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Simulation of Scheduling Technique in a Food Processing Industry

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Abstract – *Scheduling is one other method in productivity improvement. Scheduling occurs at the operation level of production planning and control system. Scheduling is important because it can optimize resource allocation and minimize waste. Simulation analysis can be used to evaluate the scheduling technique in order to determine the best alternatives. A case study company, Olilys Sdn. Bhd. Did are facing with the unsystematic scheduling methods for the job orders received from customers. The problem became worst during peak period (high demand) where the company unable to fulfil the customer orders. The objective of this project is to study the existing scheduling technique and find related problem, and propose an improvement in production scheduling system. In this project, there are five scheduling techniques proposed, which are First Come First Serve (FCFS), Shortest Processing Time (SPT), Longest Processing Time (LPT), Priority Rules by product sequences: By Part1 and By Part 2, and Earliest Due Date (EDD). The simulation modelling and experimentation being done by using WITNESS simulation software. Through the experimentation analysis, the best scheduling technique was selected and suggested to the company.*

Keywords: Scheduling, Food Processing Industry, Simulation, WITNESS

1.0 INTRODUCTION

Nowadays, many industrial companies have to face the strong global competition industries. All these challenges come from many ways and aspects. These aspects consists of the customers demand, suppliers, facility location and competitors in a global term perspective.

In order to keep surviving in this industrial global world term, these companies must handle some factors of method and technique. The factors are man, material, machine and methods. One of the useful industrial engineering method is production planning and control and scheduling is one of them. Scheduling method is selected be used for this project. For this project also, simulation will be used as basis for the analysis and design of manufacturing systems.

This project was conducted at Olily's Sdn. Bhd, Senai, Johor. This company is a manufacturing company that produces many kinds of frozen foods product and this report is mainly about how the simulation is able in solving problem related to scheduling matter.

The objectives of this study are to analyze the problems of the existing process scheduling method of the company using time study approach and to propose an improvement strategy on the current scheduling techniques used in the production line.

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2.0 METHODOLOGY

This study is using two approaches for the data collection which are qualitative and qualitative. For qualitative approach; site visit and observation are made for an overview for the current situation. Some interview and discussion are also made with the managers and workers for more details info about the operation. For quantitative approach; stopwatch time study is recorded for the data of the machine cycle time and setup time. The collected data is then been analyzed. Based on the analysis, some solutions are proposed to solve the problem arise. This project will focus on production improvement on the products which are Curry-puff, GetukUbi, GendangKasturi and Doughnut, and changes of the products result will lead to the company overall performance.

After all the data of the company is obtained, the conceptual model of the production line need to be designed before the simulation done. The conceptual model consists of input of the production line, machine used in the manufacturing process and output of the production line.Input represents the incoming raw material for four different products produced in the production line which are Curry-puff, GendangKasturi, GetokUbi and Doughnut. The machines used are the stages of the process to come out the output. And the output represents the four different finished products to send to storage before delivery.

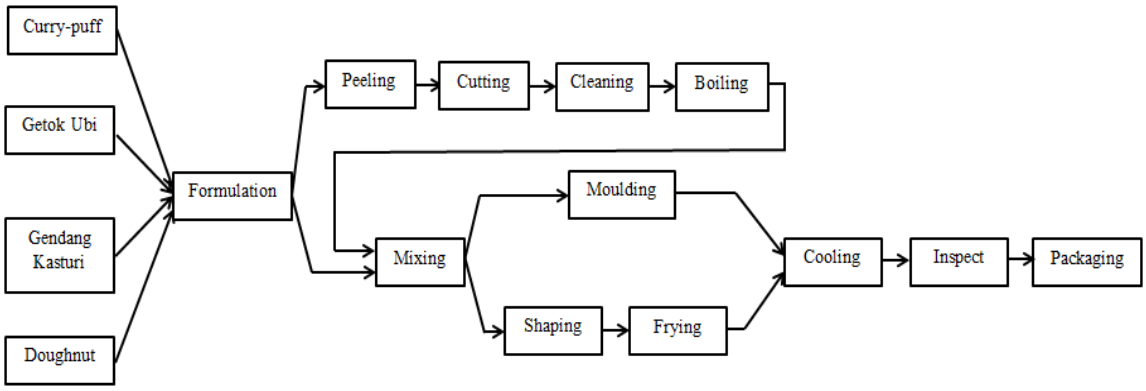

Figure 1: Conceptual model.

Simulation is modeled for the existing scheduling technique in order to get the real view of the scheduling system of the company. The simulation model had been established to evaluate and analyze the five scheduling techniques, namely Shortest Process Time (SPT), First Come First Serve (FCFS), Priority Rules by products: By Part 1 and By Part 2, and Earliest Due Date (EDD). All the result of each scheduling technique will be compared with the existing in order to achieve the objective of the project.

This project will attempt to improve the production rate by using the best scheduling technique to increase the output of the product, reduce work in progress (WIP) in term of quantity and minimize the non-productivity activities.

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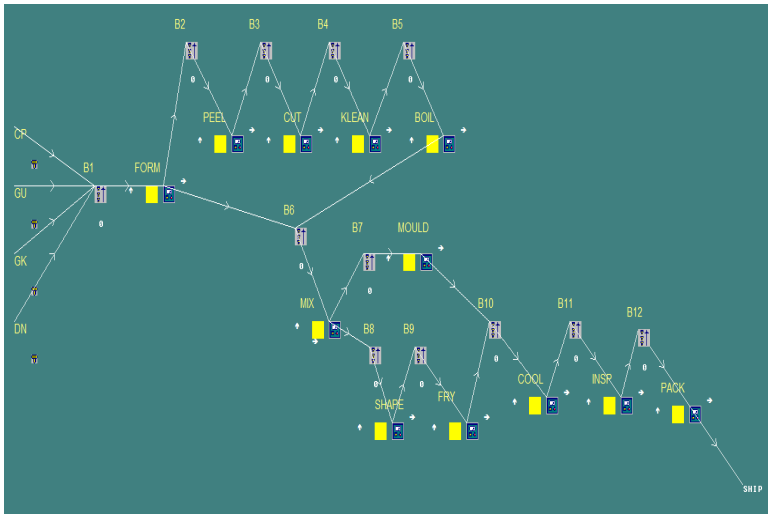

Figure 2: Simulation model.

3.0 RESULTS AND DISCUSSION

There are five scheduling dispatch principles chose in this study, which are First Come First Serves, Shortest Processing Time, Earliest Due Date, processing by priority sequence : By Part 1 and By Part 2. The comparison between proposed methods is carried out on Total Output, WIP and the Idle time for each one chose techniques. Total output is refers to average output for every week for each one dispatch principles. WIP is refers to the unfinished products at the each working station. The idle time of the mixing machine is chosen as it is the main process and the processing rate of the machine is the slowest among machines.

Table 1: The summarized result for each scheduling technique.

Dispatch Rules	Output (unit)	Different Output (unit)	Percentage Improvement (%)	WIP (unit)	Idle Time (%)	Setup Time (%)	Non Productivity Time (%)
FCFS	26,886.1	286.13	1.076	113.87	24.34	23.49	47.83
SPT	26,935.4	335.4	1.261	64.6	23.52	23.20	46.72
LPT	26,878.8	278	1.048	121.2	25.83	22.01	47.84
By Part 1	26,880.8	280.8	1.056	119.2	24.62	23.22	47.84
By Part 2	26,973.5	373.53	1.404	26.47	20.63	24.71	45.34
EDD	26,833.6	233.6	0.878	166.4	25.43	22.43	47.86

From the experimentation done, it is obviously seen that By Part 2 is the best scheduling alternative among the dispatch rules chosen. It has the highest amount of average total output for the study period and the lowest amount of WIP in the production line. By utilizing scheduling alternative By Part 2, the average total output able to increase up to 1.41% which brings the different total output of 1496 units. In term of work in progress (WIP) in the production line, this alternative also brings the lowest amount among the other dispatching rules. By having lower WIP, fewer stocks are queue to be processed and make the production flow smoother. Hence, the production line will be more clean and tidy.

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Besides that, the alternatives By Part 2 also having the lowest rate of idle time with only 20.63%. Even it has the highest setup time among the other alternatives scheduling methods proposed; still, By Part 2 has the least rate of non-productivity time with the total of 45.34%. For this experiment, the rate of improvement may not be high, but still it gives an increment to the revenue of the company with an increasing of RM598.40 which is good for the small manufacturing industry like Oilys Sdn. Bhd.

The organization or company is proposed to offer priority to approaching materials rely on upon the delivery request of every processing of product. By utilizing the By Part 2 dispatching rule proposed in the project, it may be able to achieve:

1. Improve 1.41% of total output units of product.
2. Reduction of work-in-progress (WIP) in term of quantity.
3. Minimize the idle time of the mixing machine in the production line.
4. Minimize the non-productivity activities. Hence,
5. Maximize the machine utilization.

With the proposed scheduling systems, the company can improve its ability. However, there are still a few angles in the event of the poor scheduling arranging system in the organization. Thus, a planning team need to be framed which consists of production planner or engineer and production supervisor. The production supervisor gives the data to the engineer, so that the engineer can arrange more suitable scheduled for production department. By structuring a group, a superior comprehension might be acquired and fewer misunderstand and issues will happen throughout the production planning.

4.0 CONCLUSSION

This project with the title 'Simulation of Scheduling Technique in a Food-Processing Industry' has been successfully carried out and has achieved its objectives. A simulation model is built to simulate the production process and experimentations had been done to determine the best alternative to improve the production performance.

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