A Study of Material Handling System Through Discrete Event Simulation

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Abstract- *The present study focuses on the analysis of material handling system with the help of discrete event simulation. The simple factory layout of packing system is considered and modeled with the queuing system based on time and the size delay function.it is found that the total system once modeled can helps in the improve modify or study the process in detail and helps to understand the system very effetely*

Keywords- Discrete event simulation, queuing system, size delay function

I. INTRODUCTION

Material handling is one of the important phase of industrial management. It deals with the transportation of work material or raw materials from one station to another station i.e. either the machining center or the warehouse. The role of material handling station is independent of the type of manufacturing i.e. manual or the automatic or semi-automatic the role of material handling is to temporary storage of semi-finished products. Ability to holed large and small payloads etc. the typical utilization of material handling systems is present in Aerospace, Automotive, food, Manufacturing, Retail, Construction, Hardware, Warehousing etc. the application of material handling can help the industry administrators for the forecasting of the future demands, resources allocation and production planning and inventory control and planning and customer delivery and after sale servicing. The equipment used in the material handling are cranes and hoists, AGV's (Automated Guided Vehicles) RGV (Rail Guided Vehicles) Fork lifts, Trucks, Conveyors etc.

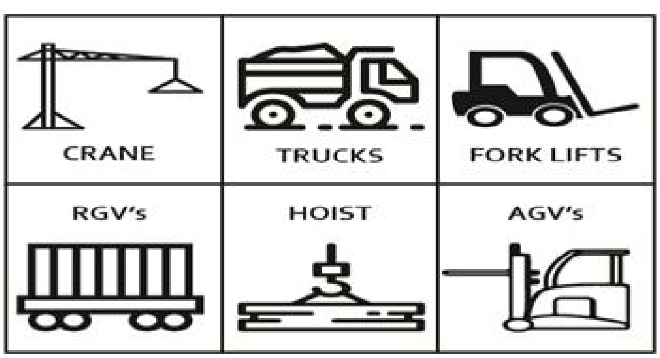

Figure 1 Basic material handling equipment used in the industry

there are of 10 principles in the usage and design and operational of material handling systems like Planning, standardization, work, ergonomics, unit loads, space utilization, systems, environment, Automation and life cycles. But much of the focus is laid in the present study is Automation and the planning.

When it comes to the planning which is the prominent step in the industry it helps in the defining the needs and the objectives and functional causes of the systems and supporting technologies, the planning is done by the consultants and the developers in the team association with the plant management and engineering and finance and operation departments. In order to improve the operational efficiency, the material handling it should be deployed with sturdy consistency and predictability.

II. LITERATURE REVIEW

The method of selection of the material handling systems by considering the cost and design with the heuristic approach has been made by(Taylor, Webster, & Jr, 2007)[1]. A primary stochastic model has been applied for the design and control of material handling has been discussed by(Johnson & Brandeau, 1996)[2]. Multiple material handling systems are reviewed and the further research are identified by the. the design and scheduling problems and control of the material handling have been addressed by the(STECKE, 1985)[3]. A simulation study of the automated guided vehicles with the multiple load carrying when applied to the flexible manufacturing systems have been discussed by the(Taylor & Ozden, 2007)[4]. A new approach by using SLAM (simulation language for alternative modelling) for the designing of material handling has been made by the(Taylor, Chang, Sullivanj, & Wilson, n.d.)[5]. A series of evaluation tests and a simulation studied by illustration of decentralization approach which is capable of delivering competitive feasible solutions in, practically was discussed by the(Babiceanu & Chen, 2009)[6].

III. METHODOLOGY

The main key of the study to make an attempt of solving the material handling station with the implementation of the discrete even simulation i.e. modeling the entire procedural steps exactly by using queues and the probability and statistic functions the simple model of 3 station material handling system is considered and the steps which as the intermediate process elements such as the machining centers inspection stations, packing, conveyor belts etc. are part of this study.

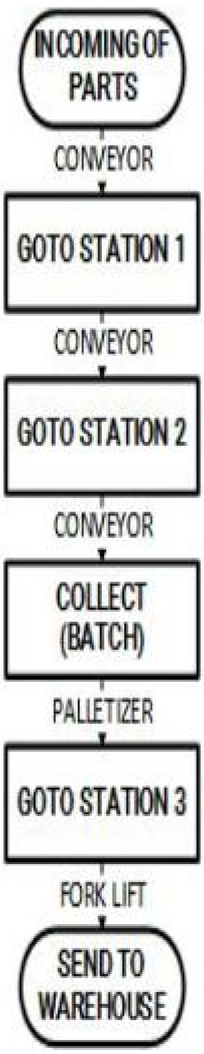

Figure 2 The workflow of the problem taken for the study

Here the parts are arrived and then passed to the machining station 1 by the conveyor and then passed through the next station consequently by the help of mean conveyor belt system and the after the third station they are made into batches and then palletized and then sent into the warehouse for the storing and transportation.

Table 1The queuing parameters and the time and source functions are given as follows.

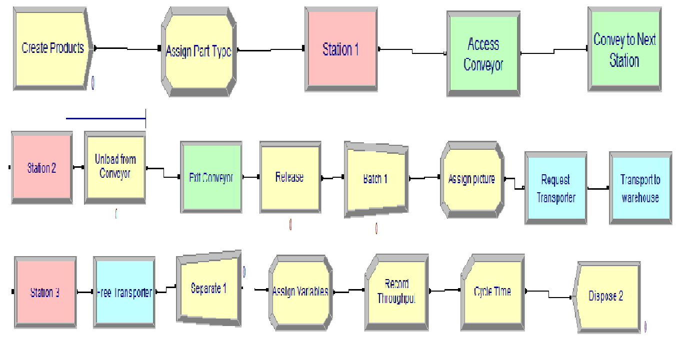

Figure 3 The individual module wise discrete event simulation model is given as below

Si.no	Module	Function
1	Raw material arrival rate	Random expo
2	Conveyor start	Constant
3	Unload from Conveyor	Triangular
4	Batch size	Constant (17)

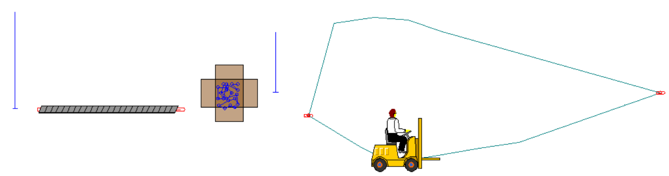

Figure 4 the Visual work flow diagram showing the conveyor and forklift and the warehouse point

The complete system is modelled in the ARENA software by the Rockwell and the method of verification s cross checked by the inbuilt model. The complete model is simulated for an 218 minutes and the statistics are observed

IV. RESULTS AND DISCUSSIONS

The various output statistics are observed that is like total time on the system and the system output performance and queuing waiting times are observed.

Table 1 the Queuing parameters of the system

Queue summary attribute	Waiting time (minutes)
Conveyor belt (loading)	0.00
Batching (palletizer)	22.72
Transportation delay	0.00
Unloading the belt	0.00

The total resource parameter for the material handling conveyors are of total number of seized resources are of 83 minutes and the total unutilized time is of 0.05 minutes and the bottlenecking is of 0.05 minutes.

The transfer variables of the material handling equipment are which the amount of the length and the maximum utilization time of the system.

The total length of the conveyor system planned is of 0.5m. and the time accumulated for the entire transversal is with the average time span of 0.05 minutes and the maximum delay of 0.01 minutes. The number of production batches is of 68 batches.

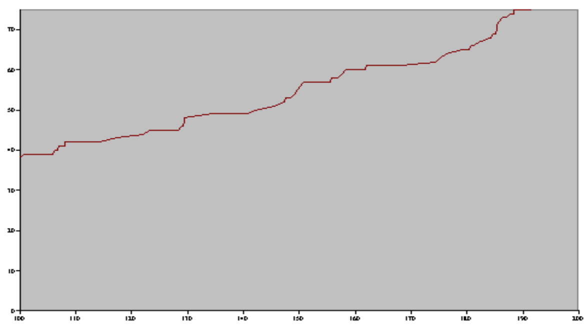

Figure 5 The output response of the raw material into the system

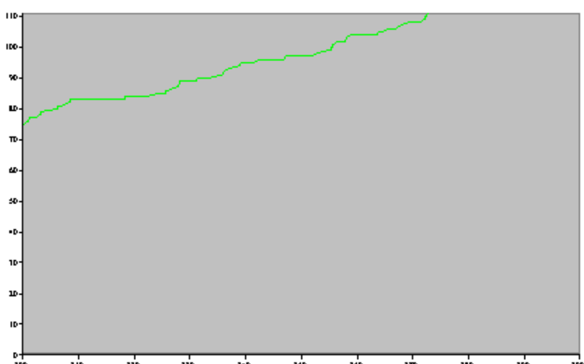

Figure 6 the material unloading response of the system

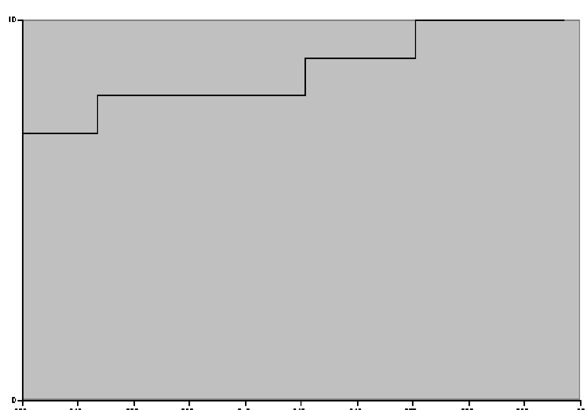

Figure 7 the batching of the products of size 17 response of the system

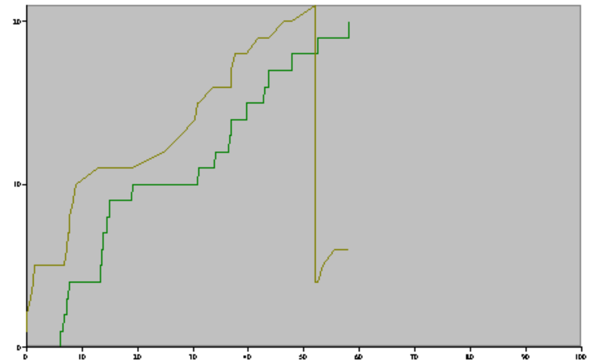

Figure 8 the batching and separation parameters of the system

V. CONCLUSION

It is found the above study that in by modelling the entire system in terms of the discrete event helped in understanding the entire system performances and by studying in detail will allows to quantify and approximate the in demand and forecast for manufacturing the required demanded parts and then planning of resources

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