Literature Review:


This paper addresses the problem of capacity estimation and improvement of a multi-stage, multi-product production line where workstations are subject to random failure and repair. The production line can process a variety of products in a batch production environment. Products are processed according to a predefined sequence. A linear programming model is used and modified by taking into account the random behaviour of unreliable stations. Station's downtime is modelled as a fictive product added to the production sequence at appropriate positions. A general procedure for the insertion of fictive products is presented.


A Markov process model of a transfer line is presented in which there are two machines and a single finite buffer. The machines have exponential service, failure, and repair processes. The movement of discrete parts is represented. The model is analyzed and a compact solution is obtained. Limiting behavior is investigated and numerical results are discussed.


In this paper Probabilistic processing times, times between breakdowns and repair times make the amount of stock in buffers between stations in production lines behave as a stochastic process. Too much or too little buffer stock reduces system economy and efficiency, respectively. We obtain optimum buffer capacities and initial stock levels for production lines employing a mathematical random walk approach based on the maximum and minimum values
of a stochastic process in a time window. Two approximations are developed, each useful under different risk-acceptance assumptions. Simulation results populate the equations. A motivating case study from a discrete part manufacturing line, including an example of using regression on the simulated results, is presented.

M. Haridass and R. Arumuganathan (2011) Analysis of a batch arrival general bulk service queueing system with variant threshold policy for secondary jobs.

In this paper, a bulk service queueing system with variant threshold policy for secondary jobs is considered. On completion of service, if the queue length is less than 'a', the server performs a secondary job of type one, repeatedly, until the queue length reaches 'a'. On returning from a secondary job of type one, if the queue length is at least 'a', the server performs another secondary job of type two, repeatedly, until the queue length reaches the threshold value 'N' (N ≥ b > a), then the server serves a batch of 'b' customers. Various performance measures and a cost model are presented.

A.D. Banik (2011) Analysis of single working vacation in GI/M/1/N and GI/M/1/∞ queueing systems

In this paper A. Banik consider a finite-buffer GI/M/1 queue with exhaustive service discipline and single working vacation. Service time in a vacation, in a service period and vacation time all are exponentially distributed random variables independent of each other. Queue length distributions at pre-arrival and arbitrary epoch with some important performance measures such as, probability of blocking, mean waiting time in the system, etc. have been obtained using the method of embedded Markov chain and supplementary variable. The corresponding infinite-buffer GI/M/1 queue with exhaustive service discipline and single working vacation has also been analysed. For this model, we also obtain pre-arrival and arbitrary epoch probability along with some important performance measures. These queueing models have potential
application in the area of computer and communication network where a single channel is allotted for more than one type of job.

V. Goswami and P. Vijaya Laxmi (2010) *Performance analysis of discrete-time GI/D-MSPa;b/1/N queue*

This paper presents a discrete-time single-server finite buffer queue with renewal input and discrete Markovian service process (D-MSP) where server serves customers in batches according to general batch service rule. Using the supplementary variable and the imbedded Markov chain techniques, we obtain the queue-length distributions at pre-arrival and arbitrary epochs. Some performance measures such as loss probability, mean queue length and mean waiting time in the queue along with some numerical results have also been discussed.

F Karaesmen, S M Gupta (1997) *Control of arrivals in a finite buffered queue with setup costs*

Author consider finite buffered queues where the arrival process is controlled by shutting down and restarting the arrival stream. In the absence of holding costs for items in the queue, the optimal (s, S) policy can be characterised by relating the arrival control problem to a corresponding service control problem. With the inclusion of holding costs however, this characterisation is not valid and efficient numerical computation of the queue length probability distribution is necessary. We perform this computation by using a duality property which relates queue lengths in the controlled arrival system to a controlled service system. Numerical results which analyse the effect of setup and holding costs and the variability of the arrival process on the performance of the system are included.

Michael Manitz (2008) *Queueing-model based analysis of assembly lines with finite buffers and general service times*
In this paper, authors study the production process on multi-stage assembly lines. These production systems comprise simple processing as well as assembly stations. At the latter, workpieces from two or more input stations have to be merged to form a new one for further processing. As the flow of material is asynchronous with stochastic processing times at each station, queueing effects arise as long as buffers provide waiting room. We consider finite buffer capacities and generally distributed processing times. Processing is a service operation to customer items in the sense of a queueing system. The arrival stream of customer items is generated by processing parts at a predecessor station. This paper describes an approximation procedure for determining the throughput of such an assembly line. Exact solutions are not available in this case. For performance evaluation, a decomposition approach is used. The two-station subsystems are analyzed by G/G/1/N stopped-arrival queueing models. In this heuristic approach, the virtual arrival and service rates, and the squared coefficients of variation of these subsystems are determined. A system of decomposition equations which are solved iteratively is presented. Any solution to this system of equations indicates estimated values for the subsystems’ unknown parameters. The quality of the presented approximation procedure is tested against the results of various simulation experiments.


The focus in this work is to jointly optimise the maintenance of a capacity-constrained resource, its feed machine/operation and inlet buffersize. The maintenance of the capacity-constrained resource is condition-based, whilst that of the inlet machine/operation is time-based. The joint optimisation is achieved by the development of a mixed integer linear programming model. A machining example is used to illustrate the application of the model.


In this paper the study of multi-server tandem queues with finite buffers and blocking after service is carried out. The service times are generally distributed. Author develop an efficient approximation method to determine performance characteristics such as the throughput and
mean sojourn times. The method is based on decomposition into two-station subsystems, the parameters of which are determined by iteration. For the analysis of the subsystems we developed a spectral expansion method. Comparison with simulation shows that the approximation method produces accurate results. So it is useful for the design and analysis of production lines.