

Acceptance Sampling

Why Is It Still Needed?

BY DEAN V. NEUBAUER

Q: If process improvement initiatives such as Six Sigma and gurus such as W. Edwards Deming, Ph.D., emphasize process control to ensure quality to customers, then why do we need acceptance sampling?

A: The simple answer to this question is that even with an in-control process, you will still be making some level (albeit low) of nonconforming parts. Your customers will still expect you not to ship product to them that exceeds the contractually agreed-upon level of nonconformance. Hence, without some means of ensuring outgoing quality, your business is still at risk.

International trade has become the hallmark of a global economy. However, in many cases the producer (you) has become increasingly removed from the consumer (customer), not only by distance but also by language, culture and governmental differences. This has accentuated the need for the economical appraisal of material as it passes from border to border through the global maze. State-of-the-art knowledge of the methodology of sampling and its advantages and limitations is essential in such an environment.

At the same time, corporate culture has changed in response to an intensely competitive business environment. Manufacturers must protect the quality of their products in the most efficient and economic way possible. The judicious use of acceptance control can supplement and support applications of statistical process control. Used alone, this approach provides a proven resource for the evaluation of products.

In a highly competitive environment, acceptance sampling plans must be appropriately applied. The proper use of acceptance sampling methods stresses the role of sampling schemes with switching rules in making sampling more efficient when dealing with a flow of lots. MIL-STD-105E, Sampling Procedures and Tables for Inspection by Attributes, and MIL-STD-414, Sampling

Procedures and Tables for Inspection by Variables for Percent Defective, are taken as the principal standards in that regard as they remain constant and, while discontinued by the military, are still used extensively for domestic application.

Over the past several years, a number of military acceptance sampling standards have been converted into ASTM International standards so they can be actively supported on a continuing basis. ASTM E1994, Practice for Use of Process Oriented AOQL and LTPD Sampling Plans, was the first standard that preserved the Dodge and Romig sampling inspection tables indexed by AOQL (average outgoing quality level) and LTPD (lot tolerance percent defective). This standard was followed by ASTM E2234, Practice for Sampling a Stream of Product by Attributes Indexed by AQL.¹ Soon after, E2555, Practice for Factors and Procedures for Applying the MIL-STD-105 Plans in Life and Reliability Inspection,² and E2696, Practice for Life and Reliability Testing Based on the Exponential Distribution,³ were completed. Currently, a draft standard to convert MIL-STD-414 is in the balloting process.

ASTM Committee E11 on Quality and Statistics has had the distinction of having Harold F. Dodge, the father of acceptance sampling, as one of its early chairmen. His protégé, Edward G. Schilling, the father of modern acceptance sampling, was a longtime E11 executive subcommittee member. Schilling initiated the process of converting military acceptance sampling standards into ASTM International format, and this author has continued the process.

So, up to this point, the argument has been made that acceptance sampling plans are still a necessary component of doing business, especially if the process producing the product is not in statistical control. Also, there are now several current ASTM standards that support producers in the application of these plans; this conversion process will continue with the balloting of the version of MIL-STD-414 currently under way. It is

anticipated that conversions of MIL-STD-1235B, Single- and Multi-Level Continuous Sampling for Attributes, and MIL-STD-1916, DOD Preferred Methods for Acceptance of Product, will follow.

What Is Acceptance Control?

You might wonder what the nature of acceptance control is. Simply stated, sampling plans, schemes and systems may be used in a strategy of acceptance control to achieve better quality at lower cost, increased productivity and overall improvement in process control. The control aspect of quality control implies “the act or fact of controlling” or “the power to guide or manage”; this signifies action and implies that acceptance control is not a passive activity. Note that sampling procedures may be used to:

- ▶ Protect the consumer;
- ▶ Protect the producer;
- ▶ Accumulate quality history;
- ▶ Provide feedback information for process control;
- ▶ Provide economic, political and psychological pressure on the producer to improve quality; and
- ▶ Foster process control by providing a climate in which the process can run and be improved while producing imperfections.

Now, it is important to state here that sampling plans are not an end unto themselves. Any sampling application should be designed to “self destruct” in favor of process control and eventually be a spot-check only.

So, why did many companies discard their acceptance sampling procedures in favor of process control programs over the past three decades? Well, the change is largely due to a misinterpretation of point No. 3 of Deming’s 14 points: “Cease dependence on mass inspection. Require, instead, statistical evidence that quality is built in to elimi-

nate the need for inspection on a mass basis.”⁴

In 1995, consultant Wayne Taylor, Ph.D., wrote, “Much of the reaction against acceptance sampling is attributed to quality guru W. Edwards Deming, who many believe advocated its elimination. However, what Deming really called for was ceasing reliance on acceptance sampling. If more time and resources are spent on acceptance sampling than on process improvement and control, or if a company believes that, no matter what else happens, its sampling plan ensures shipment of only good product, then that company is overly reliant on acceptance sampling. Instead, its focus should be on defect prevention and continuous process improvement.”⁵

Well said. Even in these days of Six Sigma training, acceptance sampling is beginning to emerge as a necessary tool for ensuring the quality of outgoing product to consumers. Sometimes what goes around comes around.

REFERENCES

1. Conforming to MIL-STD-105E.
2. Conforming to the U.S. Department of Defense’s Technical Report 7, Factors and Procedures for Applying the MIL-STD-105 Plans in Life and Reliability Inspection.
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DEAN V. NEUBAUER, *Corning Inc.*, is vice-chairman of Committee E11 on Quality and Statistics, chairman of Subcommittee E11.30 on Statistical Quality Control and chairman of E11.90.03 on Publications; he also coordinates the DataPoints column.

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