Sure Hope We Don't Get Caught

Make sure that processes on paper match up with process in reality

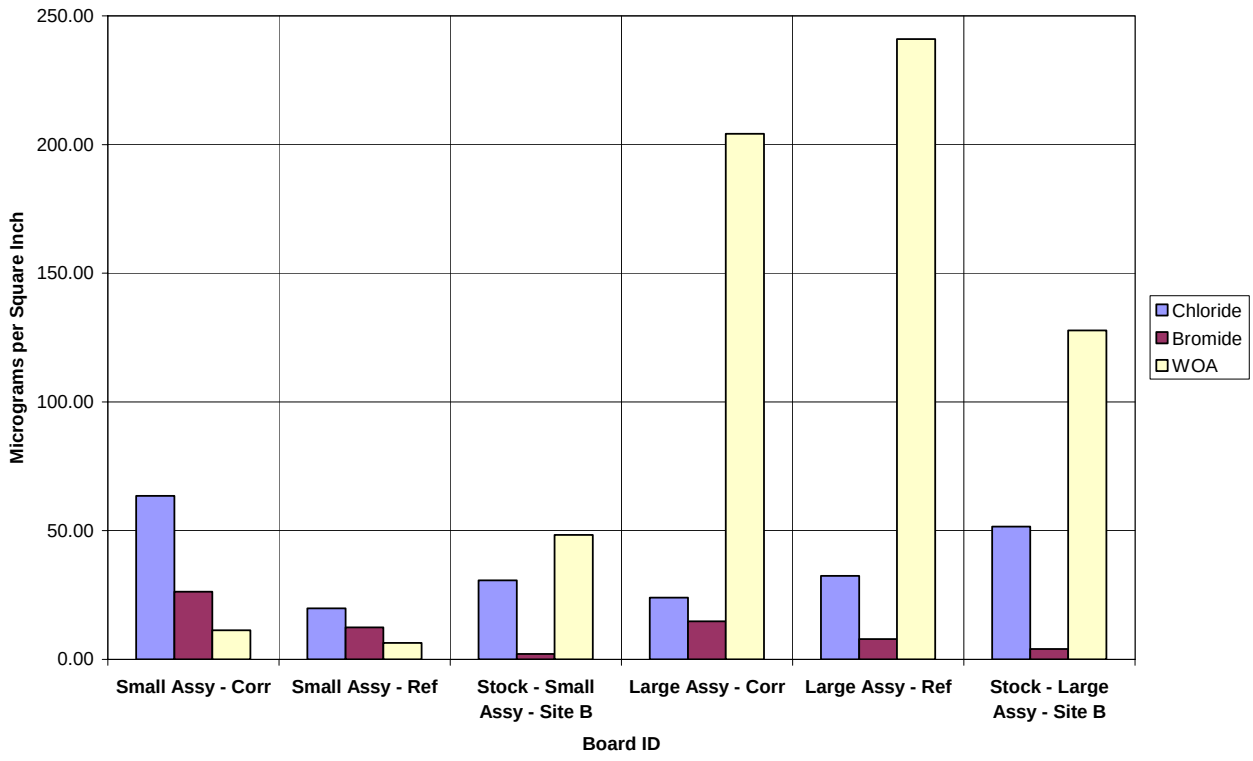
Foresite Inc.

This is the first of a two-part case study (too many good lessons for one study). We love this line of work. We get to see all different kinds of manufacturing processes, some done exceptionally well, and some done exceptionally poor.

We now look at a company that encompassed both ends of the good / bad spectrum. Company X (not its real name) has numerous manufacturing sites around the world, producing electronics that go into harsh end-use environments. We would classify the company as medium to large in terms of daily production. The flux technology used was low solids flux.

Foresite was brought into the picture when widespread corrosion, metal migration, and electrical leakage failures were experienced in the field. Chart 1 shows the residue levels on assemblies which experienced corrosion and on stock assemblies produced at Site B, as determined by ion chromatography (IPC-TM-650, method 2.3.28). Site B seemed to have a much higher failure rate than did Site A. This was unusual since the two facilities had nominally the same manufacturing processes using the same materials.

Chart 1 - Residues on Corroded and Stock Assemblies



1982 S. Elizabeth St. • Kokomo, IN 46902 • 765.457.8095 • www.residues.com • ForesiteInfo@residues.com

After a number of different analyses, the manufacturer desired an on-site visit to two of the assembly sites (we love on-site visits).

When we visited Site A, we saw the following:

- Four bare board vendors, one common with Site B
- No incoming cleanliness specifications
- A closely supervised assembly process
- Handling was done minimally and then by edges only
- Only the accepted / qualified fluxes were used, with clearly labeled bottles
- Flux applied in a controlled manner (flux pens)
- Kapton and ordinary tape used for board masking
- Connectors soldered during wave operation
- Leaded components crimped, wave soldered, then leads clipped
- Silver soldering done only by trained operators
- No cleaning following rework or touch-up

When we visited Site B, we saw the following:

- Four bare board vendors, one common with site A
- No incoming cleanliness specifications
- No controls on handling done with bare hands
- A wide variety of fluxes and flux technologies were in use, often mixing flux types
- No labels on the bottles
- Connectors attached with solder fountain
- In rework, flux applied with a brush in heavy amounts
- Leaded components crimped, wave soldered, then leads clipped
- Both Kapton and ordinary masking tape used
- Any operator, trained or not, could do silver soldering
- Localized cleaning of low solids flux residue using Axarel 2200 (a metals cleaning solvent) and a brush with no rinsing and air drying
- The process was under management from site A (large geographic separation)

When the Site A QA manager made inspections at Site B, it was known before-hand and all manner of secret jars, forbidden materials, and "individualized" practices managed to disappear temporarily. Before you start snickering at this, lots of process engineers in large (and not so large) companies think that the process laid out on paper is the same as what is being done out on the production floor. Sometimes the theory does not match up with the practice.

We will leave it to your imagination the screaming and bloodletting that occurred.

If there are lessons to be learned from this part of the study, we would say they are:

- Don't assume that the process on paper is the process that is actually used
- It's tough to catch the offenders when you announce you're coming

Was the rather sloppy processing at site B the reason for the failures? Partially so, but not the only cause. Site A still had a significant number of failures. A very significant portion of the problem was bare board contamination, encountered by both sites. That part of the study will be presented next month.