KOLEJ UNIVERSITI TEKNIKAL KEBANGSAAN MALAYSIA

Optimizing Number of Servers in Surface Mounting Technology at Cubic Electronic Sdn Bhd to Increase Efficiency

Thesis submitted in accordance with the requirements of the Kolej Universiti Teknikal Kebangsaan Malaysia for Bachelor of Manufacturing Engineering (Honours) (Manufacturing Process)

By

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DECLARATION

I hereby, declare this thesis entitled "Optimizing Number of Servers in Surface Mounting Technology at Cubic Electronics Sdn Bhd to Increase Efficiency" is the results of my own research

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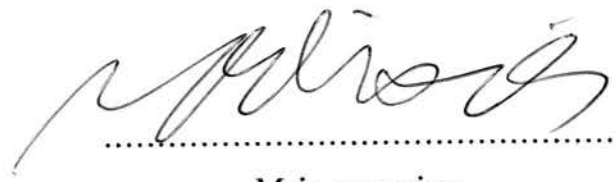

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JUDUL: OPTIMIZING NUMBER OF SERVERS IN SURFACE MOUNTING TECHNOLOGY AT CUBIC ELECTRONICS SDN BHD TO INCREASE EFFICIENCY

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DEDICATION

For my family; Mr. Kamaruddin, Mrs. Rokiah,
Nor Nizaha, Nur Syazana, M.Firdaus
and Nur Fatin Syamimi

ABSTRACT

Nowadays industry is facing with problems in maintaining the quality and increase efficiency. To improve efficiency, industry needs to do continuous improvement over long period. One of manufacturing problem is how to eliminate queue in suing any resources. This project is an attempt to improve efficiency in manufacturing industry by using simulation model. Specifically this project is in Surface Mounting Technology (SMT) Line 12 at Cubic Electronics Sdn. Bhd. Computer simulation is considered as a method for studying the behavior of business systems under a variety of assumed conditions for analyzing the simultaneous interaction of many variables to produce valuable insights into problems. Several scenarios of production line were simulated to find the best solution in order to reduce waiting time in queue, processing time and finish product time.

ABSTRAK

Dewasa ini industri berdepan dengan masalah untuk mengekalkan kualiti dan meningkatkan efisien di dalam servis yang diberikan atau produk yg dihasilkan. Bagi meningkatkan kecekapan, industri memerlukan pembaikan bagi tempoh masa yang panjang. Salah satu dari masalah di dalam sektor pembuatan ialah bagaimana untuk memusnahkan barisan @ "queue". Projek ini adalah percubaan bagi meningkatkan efisien di industri pembuatan menggunakan model simulasi. Khususnya projek ini dilaksanakan di Surface Mounting Technology (SMT) Line 12 di Cubic Electronics Sdn. Bhd. Simulasi komputer diambil kira sebagai kaedah bagi menganalisa kelakuan sistem perniagaan di bawah pelbagai keadaan bagi menganalisa tindak balas serentak bagi pelbagai pembolehubah untuk menghasilkan tanggapan yang berguna di dalam masalah yang terlibat. Beberapa senario bagi kawasan produktif telah dilaksanakan bagi mencapai kaedah yg terbaik untuk mengurangkan masa menunggu di dalam barisan, masa penghasilan produk dan masa menyiapkan produk.

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LIST OF SIGN AND SYMBOLS

Item	Description
FIFO	first-in-first-out
LIFO	last-in-first-out
FCFS	first-come-first-served
λ	Customer arrival rate
μ	Service rate per server
L_q	The average number of customers waiting for service
L_s	The average number of customer in the system (waiting and / or being served)
r	The average number of customers being served
ρ	The system utilization
W_q	The average time customers wait in line
$1 / \mu$	Service time
W_s	The average time customers spend in the system (waiting line and service time
P_o	The probability of zero units in the system
P_n	The probability of n units in the system
M	The number of servers (channel)
L_{max}	The maximum expected number waiting in line
x'	Mean
s^2	Variance
α	shape parameter
β	scale parameter
μ	mean
σ^2	Variance
k	Variable

Item	Description
k	Variable
$x_1, x_2, \ldots, x_k$	Sample
SIMAN	SIMulation Analysis
pdf	probability density function
a	Arrivals distribution
b	Departures (service time) distribution
c	Number of parallel servers (= 1, 2, ….., ∞)
d	Queue discipline
E	Maximum number (finite or infinite) allowed in the system (in queue plus in-service)
f	Size of the calling source (finite or infinite)
M	Markovian (or Poisson) arrivals or departures distribution (or equivalently exponential interarrival or service time distribution)
D	Constant (deterministic) time
Ek	Erlang or gamma distribution of time (or equivalently the sum of independent exponential distributions)
GI	General distribution of interarrival time
G	General distribution of service time
FCFS	First come, first served
LCFS	Last come, first served
SIRO	Service in random order
GD	General discipline (i.e., any type of discipline)
p_n	probability of n in the system
Ls	Expected number of customers in system
Lq	Expected number of customers in queue
Ws	Expected waiting time in system
$\hat{c}$	Expected number of busy servers
λ_{eff}	Effective arrival rate at the system

CHAPTER ONE

INTRODUCTION

CHAPTER 1.0
INTRODUCTION

1.1 Background

Now days manufacturing becomes one of the important industries, especially in developed countries such as Japan, United State, China and Malaysia. Towards the developing of great environment, technology is greater catalysis of a new revolution of human thinking. With technology, a lot of things become more easily to operate. Machine is one of the human revolutionary to increase labor's role and to facilitate difficult machining process. In order to increase productivity and efficiency together with decrease cost, company facing problem to optimized the number of machine. This problem is related to our real life problems such as mail queue problem on computer, patient facing delays, golfing queues and scheduling, and queuing for toilets. According to problems mentioned, research had been done on analyzing the waiting line process in internet queueing systems with the transform approximation method by Dr. Martin J. Fisher. By referring to this problem, it can be contribute with the machine problem.

By considering to the manufacturing system, queueing line exists in it. As the product started to be produce, it involve with several changing processes. In the process of changing production line, the product is required to wait before being machined. This creates the queue or waiting line in the system. By referring to the queueing problem in real life situation, the application of queue scenario and queueing methodology can be apply in order to solve this problem.

1.1.1 Queueing System

Waiting for service is part of our daily life. In restaurant, queue exist while wating to be serve, people "queue up" at the checkout counters in grocery stores, and even at post office, people "line up" waiting for service in post offices. And the waiting phenomenon is not an experience limited to human being only: Jobs wait to be processed on a machine, planes circle in stack before given permission to land at an airport, and cars stop at traffic lights. Unfortunately waiting line cannot be eliminating without incurring inordinate expenses. In fact, in order to achieve it is by reduce its adverse impact to tolerable levels.

The study of queues deals with qualifying the phenomenon of waiting in lines using representative measures of performance, such as average queue length, average waiting time in queue, and average facility utilization. The results of queueing analysis can be used in the context of a cost optimization model, where the sum of the costs of offering the service and of waiting is minimized.

1.1.2 Elements of a Queueing Model

The principal actors in a queueing situation are the customer and the server. Customers are generated from a source. On arrival at the facility, they can start service immediately or wait in a queue if the facility is busy. When a facility completes a service, it automatically "pulls" a waiting customer, if any, from the queue. If the queue is empty, the facility becomes idle until a new customer arrives.

From the standpoint of analyzing queues, the arrival process is represented by the inter-arrival time between successive customers, and the service is described by the service time per customer. Generally, the inter-arrival and service times can be probabilistic as in the operation of a post office or deterministic as in the arrival of applicants for a job interviews.

Queue size plays a role in the analysis of queues, and it may have a finite size as in the buffer area between two successive machines, or it may be infinite as in mail-order