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ECHNICAL BRIEF

"You're Only as Clean as Your Last Rinse"

IPC-AC-62A, Chapt. 10.6, states;

"Good quality deionized water is the preferred rinse medium.

…….Water in the 1 to 5 megohm-cm region will be satisfactor for most operations. The temperature of the rinse water should be as high as possible, but comparative with parts and process."

Ideally in an in-line aqueous wash process used to clean PCB's if you have a cascade flow of ½-gpm to 4-gpm of DI water (final rinse to course rinse) this would be the easiest method provided you can handle the discharge requirements.

A single chamber batch washer depending on the wash chemistry and PCB design loaded will require 4 to 12 rinses of @ 30-seconds each.

DI water is generated using a combination of the following tanks.

- **Carbon Exchange Tanks** - Carbon is the most often used form of water treatment to remove taste and odor components of water. In addition, carbon removes chlorine and chloramines upstream of membrane-based systems.
- **Cation Exchange Tanks** - Cation resin captures the positively charged ions in your water such as calcium, magnesium, potassium and sodium.
- **Anion Exchange Tanks** -Anion resin removes negatively charged ions from process water such as chlorides, nitrates, carbonate, bicarbonates, sulfates, and silica.
- **Mixed-Bed De-ioni ers -** These beds, mixed with 60% anion resin and 40% cation resin, provide the highest water quality possible. This product is ideally suited for the bio-tech, semiconductor, and pharmaceutical industries.

The Resistivity of the feed water into final rinse stage of the aqueous in-line washer is fine at the 1 to 2 megohm range measured at the source. Or a TDS (total Dissolved Solids) of 0.4 mg/l as recommended by IPC standards. Once it reaches the actual rinse tank and actually touches your PCB's this number is lower. (Typically 500 to 1000 k-Ohm will suffice)

Many have moved away from monitoring the rinse water tanks directly w/Resistivity meters as they were never stable or accurate and just now rely on the source readings and cascade flow rates. "Go–No-Go lights" in a specified range are available from the supplier of your DI columns.

If you use a conductivity meter for measurement, remember Resistivity is the inverse of Conductivity.

Typical Carbon & Mixed Bed Ion Exchange Arrangement.

DI water will always read highest at the source. DI water is only DI water in its purest form at the source. Once transported through pipe, sprayed in air, heated or even exposed to various metals the quality level of where it started to where it is finally used drops rapidly. Deionized water is exactly that - water that has essentially been stripped of all of its ions. Water likes to be balanced in its natural state, and this means that it adds ions to itself to achieve that goal. Therefore, DI water is hungry and grabs ions from everything it touches that can be dissolved or absorbed. It is about a close as you can get to a Universal Solvent.

For practical purposes, the maximum level of deionization of water results in a resistivity of approximately 18.2 megohm-cm. There is a relatively small difference in parts per million (TDS) between 1 megohm and 18 megohm water. There is however an exponential relationship that has a significant cost impact as well. Operating a system at 18 megohm will be substantially more costly than operating one at 1 megohm, yet the benefits in cleanliness will be minimal.

In summary, the resistivity of the feed water into final rinse stage of the PCB washer is fine at the 1 to 2 megohm range measured at the source. Or a TDS (total Dissolved Solids) of 0.4 mg/l as recommended by IPC standards.

In metal finishing and powder coating the requirements are similar.
The following data will help you decide if you require a spot free rinse. If you do, it should also help determine which system is best suited for you in order to generate spot free water.

First, what are spots? Spotting is the residue of dissolved solids that are left behind when a water droplet evaporates. The higher the total dissolved solids (TDS) are in the water, the worse the spotting. How? As water stops sheeting (running) off a surface it forms little half-moon shapes in a process we commonly refer to as beading up. (It technically is the formation of a meniscus, which has to do with surface tension and wetting ability). If you think of that bubble as a small mountain and remember how gravity works the way a spot forms is obvious. So is the reason it always looks like a small donut so to speak. As the bubble evaporates the solids (which don't evaporate) the solids settle out in the shape of the bottom of the bubble. Since many of these solids are actually salts, it also becomes obvious why soft water will often spot more than hard water, since softening, after all, merely replaces metallic ions with sodium (salt) ions. This is generally why water softening alone probably should not be used for pretreatment in powder operations. We don't need the sodium ions on the parts nor do we need the spotting received from the sodium ions. Check with your chemical supplier to get a water analysis to know for sure.

How much (many) of these total dissolved solids do you need to have spotting? At about 40 to 50ppm (parts per million) you will see spots on dark parts. At about 75ppm you will see spotting on glass and chrome and at about 150ppm you will see spotting on all surfaces.

What is the normal TDS of water? According to some recent trade journals, we average between 250 and 300ppm TDS in the United States. That means that in the average water supply in the United States, if you require a spot free part, you will have to treat the water.
The final rinse set point is the key parameter of cleanliness.

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☐http://www.finishing.com/library/cleanforpowder.html

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