그룹관리도의 경제적 설계

Economic Design of a Group Control Chart

홍창익* · 배도선*

* 한국과학기술원 산업공학과

Abstract

Manufacturing processes often have multiple sources or streams of output. For example, a machine may produce identical units with several identical heads. This process is called a multiple stream process(MSP). To monitor a MSP, one can use separate control charts on each stream. However, this approach usually results in a prohibitively large number of control charts and causes high false alarm rate. One method of overcoming this problem is to use group control charts(GCCs) in which samples are drawn from all streams but a few of them are used for plotting statistics, such as the maximum and the minimum of sample averages. In this manner, the use of GCCs reduces the administrative costs.

In this paper, an economic model of GCCs is developed which determines the design parameters of GCC; sample size, control limits, and sampling interval. Process states and system states are defined and the method of generating all possible paths of system state transition is devised to obtain the average cycle time. The expected cost per unit time is obtained which involves the cost of false alarms, the cost of detecting and eliminating an assignable cause, the cost associated with production in out-of-control states and the cost of sampling and testing. Optimum values of design parameters are obtained by minimizing the expected cost per unit time.