



Finding Residue Sources Using Process Methodology

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When it comes to maintaining an efficient and effective electronics manufacturing process, implementing monitoring and cleaning processes can mean all the difference. While your cleaning process can be well implemented, it doesn't guarantee your product will be free from problems.

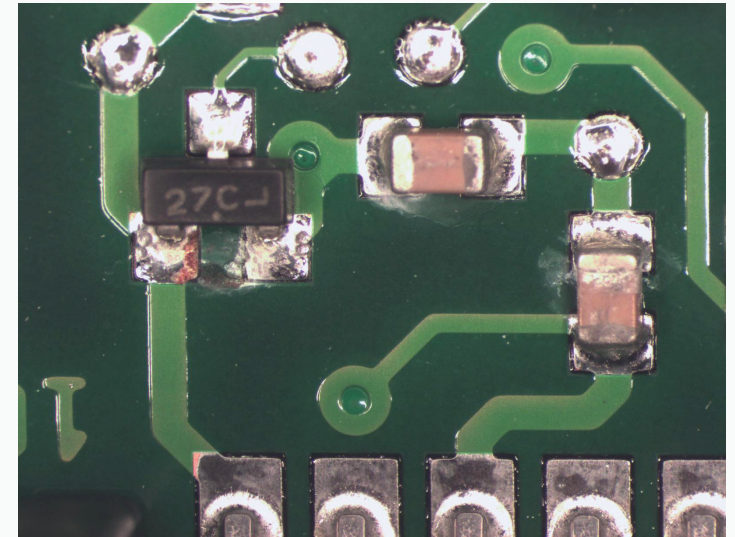
In many cases, problems arise due to gaps in the process; this is why working with professionals trained in process methodologies such as Six Sigma can help cover all your bases and maintain a near-perfect process.

The Role of Process Methodologies

Process methodology can incorporate a number of techniques that are used to improve overall quality and efficiency in your manufacturing operation. By combining expertise in manufacturing processes and applying proven problem-solving methods, these techniques provide an effective framework for identifying and correcting reliability issues.

Process methodology isn't a rigid set of requirements. Rather, it consists of a number of methods that function to keep manufacturing processes effective and efficient – and when things do go awry, it works to resolve problems quickly. We prioritize efficiency and our professionals are trained to face any problem and solve it using process methodology.

It's not uncommon to find that somewhere in the process, residues begin to form or build-up on your printed circuit boards (PCBs) or manufacturing equipment. Residues often lead to sticky messes – both figuratively and literally.



Process methodologies put you on the right track for effective operations and quick problem-solving.



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When your operation begins to experience failures due to process residues, the first thing you'll want to do is identify the source. Foresite uses several process methodologies to find residue sources, including the method described in this case study.

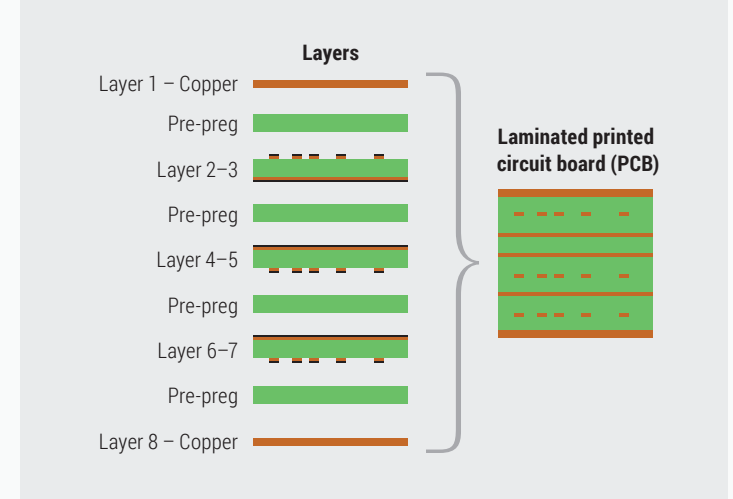
Case Study: The Dictionary Search Test

Finding the root of any problem in a process can be challenging if you do not narrow the scope of your efforts. Quality improvement consultant Dorian Shainin teaches a problem-solving technique called *The Dictionary Search Technique*, which has now become part of the Six Sigma methodology. In class, Shainin introduces this method by having students open a dictionary and choose a word. He then asks a series of 17 questions, which start with "is it between A and M or N and Z?" Shainin continues to halve the solution space until he gets to the exact word chosen on his 17th question. By applying the same technique, you can find the residue source quickly and efficiently.

Finding the root of residue sources can be a tooth-grinding process, but our professionals work quickly and efficiently to identify the problem and provide a solution in order to minimize downtime and non-conforming material while allowing you to resume work as normal.

A client began to experience failures during environmental stress testing on rigid multi-layer PCBs. The failed PCBs showed indications that an inner layer had become partially delaminated. We examined each layer, narrowing down the problem like Shainin teaches, to find a blister on layer six of the eight-layer board.

Figure 1: Eight-layer printed circuit board



The failed material also exhibited corona, arcing, and burning which indicated that electro-migration had occurred. In order to solve the problem, we needed to know what chemical differences existed between the layers. We tested both the failed layer and a non-failed layer for reference.

We identified bromide, chloride, sulfate, and weak organic acids as the detrimental ionic and organic contaminants.



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Summary: Process Makes a Difference

Using the Dictionary Search technique, we were able to pinpoint the exact source of chemical residues left behind from the manufacturing process. In this case, the book of PCB layers, like a dictionary, was re-opened and analyzed. This method isn't only a fast and effective problem solver, but it's really a way of life for process inspectors.

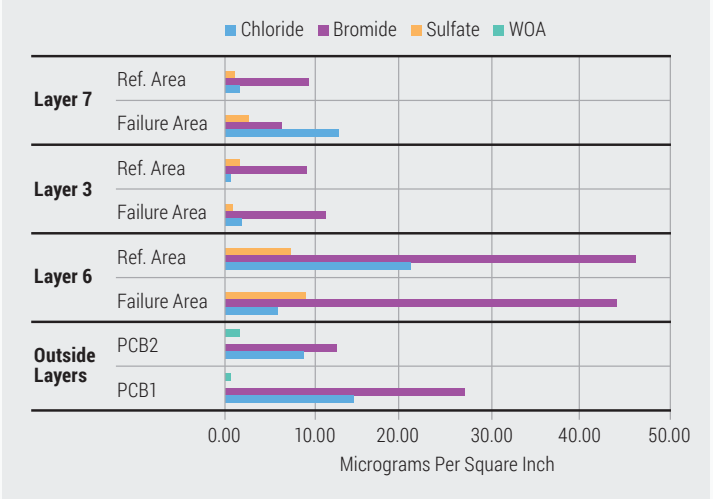
All manufacturing processes (small and large) can benefit from working from a process orientation when investigating and correcting problems. In addition, process methodologies can keep operations in line on a day-to-day basis. When a problem arises, following proven process methodologies can effectively identify the issue, determine root cause, aid in establishing corrective actions, and help avoid repeat occurrences.

Residue related failures are an all-too-common problem within the manufacturing industry, but having the knowledge and training to quickly identify and eliminate the problem can make the difference between a large, extended problem and a small, quickly resolved issue.

Foresite, Inc. is the industry expert at solving reliability and residue problems. We're eager to help you improve your product. Contact us for details.

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Figure 2: Residue levels by ion chromatography



Test results indicated that layer six had more ionic contamination than the other layers. These residue levels were higher than our recommended limits for long-term product reliability. Working with the bare board fabricator, we determined that the residues were introduced at the plating line. The client and fabricator were able to work together to reduce the levels of detrimental residues and also implemented process controls to eliminate future problems.

Using process methodology, we were able to quickly pinpoint the root cause of the problem and determine the exact point in the process where the problem occurred.