

Why No-Cleans Really Aren't "No-Cleans"!

The terms "No-Clean Fluxes" and "No-Clean Solder Pastes" are really misnomers today, because these fluxes are commonly cleaned off finished assemblies—and for good reason!

First, "No-Clean" fluxes really are synthetic fluxes, with a greater range of applicability and performance than traditional rosin-based fluxes. They don't suffer from the restrictions on their formulations that rosin-based or water-soluble fluxes have. For example, rosin fluxes must (naturally) contain rosin, and the use of this material has its own particular drawbacks that cannot be ignored. They are, for example, inherently sticky, and not well suited for fine pitch printing applications.

Water-soluble fluxes must be soluble in water, and this characteristic also has its down side. These fluxes are limited by a shorter printing life, have less tackiness, and therefore are more difficult to work with. The aggressive formulation of their fluxes is such that they must be cleaned in order to protect the assembly from corrosion and other problems over time.

Synthetic fluxes have an advantage over rosin—based and water-soluble fluxes in that they can be custom formulated to meet the requirements of the applications. They can be formulated to exhibit higher printability, tack and tack time, printing life, and can be designed to be cleaned or to be "No-cleans". There are no restrictions on the formulation.

If synthetic "No-Cleans" are so good, then – why would we want to clean them? Here are a few good reasons:

- IPC/EIA J-STD-001C requires cleaning and testing unless otherwise specified;
- Trends toward further miniaturization favor flux removal (flip chip assembly);
- Trends toward higher temperature soldering (lead free) favor flux removal;
- Trends toward higher clock speeds(>1 gig hertz) favor flux removal;
- Long term marketing strategies for electronic products favor replacement due to consumption or obsolescence vs. product failure.

The first reason is probably the most compelling. IPC/EIA J-STD 001C requires clean boards. This means, under 8.3.1, no particulate matter (all classes), with no lint, soldersplash, dross, wire clippings, and no loose or dislodgeable solderballs. Also, under 8.3.2 unless otherwise specified (all classes), assemblies shall be cleaned and be free from flux residue (1x), and have <1.56 micrograms/cm² NaCl equivalent ionizables.

With Flip Chip technology, cleaning prior to underfilling improves reliability by preventing under-fill voids and delamination. Delamination of the under-fill will cause premature solder failure. Additionally, underfill voids trap foreign matter and concentrate physical force, increasing the potential for failure.

In lead-free soldering, higher soldering temperatures can discolor and break down residues left on the board, possibly resulting in corrosion, whisker growth, or other problems in high-humidity environments, as well as negative cosmetic impact to the board surface.

For some reason, two dangerous myths regarding cleaning seem to have acquired a life of their own in the industry. Unfortunately, neither could possibly be more wrong. The first is that EMS providers have no marketing pressure to clean to enhance product reliability. The second is that OEMs are not always fully informed of the benefits to reliability that cleaning provides. In fact, both OEMs and EMS providers have plenty of incentive to clean for enhanced reliability. Saving a dollar by not cleaning may cost hundreds of dollars in repair down stream—or even worse, lost customers! Remember the exponential rule of repair:

- Repair @ board level\$1
- Repair @ assembly level.....\$10
- Repair @ customer level.....\$100

It only goes upward from there. The bottom line is that the most reliable products are those that have been cleaned. No electronics manufacturer concerned about his bottom line can ignore this simple fact.

**Copied from SMT Magazine Advertisement for : Austin American Technology Corporation
12201-160 Technology Blvd. Austin, TX 78727-6102
Tel. (512) 335-6400 * Fax (512) 335-5753 *
www.aat-corp.com**