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CASE STUDY

WHY ARE VINTAGE IPC TEST METHODS LIKE ROSE POSE STRUGGLING WITH NEW TECHNOLOGY?

A Case Study on the Limitations of Traditional ROSE Testing and the Shift to Advanced SEC Testing for Accurate Contamination Monitoring in Modern PCB Assembly

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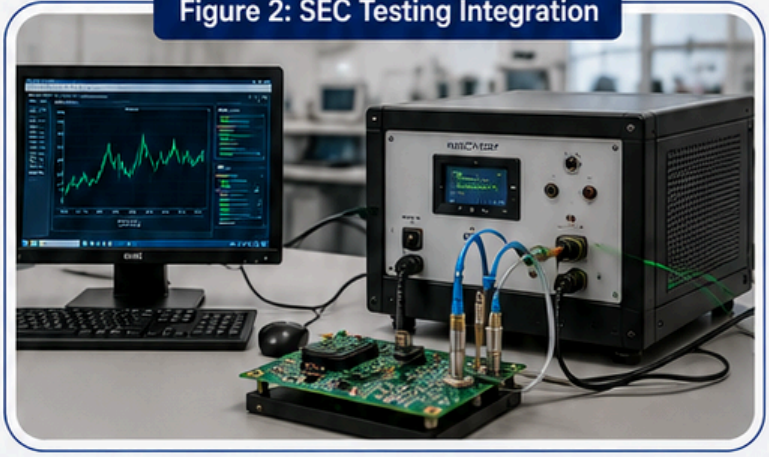
Figure 1: IPC ROSE Test System

Figure 2: SEC Testing Integration



ACCURATE MONITORING
Provides precise and reliable contamination measurement.

PROCESS STABILITY
Ensures consistent process control and long-term reliability.

BETTER QUALITY
Enhances product quality and reduces reliability related risks.

INDUSTRY 4.0 READY
Integrates with SPC and real-time data analytics for smart manufacturing.

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Why are vintage IPC test methods like ROSE pose struggling with new technology?

Figure 1: IPC ROSE Test System

1. Overview

Modern electronics have significantly changed over the years and created new challenges for PCB cleanliness and long-term reliability. Industries from the specific sectors, such as medical, industrial electronics, automotive, etc., require compact and high-density PCB assembly, which has the advanced materials and standards.

Many manufacturers still rely on the traditional IPC cleanliness testing methods, which include the ROSE, and it is abbreviated as "resistivity of solvent extract." It is being used to measure the iconic contamination that occurs on PCBs. But this method was originally developed to fulfill the needs of the simpler PCB designs and older electronic technologies.

This case study highlights the concerns related to new PCB technology, specifically addressing the manufacturers' worries about the relevance of older ROSE testing methods and their ability to provide accurate contamination analysis in current production environments.

2. Problem

The leading manufacturer that produces high-density PCB assembly had begun to face difficulties or issues while they utilize the traditional ROSE testing method which can focuses on monitoring the contamination.

The engineering team noticed that modern PCB layouts and new flux materials were producing results that did not properly match with the older cleanliness standards of IPC.

This results in many manufacturing concerns, such as

- Contamination interpretation has become difficult.
- Reliability assessment difficulty
- Testing accuracy was reduced.
- Challenges come with high-density PCB inspection.
- For dense PCB assembly, there was limited accuracy.

3. Challenges

During technical evaluation, the manufacturer identified that there were several limitations that are related to older or traditional ROSE testing methods.

The main issues incorporated

- Across the full PCB there was an average contamination measurement.
- Difficulty in analyzing the advanced flux residues
- Effectiveness got reduced for compact PCB layouts.

- Detection of localized contamination became difficult.

One of the significant concerns was the contamination that occurred on the modern PCBs.

This issue created additional risks around which include

- Sharp component edges
- Components that are tight or dense
- Low clearance assembly components
- High-intensity areas of the PCB

The company also discovered that the open-loop SEC systems behave very sensitively to environmental contamination, and the variation in the electrical signal might impact the testing reliability.

4. Key Solution

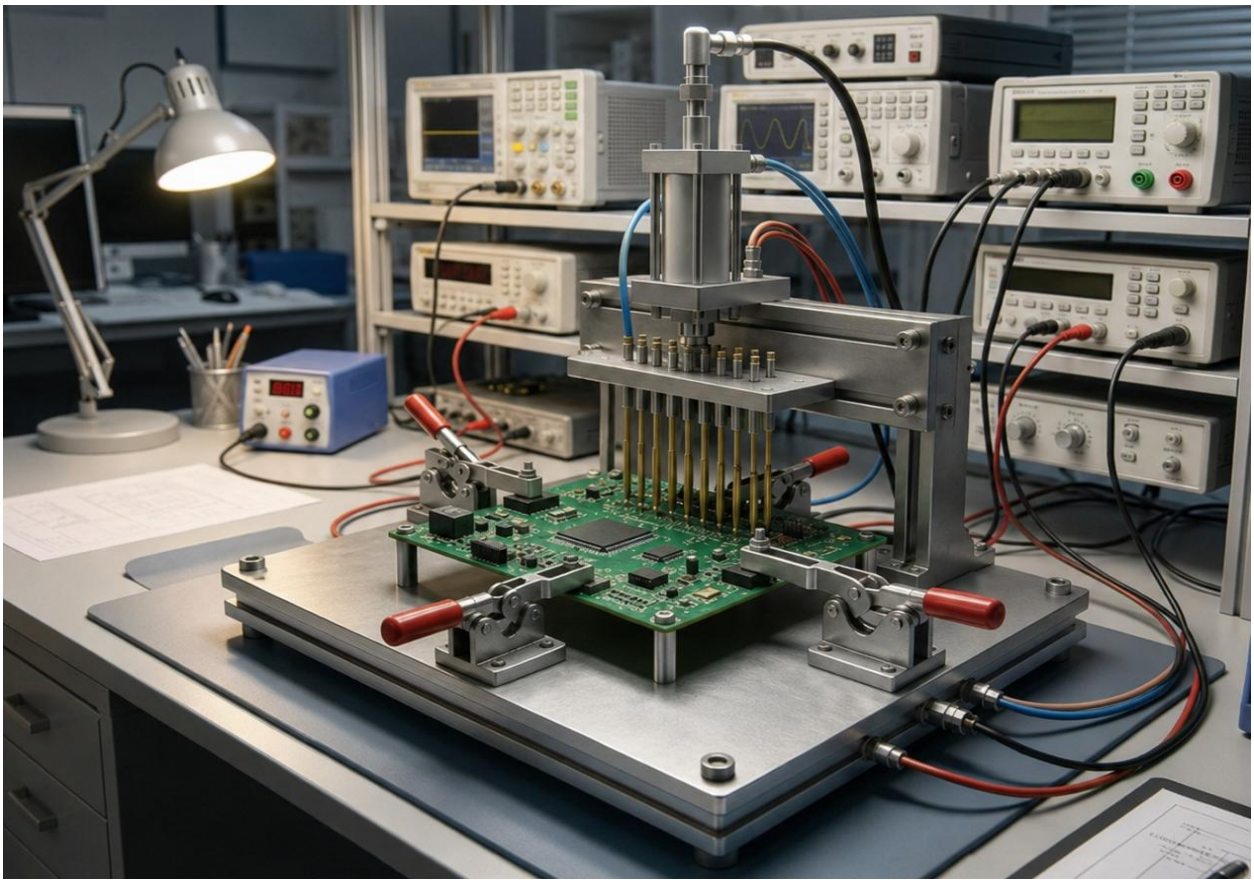

Figure 2: SEC Testing Integration

To improve the contamination analysis and reliability of the process, the manufacturer has updated the strategy and shifted from ROSE testing (which is used for only pass and fail cleanliness methods) to the process-based SEC testing method as a monitoring tool.

4.1 Evidence-Based Process Monitoring

Instead of using a single universal and fixed cleanliness value, the company has adopted an objective evidence-based method, known as the OE method, for evaluating contamination.

This process brings the improvised contamination monitoring accuracy and includes

- The reference values of PCB-specific contamination
- Product-specific cleanliness evaluation
- For process control, it could monitor the trend.
- Comparison with baseline measurements.

4.2 Closed Loop SEC Testing

The company implemented the closed-loop SEC system to improve the accuracy and consistency.

This system helps in providing

- Better testing stability
- Lower electrical noise repeatability
- Environmental control becomes better.
- Signal interference may decrease lower.

4.3 Advanced manufacturing integration

The manufacturer also connected contamination monitoring with the SPC system and Industry 4.0 systems.

It acts as an improvised tool and supports

- Continuous process real time monitoring
- Data tracking in real time
- Issues get detected faster.
- Improvised long-term quality control.

5. Outcome

After modernizing the contamination testing process, the manufacturer has improved the reliability when it comes to PCB stability.

The updated system can help the company achieve significant improvements.

- Long-term process stability
- Accuracy of the contamination testing
- Process stability
- Production quality control

6. Key takeaways

Traditional ROSE testing methods were developed for simpler electronic technologies that lacked complexities.However, in a today's scenario, modern electronics feature compact layouts and high-density designs, which present contamination challenges.

Key takeaway 1: This case study reflects the SEC testing efficacy and act as a process-controlling monitoring tool. It can't act as just a fixed pass or fail cleanliness method. But closed-loop SEC testing is more accurate and provides meaningful contamination analysis for today's electronics environments.

Key takeaway 2: With the help of the OE method, advanced processing techniques, and SEC systems, it can help to improve the quality of the PCs and minimize contamination risks.

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