PCBA Cleanliness Guidelines

DfR Solutions

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Best Practices: Control & Measure

- Confirm incoming board cleanliness
- Clean before solder mask application
- Clean after soldering operations
- Then measure:
  - Water quality going into process
  - Assembly cleanliness with ionograph

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PCBA Cleanliness: Overview

- Ensuring the cleanliness of printed circuit board assemblies involves process and control
- Process
  - Cleaning must introduced at the appropriate locations within the manufacturing process
- Control
  - The effectiveness of the cleaning processes must be validated through monitoring and measurement

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Printed Circuit Board Cleanliness

- The cleanliness of printed circuit boards (PCBs) has become especially critical in recent years due to
  - Decreasing conductor spacings (increased risk of electrochemical migration)
  - Increased use of no-clean flux (the last cleaning operations are PCB fabrication)
  - Movement of PCB fabrication to low cost countries

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PCB Cleaning Process (Location)

- At a minimum, PCB manufacturers should clean the PCB
  - Immediately before the application of solder resist
  - Immediately after the application of any solderability plating
    - HASL
    - Electroless Nickel and Immersion Gold
    - Immersion Tin
    - Immersion Silver
- Some PCB manufacturers also perform a final clean
  - Should not substitute cleaning after solderability plating
  - Residues from plating operations can become more difficult to remove with any time delay

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PCB Cleaning Process (Requirements)

- Final rinse with deionized (DI) water
  - 18 MΩ is preferred
  - Distilled water is insufficient
  - 'City' water is unacceptable
- Potential options
  - Use of saponifier during the cleaning process
  - Heated DI water is nice, but not absolutely necessary
- Common problems
  - DI water is only used if specified by the customer
  - DI water is turned off to reduce water and energy usage
  - Failure to monitor DI water at the source
  - Failure to alarm the DI water on the manufacturing floor

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PCB Cleanliness Control: Industry Specs

- IPC-6012B, Qualification and Performance Specification for Rigid Printed Boards, Section 3.9
  - Requires confirmation of board cleanliness before solder resist application
  - When specified, requires confirmation of board cleanliness after solder resist or solderability plating
- Board cleanliness before solder resist shall not be greater than 10 ug/in^2 of NaCl equivalent (total ionics)
  - Based on military specifications from >30 years ago
- Board cleanliness after solder resist shall meet the requirements specified by the customer

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PCB Cleanliness Control (Test Procedures)

- IPC-6012B specifies a Resistance of Solvent Extract (ROSE) method
  - Defined by IPC-TM-650 2.3.25
- IPC-6012B specifies this measurement should be performed on production boards every lot
  - Class 1 boards: Sampling Plan 6.5
  - Class 2 and 3 boards: Sample Plan 4.0
- Sampling plan (example)
  - If a lot contains 500 panels of a Class 2 product, 11 panels should be subjected to ROSE measurements for cleanliness testing

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This is only 1/3rd of the entire presentation. Interested? Want more?

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Best Regards,
Dr. Craig Hillman, CEO

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