It's all about Rinse

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The leading manufacturer of cleaning and cleanliness testing products.

What is the most important aspect of de-fluxing?

If I had a nickel for every time someone called their de-fluxing system a "board washer" I would buy my own island! The fact is, "washing" is the easy part. The real test of a machine is its ability to rinse.

Consider de-fluxing a four stage process:

1. Wash
2. Rinse
3. Verify cleanliness
4. Dry

The purpose of a wash cycle is to "solublize" the flux or, if you are using a saponifier, to convert the flux to soap. In other words, the flux must become part of the wash solution. Getting the wash solution under fine pitch parts is always challenging but the low surface tension of the wash chemical assists with under component penetration (impingement).

Now that the flux has been properly "solublized", the next challenge is to rinse the boards. Rinsing is a process that displaces wash solution with rinse water. Although rinsing seems to be easier than washing, the opposite is true. Modern aqueous de-fluxing chemicals have proven to be extremely effective in the removal of flux residues. Many modern de-fluxing chemicals, equipped with corrosion inhibition (brightening) packages, produce brilliantly shinny solder joints. The best aqueous de-fluxing chemicals, suitable for difficult lead-free de-fluxing applications, and standard de-fluxing chemicals share one critical component; They are extremely detrimental to the board's life if left on the board.

De-fluxing chemicals contain ingredients that produce high pH levels frequently in excess of 11 pH. The high pH levels are required to react with the acids in the flux. De-fluxing chemicals are highly conductive and corrosive if allowed to remain on a board. Therefore proper rinsing is crucial to a board's cleanliness, reliability, and life expectancy.

Rinsing is more difficult than washing. During the wash cycle, the surface tension of the wash solution is reduced by the de-fluxing chemical, making it easier to penetrate under fine pitch devices. Unlike wash, the rinse cycle is not aided by the surface-tension-lowering properties of a wash chemical. As the wash solution rinses off of a board, the rinse water's surface tension begins to rise, making it more difficult to reach tight areas under components. This challenge can be overcome with an adequately sized rinse pump and specially designed spray nozzles that deliver high velocity rinse water to the board.

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To ensure proper removal of de-fluxing chemistry, one's cleaning system (specifically the rinse section) must contain an adequate level of power. Contrary to popular belief, power is not measured by a pressure gauge. In the past, de-fluxing equipment companies have boasted high pressure spraying systems. 50 PSI, 75 PSI, 150 PSI, ect. The problem is, the method of measuring spray pressure involves placing a pressure gauge on the plumbing manifold. This actually measures the back pressure (the pressure NOT hitting the boards). To prove this point, simply insert plugs into the nozzle locations. You will experience NO water flow while measuring maximum PSI.

The real measurement is "board impact pressure". This is the pressure of the water actually contacting the board. Board impact pressures of 6 – 8 ounces per square inch (measured a distance of 6 inches) produce ideal results on lead-based solders. Board impact pressures of 12-15 ounces per square inch produce exceptional results on lead-free and other high-temperature solders.

Impact pressures are relevant only to the areas of contact with the board. Delivering adequate impact pressure to only part of a board will not yield proper cleanliness results. The de-fluxing system must be capable of delivering the proper impact pressure to all areas of the board. Some modern de-fluxing systems are equipped with technology that allows both the spray nozzles and the board to move. By moving the spray nozzles and the boards, complete "shadow-free" results are ensured.

To ensure the complete removal of wash solution, many de-fluxing systems (batch format) are equipped with resistivity sensors which measure the electrical resistance of the rinse water draining off of the boards during the rinse cycle. Because de-fluxing chemicals are extremely conductive, they are easily detected. By comparing the electrical resistance of the incoming rinse water with that of the water draining from the rinsed board, one may accurately determine if the boards are free from wash solution and therefore flux.

Once a board has been thoroughly rinsed and verified clean, the boards may then be dried.

Fortunately, modern-day automatic de-fluxing systems are capable of providing automatic wash, rinse, cleanliness testing, and drying. When evaluating a de-fluxing system, consider the machine's impact pressure ratings both in wash and in rinse. Also consider a machine's ability to deliver high-impact fluids to all areas of the boards.

With the correct de-fluxing machine, the proper chemical, and the correct cleaning profile, complete de-fluxing can be achieved literally at the push of a button.

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