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Use of Johnson Transformation for Individual and Moving Range control charts in crepe rubber manufacturing process

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Individual and Moving Range (I-MR) charts are generally used for process monitoring where we cannot group observations into rational subgroups or when it's more convenient to observe individual measurement rather than averages of the subgroups. However, the efficiency of I-MR charts is poor when the underlying distribution of data deviates from normality. Process monitoring is very important in rubber manufacturing where data on critical to quality distributes non-normally. No previous work was found applying I-MR charts especially on rubber data which are non-normal in nature. Hence this study was carried out to investigate the effect of non-normal data on I-MR charts and to develop a method to construct I-MR charts for non-normal data. We suggest to construct I-MR charts with Jonson transformed data as a solution for this issue. Performances of I-MR chart were compared with the theoretical standards, under four different cases; simulated non-normal data, real data, Johnson transformed simulated data and Jonson transformed real data. While the simulated non-normal data and real data lead to high Type-I error and low power, Johnson transformed data lead to very low Type I error (<0.001) and power comparable to theoretical standards. Further investigations are in progress with the objective of recommending this methodology for process monitoring in rubber manufacturing.

Key words: I-MR charts, Johnson transformation, process control, rubber manufacturing

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