

How Contract Manufacturers Can Enhance Product Quality Through Effective Cleaning

Rising demands for performance and reliability are reshaping expectations in the electronics sector. For contract manufacturers, the challenge of delivering high-quality assemblies has increased as devices shrink, and printed circuit board assemblies (PCBAs) become more densely populated. Even microscopic contamination can affect product performance.

For contract manufacturers looking to meet the exacting standards of their OEM customers, selecting the right cleaning solution is no longer optional, it is essential to long-term quality assurance.

Understanding the Complexity of Modern Assemblies

The advancement of PCBA design has introduced new challenges. Micro components such as flip chip, ball grid arrays (BGAs), quad flat no-lead (QFN) packages, miniature diodes, resistors, and capacitors, are now routinely incorporated into increasingly compact layouts. The frequent use of low-standoff MOSFETs and zero-clearance components further complicates cleaning processes. These tight configurations often trap flux residues and other process contaminants in spaces where traditional cleaning methods may be ineffective.

In this environment, achieving thorough cleanliness demands more than high-performance cleaning fluids; it requires carefully optimized processes tailored to the specific contamination, design, and materials of each assembly. Manufacturers must consider factors such as component sensitivity and material compatibility when developing their cleaning strategies.

Cleaning for Reliable Performance

No single cleaning approach fits all applications. Contract manufacturers must adopt tailored methods based on the specific requirements of each project. Selection criteria should include:

- **Type of Contamination:** Flux residues, adhesives, solder paste, and environmental contaminants require different chemistries and process conditions for effective removal.
- **Component Sensitivity:** Delicate components demand gentler cleaning formulations to prevent damage.
- **Material Compatibility:** Cleaning solutions must be compatible with substrates, plastics, metals, and other assembly materials to avoid adverse reactions.
- **Geometry:** The physical structure of the PCBA, including low-clearance areas, necessitates advanced cleaning techniques such as vapor degreasing.

Choosing the correct cleaning process involves close collaboration between manufacturers, cleaning fluid manufacturers, and sometimes OEM customers to balance cleaning efficacy, production throughput, and cost.

Futureproofing with Sustainable Solutions

In addition to performance, sustainability has become a critical focus for contract manufacturers. With mounting pressure to meet stringent environmental regulations and the demand from OEMs for greener supply chains, there is an increased emphasis on adopting eco-friendly manufacturing practices.

While effective, traditional solvent-based cleaners present environmental and health risks due to high VOC emissions and hazardous waste. As a result, there is a growing shift toward using modern, sustainable cleaning fluids in vapor degreasing systems. These fluids offer efficient contaminant removal while minimizing the environmental impact.

Vapor degreasing is an advanced cleaning method, particularly effective for cleaning complex PCBAs, including those with miniaturized components and intricate geometries. The process involves using cleaning fluids that boil at low temperatures and creates a vapor “blanket” that is used to effectively clean and rinse the assemblies with minimal contact. This method prevents damage to sensitive components when using the correct vapor degreasing fluids, which are formulated to dissolve and remove flux residues, oils, and particulates, while keeping the integrity of the PCBA.

Benefits of Sustainable Vapor Degreasing Solutions

Choosing modern vapor degreasing solutions offers several advantages for manufacturers:

- **Regulatory Compliance:** Today’s vapor degreasing fluids meet stringent environmental standards, including low global warming potential and reduced toxicity. These fluids help manufacturers stay ahead of evolving environmental regulations.
- **Cost Reduction:** Vapor degreasing systems reduce cleaning fluid consumption through closed-loop technology, leading to operational savings. Additionally, efficient fluid recycling can reduce the need for frequent replacement, which can lower associated costs.
- **Brand Reputation:** Adopting more environmentally responsible cleaning solutions helps manufacturers appeal to OEMs with strong corporate social responsibility (CSR) programs, reinforcing their commitment to sustainability and boosting their market position.

Modern vapor degreasing systems are engineered with advanced cleaning fluids designed to balance high cleaning performance and environmental responsibility. These systems are optimized for effective contaminant removal while minimizing environmental impact, providing manufacturers with a reliable and more environmentally responsible cleaning solution.

In the Long-Term

For contract manufacturers, effective cleaning isn't just about meeting immediate standards it's essential for ensuring long-term reliability and product performance. Manufacturers can

achieve superior cleanliness while reducing their environmental impact by using advanced vapor degreasing systems with modern cleaning fluids. These modern cleaning solutions help minimize the risk of field failures and warranty claims, improve operational efficiency, and ensure compliance with industry regulations.

In a competitive market, investing in the correct cleaning technology helps support product quality and strengthens a manufacturer's reputation for reliability and environmental responsibility.

Author Information:

Elizabeth Norwood is a Senior Chemist at MicroCare, LLC, which offers precision cleaning solutions. She has been in the industry for more than 25 years and holds a BS in Chemistry from the University of St. Joseph. Norwood researches, develops and tests cleaning-related products. She currently has one patent issued and two pending for her work.

For more information, visit www.microcare.com.