INTRODUCTION

World over competition is growing and every organization will have to review the policies, processes and strategies, particularly in the area of quality, since the demand for quality is emerging as the single most critical factor for organizations to survive. Continuity of success and improvement will be achieved only when proper quality management system is followed. Most of the The introduction of automation and computer aided designing technology supports the manufacturing processes to produce units of homogeneous quality. Many modern production processes particularly those in electronic industry, such as integrated circuits manufacturing have very low fraction non-conforming levels measured in the range of parts per million.

Several technologies and methodologies are available for bringing about improvement in quality of the products. Statistical quality control is the combination of quality control charts and acceptance sampling plans. The former is used to maintain the quality of products during the manufacturing process and the latter is used to inspect the final manufactured products before they can be released for consumers use.

Further, during the process of inspection, it may not be possible to inspect all of the products especially in case of electronic components, as it requires testing with damage of the products high cost and time. On the other hand, if the product is believed to be good then it requires no inspection. Acceptance sampling works as a bridge between no and complete inspections. Due to the reason, acceptance sampling plans are desirable for high quality processes. Various well-organized sampling plans and procedures have been published for the inspection of product that is made available in individual, units, lots or batches.

Dodge (1943) introduced the concept of continuous sampling plans, CSP-1 and provided the mathematical rationale and rules of operation when the product units are manufactured by a conveyor belt or other straight line system with units flowing one after another in progressive assembly such that the formation of lots for lot-by-lot acceptance may be impracticable and/or artificial. Various single level continuous sampling plans are considered as variations and modifications to the basic structure of CSP-1.

As an extension of CSP-1, three different types of multilevel (infinite levels) plans with identical clearance numbers and geometrically reduced sampling rates are considered which allows for smoother transition between sampling inspection and screening inspection. These plans permit a rapid reduction when quality is superior and to require screening only when the quality of the product is not satisfactory and releases the screening crew earlier to return to the production duties.

However, the inspectors find difficulty in the application of multilevel plans infinite levels of sampling inspection and with geometric reduction of sampling rates while the products are on a conveyor belt. This initiated the researcher to work on the tightest of the three multilevel plans having two levels and three levels of sampling inspection with generalized parameters which carry simultaneous reduction of clearance numbers and sampling rates while switching from lower level to a next higher level of sampling inspection.

The chief features of newly introduced multilevel plans are

(i) general clearance numbers (without imposing the condition of identical clearance numbers at different levels) and

(ii) general sampling rates (without imposing the condition of geometric or arithmetic reduction at different levels)

Consumer protection has always been a prime factor in the construction of acceptance sampling plans. US Military standard MIL-STD-1235C (1988) on continuous sampling plans provides the tables and procedures for applying the continuous sampling plans not including consumer protection. This motivated the investigator to estimate the consumer protection of the selected plan in terms of inspection cost and outgoing quality by considering average fraction inspected and AOQL. This may assist in the future to incorporate the aspect of consumer protection in US Military standard table.

Continuous sampling plans are most suited to processes where lot formation is difficult. However, their application is not limited and may also be applied to continuous production processes involving lot formation. In modern production processes involving computerized manufacturing the fraction of producing nonconformities is in the range of parts per million which requires either with larger clearance interval or larger fraction to be sampled in the application of continuous sampling plan. To study this type of situation combining the best features of continuous sampling plan and lot by lot inspection plan is desirable.

Pesotchinsky (1987) proposed a complex scheme that includes both the strategies of screening inspection of units and sampling inspection of lots formed together with certain criteria for switching between strategies. Combining the best features of continuous sampling and the lot by lot inspection initiated the investigator to propose a new multifaceted continuous lot by lot acceptance sampling plan governed by clearance number for unit by unit inspection along with the strategies of clearance number, sampling fraction and sampling rate for lot by lot inspection.

Profile of study

This dissertation is prepared on the basis of the following research work

(i) designing of generalized tightened two level and three level continuous sampling plans of Muthulakshmi (1999) and analysis of consumer protection of these plans

(ii) designing and derivation of performance measures of combined continuous lot by lot acceptance sampling plan of Govindaraju and Bebbington (2000)

(iii) a new multifaceted continuous lot by lot acceptance sampling plan is proposed by the investigator