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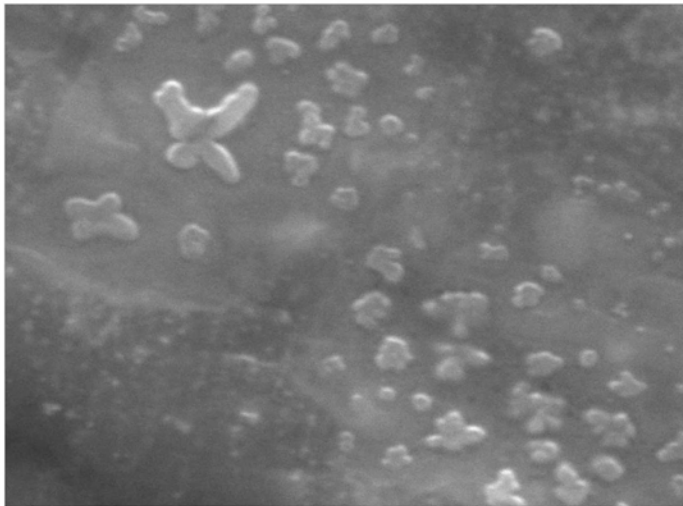
Straight Talk About "No-Clean" Fluxes

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First Published: 1993

Before selecting an alternative solvent, engineers should address the fundamental issue of the cleaning process. The crucial question remains, "Is cleaning really even required?" "No clean" processes are very attractive when faced with the rising cost of cleaning: expensive solvents, waste disposal problems, safety worries about chemicals and global efforts to protect the environment. Substantial savings could result if the cleaning step can be avoided. Unfortunately, it is our experience that only under the very best conditions can quality solder joints be produced reliably using "no-clean" processes.

All fluxes contain activators to promote solderability; stronger activators make for stronger solder joints because the solder flows more evenly, without gaps or weak spots. But since these activators are corrosive, these activators must be removed before they can cause any damage. Hence, the invention of circuit cleaning.



"No clean" fluxes minimize or eliminate the activators (and therefore the need to clean) in one of two ways. First, they dilute the activators to the lowest possible levels. These "low solid" fluxes can be very hard to work with; in effect, they are soldering without any flux. Inconsistent results are the obvious by-product of this unsophisticated technology.

The second strategy is use activators of normal or near-normal strength, but to encapsulate those activators inside a protective shell. The shell is a polymerization created by the heat of soldering. In this process, engineers can expect to see fairly successful soldering results. But problems can arise if not all of the flux is heated, and therefore not all of the activators become encapsulated. This is a particularly severe problem when hand-soldering is required, because even a small amount of excess flux on the board can result in large areas of the PCB being exposed to activators which will never be removed, since the cleaning step was eliminated.

Other problems with "no clean" fluxes are similar to the traditional soldering problems that occur without fluxes. Poor results in reflow or wave soldering can stem from corrosion or contamination of the leads prior to soldering, imperfect speeds and temperature parameters in the soldering process, or even fluctuations in humidity.

Since the joints are not as strong as joints produced with activated fluxes, finished products cannot handle thermal and physical stresses as reliably. Conformal coatings will not adhere to "no clean" materials which reduces their usefulness in harsh environments. Additionally, since cleaning removes corrosive contamination besides fluxes - solder balls, excess paste, tape residues, finger prints - sensitive electronics will need to be cleaned regardless of the type of flux.

In short, it has been our experience that "no clean" fluxes will work best only in high volume automated commercial applications such as televisions, desktop computers and other consumer products. In other words, if you don't demand too much, and the product is going to stay inside, away from temperature changes and vibration, then "no cleans" will work well.

But traditional, activated fluxes will be the best choice on the following types of boards:

- Boards designed for ultra-sensitive electronics, such as video production, where noise on the circuit can degrade functionality;
- Boards designed for rugged environments with wide variations in temperature or vibration, such as portable medical products, military radio systems or oil well "logging" systems;
- Boards where failures could have expensive or catastrophic consequences, such as satellite or aviation products;
- Boards which do sensitive analog-to-digital conversions, such as sensitive medical equipment;
- Boards on which extensive manual soldering is required; such as boards with unusual components or prototype boards not yet ready for automated production.



"No cleans" have other drawbacks which may disqualify them. The requirements for "no clean" production processes -- the new capital equipment, environmental controls, technician retraining, revamped quality control processes, additional incoming

inspections, just-in-time inventory management and more -- may not be feasible for many companies, particularly smaller ones. For companies with extensive hand-soldering requirements, the problems with incomplete encapsulation may be insurmountable, and traditional fluxes with untraditional cleaning solvents may be the only viable choice.

EDITORS NOTE: While the information in this article was accurate when it was written, today the technologies of fluxes have improved enormously. MicroCare estimates that more than 50% of the company's total business is helping customers to clean no-clean fluxes. Now, with the advent of lead-free pastes and solders, fluxes and cleaning fluxes is even more important. Today those are best represented by the [HFC solvents](#) from MicroCare.

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