Flux residues have been the bane of reliability of PCB assemblies (PCBAs) from the first time they were used. However, it is necessary to use some sort of compound to reduce the oxides that form on the copper surface before soldering. Historically, activated rosin based fluxes were used to provide a surface for the solder to wet with. The problem with these fluxes is that they contained chlorine or bromine and remained corrosive after the soldering operation and would cause corrosion of the surface during operation of the product. Many cleaning and testing methods were developed to clean the surfaces and to test to insure the surfaces were noncorrosive afterwards. The majority of these test methods involved checking for ionic contamination after the cleaning was performed. A passing product would have a low level of ionic contamination.

During the changeover to RoHS compliant solders low solids fluxes were introduced as “no-clean” fluxes. These fluxes were composed of organic acids such as adipic acid or citric acids. These organic acids are decomposed by the temperatures reached during soldering, and were marketed as fluxes that did not need to be rinsed from the PCBAs after reflow. This is not normally an issue with reflow soldering as the entire PCBA reaches the required temperature for degradation of the flux.

However, these fluxes may not reach the required temperature during a wave soldering operation if they are shielded from the molten solder. Because assembly houses believe these fluxes do not need to be cleaned from the PCBA, they make no attempt to clean any flux residue that remains after reflow or wave soldering. Many assembly houses will argue that they are using “no-clean” flux which does not need cleaning.

There are areas that flux residues can be trapped and not experience enough heating during a wave soldering operation. One of these areas is between the printed wiring board (PWB) and the pallet used to transport it across the solder wave. Flux trapped between the wave soldering pallet and the PWB will not be exposed to the molten solder because the pallet provides a thermal barrier to the wave. This flux can lead to corrosion because it is still acidic in nature. It is also hygroscopic, which means it will pull water from the air and dissolve. Figure 1 shows active flux remaining on a PCBA after wave soldering.

**Flux residues can cause corrosion on PCB assemblies**

Michelle Woolley - October 30, 2013
Low solids fluxes often cause a whitish material on the PWB that is not active and will not cause issues in reliability. This material is very resistant to removal by water or isopropyl alcohol (2-propanol). However active fluxes are readily dissolved by either water or isopropyl alcohol. This can be used to distinguish the active flux from decomposed flux films. A visible difference in appearance after swabbing a suspected area with an isopropyl saturated cotton swab indicates that the swab removed a significant amount of flux, and indicates that the flux is still active.

It is important that the wave solder pallets be cleaned often to remove the flux residues that build up on them from the fluxing operation. Cleaning should be performed using the same solvent that is used to dilute the flux. Fiber-free cloths should be used to perform this operation so that future product is not contaminated with debris from the cleaning process.

Also See:

- [Corrosives on a PCB: Finding the source](#)
- [How to prepare for shock, mechanical, and vibrational testing](#)