The Economic Design of X-bar Control Charts under Preventive Maintenance and Taguchi Loss Function

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ABSTRACT

Quality is one of the important indicators of enterprise competitiveness. Reaching a balance between low costs and high quality is a key to the success of an enterprise. Sampling and inspection are conducted during the production process to monitor the product quality in manufacturing process. However, the coming of automated production has gradually increased the plant utilization rate. The failure rate of machines will increase in the manufacturing process due to increased working time. If preventive maintenance can be carried out in proper time, the deficiency rate of the manufacturing process can be reduced to improve the general quality of the products and effectively cut production costs. This study, based on the economic design of X-bar control charts, integrated status-based preventive maintenance to determine whether preventive maintenance of the machine shall be carried out by the statistics of the samples. Taguchi quality loss function was also used to replace the traditional quality cost function to comply with the modern concept of social loss cost to establish the unit time cost analysis model and find out the optimized parameter combination of the economic design of control charts. Meanwhile, numerical examples were employed to illustrate the application of the proposed model. Sensitivity analysis was also conducted to understand which parameters have relative significant effects on costs to provide the industry with a new approach to using control chart design by integrating the preventive maintenance strategy and Taguchi loss function to enhance the competitiveness of the enterprise.

Keywords : Control chart ; Economic design ; Preventive Maintenance ; Taguchi loss function

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