ABSTRACT

In the field of statistics, control charts are a commonly used tool for tracking a statistical process. The main goal of every production process is to maintain high product quality throughout the production period. Several control chart structures are available in the literatures that are used to assess the manufacturing process. A comparison was made between the proposed and the existing charts based on mean run length, median run length and standard deviation of run length.

The term "linear profiles" describes the relationship between the response and the explanatory variables. For example, the relationship between the density specifications of a polymer and its tensile strength is illustrated by a linear profile involving one response and one explanatory variable. If this relationship involves only one variable, it is referred to as a simple linear profile.

This study deals with a new technique for measuring error variances that reduced the variability in the observed sample. The results and conclusions are drawn from a simulation study conducted with the R programming language. Design different control chart structures for error variances, intercepts, and slopes that work effectively in monitoring process parameters. This study investigates different error variance approaches for monitoring medium and small displacements. And a comparison is made between four different error variance methods (log_scale, Natural_scale, jackknife, D_method) to make the study clearer.

The control charts are designed to maintain fixed average run lengths of 200, 370, and 500. The analysis shows that as the value of λ increases, the average run length (ARL) also increases, and as the offset value increases, the ARL decreases. After observing the tables and graphical representations, it is concluded that the proposed EWMA-J control chart dominates for the detection of positive medium and small shifts.