

## Time Study Analysis of Food Services Using Man Machine Chart

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**Abstract:** In all human activity, both daily and production activities would require method, time and place. In order to achieve the best result will require the best method, the best place and the best work time. Work chart is a tool that can help to identify problems and provide solutions through describe the work activities in a systematic and clear steps such as transportation, operation, inspection and assembly to be a finished product. The best method, the best place and the best work time were also required in snacks food business called crepes. Initial observations on crepes stalls shows that it is still happening customer queue and the idle time percentage quite large. Further investigations conducted using a video camera, and then describe the activities of the food servants and crepes making machines. Based on the time required starting from customer order till receive the order, the effective time for customers, servants and crepes making machines respectively is 17,6%, , 94,4%, 58,4% and 54,4%

**Key Words:** *observation, mans machine chart, time*

### 1. INTRODUCTION

In all human activity, both daily activities and production activities would require a method, time and place. In order to achieve the best result will require the best method, the best place, and the best time. (Sukania, 2012). Analysis of time required to determine the length of time completing work tasks to be determined is the best time. Analysis of time is also to determine the allowance time required by the workers fairly. Usually the time study is also combined with the study of movement (motions) of workers in doing a job because it helps find the efficient and effective movement. Time and motion studies can be conducted directly observe workers or by recording into a video camera and then analyze it by turning in a slow motion. Other factors to be considered are the working conditions which include workstations and working environments. These factors are very influential because the time completing the job become longer if the workplace is inadequate and the work environment does not support.

Development of the business world in the era of globalization demands a perfect performance of each stage of the process. Create value and customer satisfaction is the expectations of all service providers. Promising means to market products appropriate value so as to retain customers and create customer satisfaction at a certain level. As with any commercial food service industry started from the need for food due to the higher mobility of society so that it appears the notion that eating out is more practical than cooking at home. Further to an entrepreneurial this was taken as a golden opportunity. This is evidenced by the snack food industry operating in the mall and at various strategic places more intense. Therefore, the values must be met among others the food service provider service speed, price, taste, cozy

room, etc. The faster the food can be served increasing customer satisfaction. Service providers are required to prepare for labor and equipment efficiently and effectively thereby saving time and energy costs.

Therefore, the authors try to make observations and data collection at a snack shop in a mall in West Jakarta. The data movement, transaction, the waiters and customers doing were recorded using a video camera. All activities along with the time needed by workers and consumers are described from a videotape played at a slow pace. By describing all these activities into the machine process chart can be obtained relationships between workers, consumers and machinery, working time, idle time and can then be used for improvement of working methods.

## **2. BASIC THEORY**

### **2.1 Process Chart**

Process chart is a tool that describes the work activities in a systematic and clearly. Through these charts we can see all the steps or events experienced by a body of work from the start into the factory (in the form of raw materials), then describes all the steps that happened, such as transport, machinery operation, inspection and assembly, until it becomes a product so, either full product or as part of a complete product. A thorough understanding of our work will facilitate improving the working methods of the production process. Basically all the improvements are intended to reduce overall production costs, thus this chart is a good tool to analyze a job making it easier for job improvement plan.

The charts are divided into two major groups based on their activities, the first process charts used to analyze the activities of the whole work. (Sutalaksana, 2006). Which includes a chart of the whole work is: Operations Process Chart (OPC), Flow Process Chart (FPC), Group Process Chart (GPC), Flow Diagram (FD) and Assembly Chart (AC). While that includes a chart of local employment is: Man Machine Chart, Left and Right Hand Chart.

Both are process charts used to analyze the activities of local labor. Chart of the whole work involves most or all of the systems work necessary to make the product concerned. While our local work describes the activities of local employment, if it involves only one work alone systems that usually involve people and facilities in limited quantities.

Both of process chart will look closely interrelated if a product is required to complete several work stations, which are interconnected with each other, such an assembly company has several production machines or work stations. In this case the smoothness of the whole production process will greatly depend on the smoothness of each work station. So, to improve the overall process should first fix or enhance any existing system work in such a way as to obtain the best working order.

### **2.2 Man Machine Chart**

Man Machine Chart graphically represents the relationship between the cycle time of the operator (worker) and the operating cycle of the machine or other work facilities are handled by the worker. The workers and machines will describe the coordination or relationship between working time and idle cycles of the combination of the operator/worker and machine.

Thus this chart would be a good analytical tool to reduce idle time. The most important information gained from our work and this machine is a clear relationship between the operator and the working cycle machine operation.

### **2.3 Left Right Hand Chart**

Left right hand chart is tool of motion study to determine the movements performed by the left and right hand in doing the job that usually is the assembly process. This chart illustrates all the motions at work and idle time by the left and right hand, also shows a comparison between the tasks assigned to the left-hand and right hand. This chart illustrates the operation is complete. This chart is very practical to repair a manual work like when each cycle of workers occurs quickly repeated. This chart is very good for analyzing a work system so as to obtain improved layout tools, a good worker movement pattern, and the sequence of good jobs. By using this chart can be seen clearly that the movement patterns and inefficient movements unnecessary.

Usefulness of the left-right hand chart are:

- Balance the motions both hands and reduces fatigue.
- Eliminate or reduce the movement of inefficient and unproductive, so it will shorten working time.
- As a tool to analyze the layout of the work system.
- As a tool to train new workers, with an ideal way of working.

### **2.4 Principles of Economics Motion**

The principles used to develop the most economical of motion in terms of two aspects, namely the use of limbs and the workplace. Based on the use of a limb that works as follows:

- As far as possible to the two hands will start and finish a job in the same time.
- As far as possible to the two hands are not idle at the same time except at the break.
- The motion of the hand should be balanced and in unison.
- Motion of the hand and body movement as possible is a matching, so that it not causes interference with the health of its employees.
- Balance of speed and accuracy are always maintained so that it will move according to the distance on the order of the employee's body,
- Preferred make smooth and consistent motion continuously to make it easier for employees learn.
- Motion for movement of goods carried out quickly and easily as possible.
- Implementation of the work as far as possible arranged in the form of normal motions, symmetrical and do not intersect.
- Accommodations may be arranged as far as the eyes caused no "tired".

While the motion to create a workplace in terms of economical use of the principles:

- All equipment used and the materials required are placed in permanent employees around the place.
- Equipment and materials placed on supervision site that is easily accessible by employees who use it.
- Movement of materials; from warehouse to the employees as possible to use the law of gravity, thus saving energy.

- The use of "drop deliveries" (entry of goods by way of imposition/place the goods under the employee) may be used wherever.
- Materials and equipment placed on good location so that employees can take a good order.
- Lighting should be appropriate regarding the employee objects to make adequate lighting. As far as possible the direction of light is not blinding people, and also not obscures the vision of employees.
- The high places of work and seating made harmoniously as possible so that it facilitates employee at any time to stand and sit back.
- The size of the low seat height is sought to be used by all employees, so that turnover does not require a change of equipment.

## 2.5 Time Study

This time study is a series of research activities of the research methods or motion, because the time study was conducted after it determines the efficiency of motion by using motion analysis without specifying the efficient motion first. Research at that time cannot be used as a standard determination of the exact time that can be used in conducting surveillance of the workers in its work. Research time is work measurement techniques to record the length of time and comparison of the work of a particular element of work performed under certain circumstances. The research time can produce the standard time of each type of product produced by the workers. The results of the analysis will help the leaders and workers in determining the time-efficient in completing a job. Commonly used tool is a questionnaire, or stopwatch and camera video.

## 3. OBSERVATION METHODS

Observations conducted to determine the relationship between work and worker, the machine (working tools) and the buyer. Especially in these circumstances observations selected is when a buyer ordered to get the service and to accept the food that was ordered. Another situation that may occur is some consumers order the food and at the same time the waiters finished the previous orders. Further data collection is done by recording into a video camera. Through the video playback in slow motion can be analyzed every elements and the movements occurred. Some movement combinations that took place very quickly identified as one motion. Data is collected by Julita, Oktaviangel on the 11th of November 2012 at a Mall in West Jakarta.



Figure 1 The food stand in a mall

#### 4. DATA AND ANALYSIS

Here is presented the Man Machine Chart. The chart is described from the slow motion of video playback and the time expressed in seconds. All of the waiters, machine, and the buyer activity are presented in this chart. Data presented in table 1.

Table 1 Man machine chart

<b>MAN MACHINE CHART</b>										
<b>ACTIVITY: PURCHASE OF CREPE IN CREPE STAND</b>										
<b>MACHINE NAME: CREPE MACHINE</b>										
<b>CHART MAKER: JULITA &amp; OKTAVIANGEL</b>										
<b>DATE MAKING: November 11<sup>th</sup> 2011</b>										
	Man						Machine			
	Buyer	T	First waiter	T	Second waiter	T	Crepe Machine	T		
04	Mentioned the ordered crepe	4	Listened to the order from the buyer.	4	Idle	4	Idle	4		
07	Listened to the price of the order and prepared a cash payment	3	Input the orders into the computer cash register and mentioned the price orders	3	Idle	3	Idle	3		
09	Gave the money payment	2	Received the money payment	2	Idle	2	Idle	2		
29	Idle	20	Printed the bill and took the refund from the cash register.	20	Idle	20	Idle	20		
34	Received the refund	5	Gave the refund to the buyer.	5	Started the crepe machine	5	machine was on	5		
37	Idle	3	Mentioned the order to second waiter.	3	Listened to the order from first waiter	3	machine was on	3		
44	Idle	7	Idle	7	Made the outer layer of crepe	7	Made the outer layer of crepe	7		
57	Idle	13	Prepared the crepe box.	13	Filled meat, sausage, and mayonnaise on the outer layer.	13	Heated the crepe	13		
66	Idle	9	Prepared the plastic for packing crepe.	9	Took some cheese and gloves.	9	Heated the crepe	9		
100	Idle	34	Folded the other crepe box.	34	Filled the lettuce in crepe, folded and formed the crepe.	34	Heated the crepe	34		
102	Idle	2	Received the crepe	2	Gave the crepe to the first waiter	2	Idle	2		
117	Idle	15	Packing the crepe	15	Idle	15	Idle	15		
125	Received the ordered crepe	8	Gave the crepe to the buyer.	8	Idle	8	Idle	8		
T = time in second										
	<b>Buyer</b>	<b>First waiter</b>	<b>First waiter</b>	<b>Machine</b>						
<b>Idle time</b>	103 second	7 second	52 second	57 second						
<b>Working time</b>	22	118	73	68						
<b>Total cycle time</b>	125	125	125	125						
<b>Utilization in percent</b>	17,6%	94,4%	58,4%	54,4%						

Table 1 shows the buyer activity starts from ordering the crepe, listening to the price of the order, prepare the cash payment, made payment, receive a refund and then waiting for the food received. Based on buyers time, waiting is the most dominant activity, whereas the effective time of only 17.6%. This must be addressed with a variety of matters, such as by accelerating the process of making food and providing a comfortable waiting room.

From the waiters side of view, it can be seen the less balanced of the tasks between the servants, where the effective time of the first servant to serve the customer only 94.4% while the second servant who served to make food only 54.8%. This data is known at the time there was only one buyer who served. The above figures may be change the balanced direction if the waiter serves multiple orders.

From the tools side of view, it can be seen that the effective time in using the tools only 58.4%. Possibilities when serving more than 1 orders the use of tools will be more optimal. Based on observations known that one of the weakness of production of this food is the layout of the material not optimal yet. For example the location of lettuce and cheese placed behind the crepe machine. Lettuce and cheese should be placed beside the crepe machine. Gloves should be placed near the engine so that the servants do not have to move just to take the gloves because gloves frequently used tools.

## 5. CONCLUSION

Present the data using a video camera is very helpful in describes the elements of the tasks and time for servants, buyers and tools. The process of food service on this observation requires a total time of 125 seconds. Effective time for buyers 17.6%, 94.4% for the first servant, for the second servant 58.4% and 54.4% for the tools. Furthermore, the data can be used to improve the working methods, balancing of the servants tasks and improving waiting room facilities.

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