A study of control chart detection capability using taguchi mahalanobis distance

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ABSTRACT

With industrial and technological development, automated production equipments have gradually replaced manpower. However, during the production process, there is still a need for strict monitoring in order to avoid the occurrence of nonconformities in the manufacturing process, thus reducing product quality or increasing quality loss owing to rework and rejection. In the continuous manufacturing process, the data collected are usually correlated, which results in more error signals in the traditional control chart, and thus, increasing the misjudgment probability of manufacturing process control and monitoring. The traditional Shewhart control chart only uses the last quality characteristics to determine whether the process is in-control or out-of-control state. Therefore, when the magnitude of mean shift of the manufacturing process is larger, the detection capacity is better. Otherwise the detection capacity is poorer. Mahalanobis-Taguchi System (MTS) can be used for classification and feature selection, which can further evaluate the degree of aberrance of the observed samples ’ corresponding group. Therefore, this study uses average run length as the evaluation indicator to investigate the influence of the difference in the mean shift of manufacturing process for the observed value under normal distribution on the traditional control chart, as well as the detection capacity of the application of MTS to control chart. In addition, this study investigates the detection capacity of the application of MTS to pre-control chart under non-normal distribution. Results indicate that when the manufacturing process is under non-normal gamma distribution, the detection capacity for the application of MTS to pre-control chart is better.

Keywords : Shewhart control chart, pre-control chart, Mahalanobis-Taguchi System, Mahalanobis distance, average run length

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