TIGHTENED MULTI-LEVEL CONTINUOUS SAMPLING PLANS

By C. Derman,[1] S. Littauer[2, 3] and H. Solomon[2, 3]

Columbia University

1. Introduction. Industrial needs have provoked some recent studies on continuous sampling. This procedure is especially of interest when the formation of inspection lots for lot-by-lot acceptance may be impractical or artificial as in conveyor-line production, or when there is an important need for rectifying quality of product as it is manufactured.

These newer papers are best considered in the light of the earlier papers of Dodge [3] and Wald and Wolfowitz [11]. One point of departure from the Dodge type of plan has been the introduction of several levels of partial inspection with different rates of sampling in each level. Multi-level continuous sampling plans (which reduce to the Dodge plan when only one sampling level is tolerated) have been considered by Greenwood [8], Lieberman and Solomon [9], and Resnikoff [10]. A plan based on the Wald-Wolfowitz approach, a scheme essentially handled by the methodology of sequential analysis, was created and developed by Girshick about 1948 in connection with a Census Bureau problem and has only recently been reported [7]. The reader is referred to Bowker [1] for a more thorough account of continuous sampling plans.

The multi-level plan given in [9], namely MLP, allows for any number of sampling levels, subject to the provision that transitions can only occur between adjacent levels. Three generalizations of MLP, accomplished by altering the manner in which transition can occur, are analyzed in this paper. In each situation, we will make it more difficult to get to infrequent inspection than in MLP, and thus we can label these three plans as tightened plans. These three plans which will now be specifically defined obviously relate to more realistic situations for control of industrial processes. The three plans are given in language which assumes some familiarity with MLP, which is given in detail in [9].

(a) *The MLP–$r \times 1$ Plan.* We say we are in the jth sampling level if every $(1/f)^j$-th item produced is systematically sampled. If i consecutively inspected items are found clear of defects when sampling at the jth level, begin sampling at the $(j + 1)$-th level. On the other hand, if a defective item is found before this is accomplished, revert immediately to the $(j - r)$-th level, if $j > r$, or to the zero level, that is, one hundred per cent inspection if $j \leqq r$. Let inspection begin at the zero level. When $r = 1$, we have the MLP plan described in [9].

(b) *The MLP–T Plan.* This is exactly the same as the MLP–$r \times 1$ Plan, except that when a defective is encountered, we immediately revert to one hun-

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