to 7.7			
Day 21	7.8	7.8	7.8	7.8

The results obtained suggest that adding 3000 ppm of salt does indeed have a negative effect even on good quality plaster if added at startup and up through the first two or three weeks. When salt is added to water containing fresh plaster coupons, the pH of the water began to increase significantly (higher than normal). This indicates a loss of calcium hydroxide from the plaster surface is occurring. This likely causes an increase in the porosity of the plaster finish, which weakens and ages the surface prematurely.

The data also indicate that the negative effect of salt on new plaster only lasts about three weeks. As mentioned above, this is because a new plaster surface becomes carbonated; meaning that any calcium hydroxide (on the plaster surface) that is not dissolved and converted to water hardness and/or plaster dust is slowly being converted into calcium carbonate during the first three to four weeks of being filled with balanced tap water. This conversion creates a protective and more durable plaster finish. It appears that once the plaster surface has been sufficiently and properly carbonated, salt does not have the same negative effect.

Our experiment used well-made plaster coupons, which received proper curing, and positive Saturation Index water. If, in the field, proper plastering practices are not followed closely, which results in a lower quality finish, more time may be needed before salt should be added. It appears that the recommendation to wait 30 days before adding any salt is appropriate for plaster pools, including quartz and pebble pools.

Experiments were conducted by the National Pool Industry Research Center (NPIRC) at Cal Poly on "Salt" during Phase 2 (2004-2005). Unfortunately, the results were inconclusive and not supported with reliable data. It is our understanding that additional experiments on salt pools have been performed by the NPIRC during Phase 4 (2006-2007) and Phase 5 (2007-2008), but those reports haven't been made available to the industry yet by the NPC.