Application of statistical quality control in the rubber industry

M D N Gunaratne[1], W Wijesooriya[2] and D A B N Gunaratne[1]

[1]*Department of Crop Science, Faculty of Agriculture, University of Ruhuna*
[2]*Division of Biometry, Rubber Research Institute, Agalawatta.*

Abstract

A quality control system perform inspection, testing and analysis to ensure that the quality of the product produced is as per the laid down quality standards and it is called "statistical quality control" when statistical techniques are applied, to control, improve and maintain quality or to solve quality problems. In executing of an information system requires statistical thinking in outlier detection, precision experiments, acceptance sampling, and process control etc. that have an important part to play in the improvement of quality, enhancement of productivity, creation of consumer confidence and development of economy. With the advancement of ISO standards on quality systems it has been effective feature in any quality control system.

This study suggests application of ISO recommendations in precision experiments and process control. In addition to the ISO recommendations additional graphical methods are suggested for better and convenient presentation in outlier detection and precision experiments.

Shewhart control chart is the statistical devise used for the study of addition of bleaching agents and sodium bisulphate in the crepe rubber production. *X-bar* and *R* charts are plotted in controlling temperatures of 6 rooms of drying tower and X charts and moving range charts are plotted for univariate chemical applications.

Multivariate process control is applied as an approach to consider two or more variables simultaneously. In this study application of bleaching agents, sodium bisulphite and acid were evaluated simultaneously. Multivariate Shewhart control charts are applied to study chemical applications in the process of crepe rubber production.

Introduction

Quality control is a process of application of operational techniques and activities that are used to fulfill requirements for quality. Statistical quality control is a part of quality control in which statistical techniques are used. Appropriate methods of statistical quality control can be applied for the rubber industry for different uses.

Materials and Methods

Different quality control techniques of ISO quality standards with suggested techniques have been applied in this study for different processes.
Precision experiments are done for test results of DRC content of rubber latex carried out in 7 laboratories with two samples in the Rubber research Institute. Four variances are calculated they are the repeatability variance, the between laboratory variance, the reproducibility variance and the co-efficient of variance for repeatability and reproducibility. Outlier detections is done to find out discordant test results or observations. In graphical method of outlier detection, box plots and Mandel's static are used in data presentation and numerical methods, Cochran's and Grubs tests are used.
In univariate and multivariate process control, temperatures of 6 rooms in the drying tower of the factory and amount of Latex collected, amount of chemicals applied were taken from above mentioned factory records. Control charts are the major tools in process control.
In multivariable scatter diagrams and control ellipse has been used to show the process when the multivariate data composed of two variables. In multivariate monitoring included the economic design of the T^2 control chart the use of adaptive sampling for the T^2 chart for monitoring the process of factory operations in crepe rubber production.

Results and Discussion

Use of box plot diagrams as a graphical presentation will provide clear information on the consistency and accuracy of the results.
Trueness and precision are two terms that are used to describe the accuracy of measurement methods in ISO 5725. They are two conditions of precision and they are useful for describing the variability of a measurement method is of interest when it is possible to conceive of a true value for the property being measured.
Development of SPC techniques using the guidelines should facilitate a reduction of process variation, and scrap. The graphical presentation is very important and it is a quick way to see the advantages of process control. Multivariate Process Control allows for the examination of the group of variables as a whole. Multivariate procedures are more sensitive to changes in a variable or its relationships than univariate process control procedures.

Conclusion

ISO recommendations of statistical quality control can be applied in the rubber industry for an effective quality control system.

Precision experiments can be applied to compare different laboratories against a standard measurement method
Shewhart control charts can be applied in monitoring process of production.
Multivariate process control provides a way for monitoring of more than two variables simultaneously.

References

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