Tech Article

Don't Risk Your Reputation: Use Effective PCBA Cleaning

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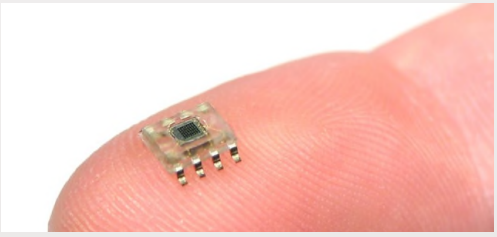
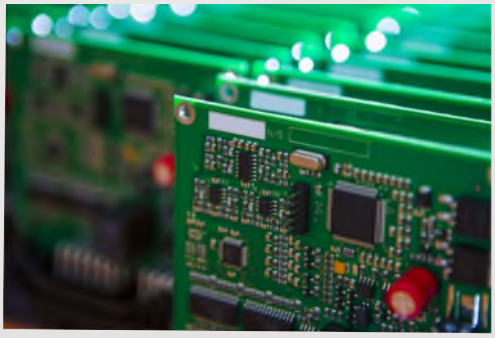


The complex circuitry used within them are getting smaller



Modern PCBs are dense, multilayered and highly complex assemblies

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Consumer electronics companies require components from Original Equipment Manufacturers (OEMs) to not only perform faultlessly, but to be perfectly clean as well. Cleanliness standards and processes must be applied when outsourcing goods to ensure the products do not fail. This is particularly significant with the increasing miniaturization of Printed Circuit Boards (PCBs) and the complex circuitry used within them.

Contaminated PCBs, or those with badly adhered conformal coatings, have a poor appearance and may make manufacturers question the quality of the product supplied. In addition, dirty PCBs run a higher risk of reliability and performance problems. Modern PCBs are dense, multilayered and highly complex assemblies. The continued reduction in pitch between conductors makes them vulnerable to insufficient, weak solder joints, bridging, and dendrite of which can cause consistency problems.

Maintaining long-term functionality in shrinking electronics requires precision cleaning. If not properly cleaned, contaminated PCBs can fail in the field, resulting in malfunctioning devices, extensive product recalls and costly warranty replacements. PCBs can be exposed to a variety of different contaminants during the production process. This includes everything from adhesives, conformal coatings and fingerprint residue, to uncured solder paste and marking inks. It is therefore essential that a reliable cleaning process is undertaken before conformal coating or final packaging and shipping. This ensures manufacturers receive clean, reliable and well-finished boards.

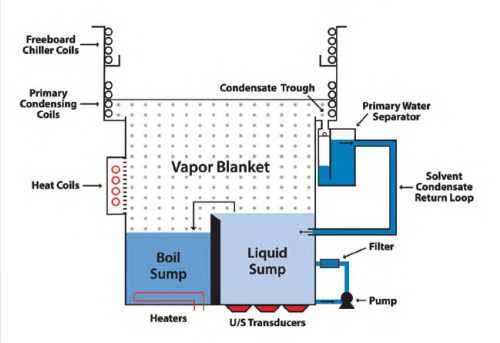
Finding a Consistent Cleaning Method

A good option when looking for a reliable cleaning method is vapor degreasing. It is important when outsourcing to an OEM that the cleaning process used is investigated and specific procedures are stipulated to confirm its effectiveness. The process of vapor degreasing not only helps guarantee the cleanliness of the PCB, but it is also a consistent automated method that can be closely monitored.

Vapor degreasing is a thermo-mechanical process that boils and condenses a specially-designed low-boiling, non-flammable cleaning fluid. A vapor degreasing machine contains two chambers, a boil sump and a rinse sump. In the boil sump, the cleaning fluid heats and the parts are immersed and cleaned in the fluid. Once cleaned, the parts are automatically transferred into the rinse sump for a final rinse in more pure, uncontaminated fluid.

The cleaning fluids used within the system have multiple chemical properties that are advantageous to cleaning intricate electronic assemblies. For example, they typically have a low surface tension and a very low viscosity. This allows them to clean very effectively, especially under low surface mount components like QFNs or D-Paks or compact spaces like blind and buried vias used on high-density boards. The lower viscosity also ensures the cleaning fluid and any contaminant residue flows out from under the components, preventing performance issues later. Most vapor degreasing fluids also are very heavy and dense, a further advantageous cleaning power to dislodge contaminant. Using highly-advanced cleaning fluids is important to ensure the cleanliness of intricate miniaturized PCBs like those used in Smart watches for example.

Manufacturers require clean, reliable and well-finished boards



Vapor degreaser cleaning can result in increased yields and better PCB reliability

Because modern cleaning fluids also evaporate quickly, the fluid is easily removed from small, tightly packed PCBs where slower-drying solvents or water from aqueous cleaning could become trapped under components. The fluid dries completely and leaves no residue or spots behind.

Choose your Cleaning Fluid Wisely

It is important to select the correct cleaning fluid for use in a vapor degreaser as it contributes to the functionality and reliability of the boards. Components on the PCB assembly can be adversely affected if the wrong cleaning fluid is used. For example, a cleaning fluid with a very high cleaning strength may potentially damage plastics or other soft materials. To avoid this problem, it is important to ensure the cleaning fluid is compatible with all materials within the assembly and not destruct any plastics or coatings on the assembly. This should be balanced with finding a cleaner that is strong enough to effectively remove the contamination.

The cleaning fluid must also be matched to the contaminant to be removed, whether it is flux residue, inks, dust or fingerprint oils. When it comes to precision cleaning “like cleans like”. For example, if a non-polar polar contaminant like oil requires removal, a dense, non-polar cleaning fluid should be matched to remove the contamination from the PCB substrate.

Clean Carefully to Protect your Reputation

When manufacturing PCBs, the cleaning process is critical to their reliability. If the cleaning processes are not consistent and efficient, functionality will likely be compromised.

It is important that electronic component fabricators put in place cleaning standard requirements when working with an OEM. This will not only ensure long-term functionality, but also help to protect the reputation and name of the fabricator by eliminating critical failures. Cleaning must be a primary consideration when manufacturing PCBs, and tried and tested methods like vapor degreasing should be used.

Vapor degreasing not only ensures the cleanliness of the PCB, but also satisfies the economic requirements needed within modern electronics manufacturing. It cleans faster, more efficiently and improves cleaning processes which can result in increased yields, repeatability and reliability.

About the Author:
Emily Peck is a Senior Chemist at MicroCare which offers benchtop and vapor degreasing critical cleaning solutions. She has been in the industry more than 6 years and holds a MS in Chemistry from Tufts University. Peck researches, develops and tests cleaning-related products that are used on a daily basis in electronics, medical, fiber optic and precision cleaning applications.
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