A production inventory model with protection for few stages of production.

Abstract

We consider a two server production inventory model with positive service time. Customers arrive to the system according to a Markovian Arrival Process. Service time of customers follow identical but independent phase type distribution. The production of inventory follows (s,S) policy. Production of inventory is by one unit at a time and the production time follows Erlang distribution. While in production shocks occur and consequently breakdown of the production machinery takes place. The shock/damage process occurs according to a Poisson process. After repair, the production process restarts, discarding the item in production. The repair time follows phase type distribution. In order to minimize the product loss due to shock, protection is given to the last k stages of production. Protection of the production process involves additional cost. As a result of this protection, the item, while in the last k stages of production, will not be affected by shocks. Steady state analysis of the model is performed. Some performance measures and distributions of certain important performance characteristics are evaluated. We formulate an optimization problem related to the number of stages of the production process to be protected.

Keywords: production inventory, protection, phase type distribution, Erlang distribution, Markovian Arrival Process