



Morbid Thoughts From a PWB Coroner

In the lab we spend a great deal of time evaluating “dead” printed wiring boards and assemblies. The typical dead board comes to us from a PWB manufacturer after he has detected, or suspects, a fatal anomaly. Fatalities can also come to us from end-users who have assembled the PWB and had it die on them prematurely. The task of evaluating these dead PWBs is similar to that of a real coroner, who’s task is to determine the cause of death in the victim. A PWB coroner can be a quality manager, lab technician, engineer or anyone who is saddled with the task of solving the cause of a PWB death.

PWB coroners are depended upon to examine the evidence from the cadaver and find the cause of the fatality. The results can be used to prevent further deaths, incarcerate the culprit, get restitution for the “surviving family members” or as forensic evidence in cases which go to court. Forensic evidence is defined as the application of scientific knowledge to legal problems. For those of you who never listened to anything concerning the O.J. trial we had here in southern California, I just wanted to let you know that the attorneys in the case spent a great deal of time talking about forensic evidence. This landmark case showed that the inept handling of forensic evidence can cast doubt on the validity and conclusions drawn by scientific findings.

Preserving the Evidence

It is critical that the dead PWB be carefully preserved for analysis. It should not be subjected to further operations or handling once it is pronounced dead. If contamination could possibly be an issue, do not use plastic bags to hold the specimen as they can sometimes deposit residue to the surface. I recommend aluminum foil for wrapping the “body” because it is one of the cleanest materials easily available. If certain process chemicals or materials are suspect, samples of these materials should be sent along with the failed part.

Questioning the Witnesses

One of the keys to finding the cause of death is to get accurate information on the conditions which led up to the fatality. How many parts died under the same circumstances? Are the dead parts from an individual production lot or group of lots? What changes in production or assembly occurred around the time of death? Was the PWB “dead on arrival” at the assemblers facility, or could it have been killed there? Witnesses should be questioned soon after the death in order to gather all the information possible about the circumstances leading up to the fatality. Time is of the essence as the evidence trail gets colder as time passes. Manufacturing processes change, and people’s ability to remember problems or circumstances surrounding the fatality diminishes rapidly.

Answering many of these questions becomes much easier when the parts can be accurately traced through manufacturing and processing. Thorough traceability can narrow the search for the cause of death down to a reasonable size. It can also help in isolating terminal illness in other parts, and aid in separating the healthy parts from the sick.

Examination and Autopsy

The first step in any coroners investigation is to visually examine the dead part. Many times visual clues are uncovered by a careful and thorough visual examination. Discoloration, residue and suspicious looking marks can all be clues to finding the perpetrator. When performing visual examination, it is always good to have a live and healthy subject for comparison. Experience in examining other cadavers can also aid in diagnosis and tracing the cause of the fatality. It



is important to take photos of suspect areas and document any unusual characteristics found during the visual examination.

When contamination is evident, it is important that it be identified. Elements and compounds can be characterized in a variety of ways. Scanning Electron Microscopy (SEM), Energy Dispersive X-Ray (EDX) and Auger (amazingly pronounced O.J.) can be used to identify the elemental composition of a material. Various types of infrared and chemical analysis techniques can be used to characterize compounds (i.e., IR, FTIR, AA, MS, etc.). For those of you who would like further information about these techniques, I will be giving an all-day tutorial at the IPC Expo titled “Analysis and Test for the PWB Industry” on March 9th (contact the IPC office at 847-509-9700).

When an actual autopsy is required, the area in question from the dead PWB is carefully carved out and placed into a polymer potting compound. This microsection is then ground and polished down to the area of interest to allow the specimen to be evaluated at high magnification, while looking for visual evidence of illness or foul play.

The Autopsy Report

The facts in the case must be presented in such a manner as to be understood by the average juror (or manager). As we all know, the jury in the above-mentioned court case took little stock in the forensic analysis, claiming confusion, ambiguity and improper technique in the information presented. Don’t let that happen to you! Too much or too little data can detract from a great coroners investigation. Present the facts in a clear, concise manner with easily understandable data or fact sheets. Use photos to document the crime scene and victim! As the saying goes, “a picture is worth a thousand words.” And last but not least, be thorough and follow the facts through.

Just remember, Quincy, unlike Mr. Golden, always got his man.

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