

## pH Metal Finishing

### Session Questions and Answers

**Q: Can I measure concentration with pH?**

**A:** The short answer is no. That's really not a good idea and that goes back to our original point of that 10 to 1 ratio. So what happens is when you are operating under one percent, you get really good resolution with pH, but, as soon as you get into the 1-10% range of soap, your pH skyrockets up and you plateau out. So, from 1 all the way up to 100% you don't get a lot of change in pH. That's a result of the 10 to 1 ratio and a good cleaning chemistry will have buffers in it which are designed to stabilize pH over a wider range. The counterpart to that is you can measure concentration with titration and titration is interesting cause it's not exactly pH, it's measuring the amount of the opposite material to neutralize it. So if you're using a basic cleaner, you measure the amount of acid it takes to get that solution back to neutral or back to whatever your set pH is. Its much easier to measure the amount of acid than it is to measure the actual pH number so that's how we solve that problem in the industry. However, it doesn't do much good because you can't use a pH probe you have to do kind of a cumbersome titration. The other solution is to use conductivity our Regional Manager, Ethan Mueller, did a great Tech 2 Tech presentation on how to measure concentration with conductivity.

**Q: Looking at acid test kits, if someone has hydrochloric acid inside their washer and it calls for 20 drops of booster, does that still mean that the hydrochloric acid is 1 on pH scale?**

**A:** The short answer is yes, hydrochloric acid will always be 1 on the pH scale if you have it in any real concentration. These acid test kits are generally found in solvents and it gets tricky because solvents can't have a pH because there is no water. So you've got a pure solvent you can't have a pH. What you're doing with those acid kits is actually extracting the acid out of a solvent and into an aqueous solution and then measuring the pH of that aqueous solution. You're normally getting such a dilute amount of acid that's been extracted that you're measuring a much smaller amount of pH so you don't have a very high concentration of hydrochloric acid. That's when a good chemical supplier will design the kit to get extra drops of booster and correlate those booster numbers into how much booster you should add into your machine.

**Q: Someone that has 50 drops vs 10 drops, how would that affect?**

**A:** That's like the titration. The 50 drops vs 10 drops means you have more acid than solution. So the way we work a titration is you're measuring the number of drops of acid or base that will neutralize what you've got in your small solution. And then you scale that up and you can do one of two things. Measure the concentration of aqueous solution or in a solvent bath your measuring the amount of acid that's present. So the pH number is indicative it's that number of drops. If someone has 50 drops they have more acid than that are bath than you would if you had 10 drops so you need a larger amount of booster to neutralize that or you have a higher concentration if you're just using an aqueous titration kit.

**Q: How much does water quality affect pH?**

**A:** Tough question because water quality can affect pH a little bit because if you've been around like us and see people all over the country, tap water can actually range in pH from about a 5 to a 9. The big factor here is how much concentration are you running. Because if you look at a titration curve, the difference between a 5 and a 9 because we're on that 10 scale seems like a lot, but you're really going from .0001 acid to .0001 base. If you're working in really low concentrations, your water quality might affect the pH of your solution but if you're above 1% whatever you're using is going to dominate the pH there. Most of these cleaning chemistries have these buffers or water softeners to tie up those ions that bring that pH down or up accordingly. That's the job a good buffer does.

**Q: Is taking a pH measurement of my wash bath helpful?**

**A:** Yes and no. The big heavy on here is you've got to work with your chemical supplier to understand what your target pH is because if you're using a high alkaline cleaner, you're going to have 1 pH. If you're using a mild alkaline cleaner, you're going to have another one and the concentration is going to affect that to a point. pH isn't going to tell you a whole lot if you've got a lot of soap in your bath. Let's say you're going to be at a 11, that's what your chemical supplier says, what's the pH measurement going to tell you? It will tell you two things: either you've got no soap in your bath, or you have something that's really tying up all your wash solution so you think you've got 10% concentration but you're not getting clean parts because some type of soil you're putting in there is neutralizing every part of the alkalinity in your soap. It's a very rough test that can tell you some thing but there are better tests to do free alkalinity ratios, conductivity measurements that can tell you a lot more. And you can work with your chemical supplier to figure out those tests.

**Q: Do solvents have pH?**

**A:** It's a little tricky to answer but, again, the short answer is no. Remember, pH is based on water, so if you're using a true solvent that's not water, like trichloroethylene, you're not going to have water in your process. That's the goal of using solvent so you can't have pH by definition. Now, you can still have acid get into your solvent and in that case you have to do some other interesting things to extract that acid and then measure it but you cannot take a direct pH measurement of solvent, it just won't work.