

## ABSTRACT

The cumulative sum (CUSUM) chart has been used extensively in statistical process control for various fields and industries. In classical CUSUM charting procedure, the underlying process distribution is required to set up the chart. If the underlying distribution cannot be approximated by known parametric distributions, a CUSUM chart cannot be used. This thesis develops a general CUSUM chart which can be implemented for any underlying distribution. Smooth empirical cumulative distribution function is used to estimate the cumulative distribution function of in-control process from historical data. Monitoring statistic is a transformation of data such that the in-control distribution for monitoring statistic is always approximately standard normal. When the historical data size is sufficiently large, the proposed CUSUM chart will perform well in terms of average run length. A simulated real life application is included to illustrate the procedure. From the application, the proposed CUSUM procedure works better than a classical normal CUSUM chart when the underlying distribution deviates from normal. Main advantages of the proposed CUSUM procedure are versatility and performance.

**KEY WORDS:** Average Run Length; Collocation Method; Empirical Cumulative Distribution Function; Normal Distribution; Statistical Process Control