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Optimal economic production quantity policy for randomly failing process with minimal repair, backorder and preventive maintenance

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Abstract

This study examines the feasibility of using an economic production quantity (EPQ) model incorporating maintenance and production programs to model an imperfect process involving a deteriorating production system. In response to failure, defective parts were produced and minimal repairs performed to create an in-control state. The conditions are studied in the case of the EPQ model undergoing a backorder owing to rejection of defective parts after a failure. Following production run period, two types of periodic preventive maintenance (PM) exist: imperfect and perfect. The probability of perfect PM being performed depends on the number of imperfect PM performed since the last renewal cycle. For the EPQ model, the optimal run time for minimising the total cost is discussed. Various special cases are considered, including the PM learning effect.

Finally, this investigation presents a numerical example to illustrate the effects of PM ability, repair cost and defect number on total costs and production period. This study finds that enhancing maintenance ability reduces production related costs. The product system can be produced more efficiently using a PM program.

Keywords:

production | imperfect maintenance | learning effect | optimum | backorder

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