

ON THE DEPENDENCE OF SAMPLING INSPECTION PLANS UPON POPULATION DISTRIBUTIONS

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1. Introduction. The foundations of the science of quality control and quality determination have been laid by W. A. Shewhart [1, 2]. His ideas pervade what follows, but they are too well known to require discussion here. There is, however, one that should be specifically mentioned, that of *statistically controlled production*, because it provides the justification for the basic assumption of this paper: *When production is statistically controlled, there exists a probability, $P(N, X)$, that a lot of size N will contain X defective items.* Shewhart has given a complete discussion of assumptions of this nature.

Sampling inspection of lots may take one of two courses:

- (a) Item inspection, in which a lot is accepted or completely inspected on the basis of one or more samples drawn from the lot.
- (b) Lot inspection, in which a lot is accepted or rejected on the basis of one or more samples drawn from the lot.

The former has been extensively studied by Dodge and Romig [3, 4, 5]; the latter has received little attention, but some of the basic ideas of Dodge and Romig are applicable to this case also.

In this paper the approach to the general problem of lot inspection will be different from that of Dodge and Romig in one important respect: The role of the population distribution function will be emphasized, whereas they have directed their attention to methods which require no knowledge of the population distribution. Their techniques are particularly valuable when a probability distribution does not exist, that is, when production is not statistically controlled. The interest here will be in the inspection of lots which may be regarded as having been drawn from a statistical population. After the first sample from the first lot has been drawn, something is known of the distribution of that population, and as the inspection proceeds a great body of knowledge may be accumulated. Here, if ever, is a real opportunity to explore and to use a population distribution. The very nature of inspection supplies a continuous flow of information about it. To neglect this information would be wasteful indeed.

It is, therefore, the object of this paper to point the way to more efficient inspection procedures for situations in which production is statistically controlled. The inspection procedure will be considered to be an inferential process—on the basis of one or more samples, and with whatever information is available about the parent distribution, an inference will be made regarding the quality

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