

# 'Intelligent' Sampling and Testing; What do we Have in Common with the CIA?

By Bob Neves



**Where's** the data to back that up? What does the data suggest? Where did the data come from? These are questions people repeat when they ask about information collected from process control, product characteristics or failure analysis. Regardless of the system used to control a manufacturing process or to assess product attributes, "data" is required to make intelligent decisions on process control or product conformance. If this data is not properly gathered, correct or complete, the decisions made regarding process control, product acceptance or failure determination will be incorrect.

Much of the data currently generated is filed away in a cabinet somewhere as a customer or contract requirement, and is never used to improve a manufacturer's process. Product conformance specifications are slowly migrating away from this type of end-product conformance testing and moving toward the enlightened view that end-product conformance without process control will have little or no value. Users and manufacturers alike are beginning to understand that testing only at the end of production will not guarantee a good yield due to the inherent inconsistencies in the product. The current trend in the next generation of performance documents is to make requirements more flexible so that manufacturers can actually use data gathered from process control to prove conformance, and data gathered for conformance as a tool to improve their process. This makes the techniques for gathering information more critical because the data must be analyzed in "real time," and then interpreted to allow the manufacturer to adjust his process. There has been a large effort within both the IPC and IEC to modify, simplify and clarify test methods. IPC-TM-650 is under a major revision and update and the IEC is developing a new test methods document for printed boards and materials.

I equate the gathering of data on a product or process to that of a national intelligence gathering operation (CIA, FBI, MI6 etc.). Many of the same principals these agencies use to gather information on the world apply to the gathering of data on a product or process. Field Agents (engineers) are used to gather and sort through information. The information can be gathered by direct or indirect means. Surveillance devices are used for monitoring

and observation. Forensic analysis is used to find the origin of particular attributes. Improper or inadequate analysis can lead to "international incidents." Intelligence operations can gather a lot of information, but unless it is relevant, a lot of time will be wasted wading through useless data. It is not only important to gather data, but you must know whether it is relevant to the situation or requirement.

There are many considerations that must be made when preparing to collect relevant data on a product or process. The population of data to be gathered must represent samples containing the expected attribute variation. Statistically sound sampling procedures are necessary for the correct characterization of the attributes in question. We see examples of this type of statistical sampling every day in the form of TV ratings and political polls. These statistical techniques allow the use of the information gained from a small sample group to evaluate the characteristics and attributes of a large group. This sampling procedure is necessary because it is typically impractical or impossible to evaluate an entire product or process group. Correct sample sizes and groupings are necessary to make intelligent decisions on process control and product conformance possible.

There are many publications and articles available which deal with the selection and acquisition of statistically significant samples. A thorough review of statistical methods is necessary before embarking on an "intelligence gathering operation."

During the next several months, I will present a series of discussions about various ways to gain intelligence (attribute data) from products or processes using current testing techniques. The article topics will include many of the physical, mechanical, environmental, electrical and surface analysis techniques currently available. These articles will include both destructive and nondestructive testing techniques. Discussions will contain the basic test method and what reasonable expectations of results are, as well as clarifying some of the acronyms and terms used in these test methods.

If you have any specific questions on testing or analysis you would like addressed in this column, Bob Neves can be reached at 714-999-1616, fax: 714-999-1636 or via e-mail at: [BobNeves@TheTestLab.com](mailto:BobNeves@TheTestLab.com)

Bob Neves has spent the last ten years as the director of technical services for Microfek Laboratories, an independent test facility. Prior to his tenure at Microfek, Bob worked in quality management and engineering in PWB manufacturing. He currently serves as the IPC's Rigid Board General Committee chairman, Rigid Board Test Method Task Group chairman, laboratory Qualifications (IPC-QL-653) Committee chairman, Member of DESC's Tiger Team for MIL-P-RRRRR (MIL-PRF-31032) Member of Blue Ribbon Committee for MIL-S-XXXXX (MIL-PRF-5X) and Convenor of IEC TC52 Working Group 10 Printed wiring Test Methods.