DEVELOPING MANPOWER ARRANGEMENT USING WORK MEASUREMENT IN FT AND LH PACKING + WEIGHING LINE

Tze Keong Woo[1] and Ilamaaran Murugan[2]

[1,2] Politeknik Ungku Omar, Malaysia
kenz78@gmail.com, 01bms17f3027@student.puo.edu.my

Abstract: This project is to study the work measurement and manpower arrangement of Company AD. Company AD is a food processing industry, where the main business is poultry processing. In this study, it has been identified Company AD's one of the departments (EVI) is facing poor manpower arrangement, delay in production and absenteeism due to tiredness from previous day overtime working hours. To overcome this issue, it is necessary to measure the manpower productivity using work measurement and arrange the manpower accordingly. Stopwatch used to measure the workers' performance in this project, where the workers' productivity will be taken 2 times per day for 3 weeks. The data that been collected will be analyse and 2 workers will be chosen for each work so the desired outputs of the study are work measurement and manpower arrangement. This change in manpower arrangement reduce the overtime working hours.

***Keywords**: work measurement, manpower arrangement*

1. Introduction

Work measurement is all about the measurement of time and also output of an activity. Work measurement allows doing changes and manpower arrangement as well. Work measurement can be classified into 2 types. One is according to standardization and another one is according to past records and performance. In this study, past records and performance will be use. Other than that, as work measurement involved with the measurement of time it is also referred to as 'Time Study' and also 'Productivity Test'. Measuring time and output is very important to do any effective work plan (manpower arrangement schedule). To find out the suitable productivity time for a product, time examine is carried out.

1.1 Problem Statement

There is problem in Evisceration department regarding manpower arrangement. Due to poor manpower arrangement, it is unable to achieve the targeted productivity level. Daily production ends up later than targeted time when the production work actually can be completed within targeted time frame. Next, the management also intended to minimize the overtime works as most of the workers tend to be absent due to excessive tiredness (sick) and presenteeism from previous day of overtime work so they prohibit workers from doing overtime unnecessarily. Unnecessary work time or overtime work happened due to poor manpower arrangement and it affects the production process for the following day.

This project is focuses on:

i. Work measurement to get the productivity data; and
ii. Manpower arrangement to solve the productivity problem.

1.2. Project Objective

The objectives of this project are:

i. To get productivity data to compare the performance of workers.
ii. To analyze the productivity data using work measurement to identify and place workers according to their performance.
iii. To reduce the overtime working hours of worker with the use of effective work measurement and manpower arrangement.

1.3. Scope

The scope of work in this project is:

i. Focuses on two activities, FT Packing + Weighing and LH Packing + Weighing to get the productivity data using work measurement.
ii. Focuses on productivity data to develop manpower arrangement .

2. Literature Review

2.1. Work Measurement

Work measurement is about determining the time taken to complete a job by a worker. Mostly this work measurement is conducted to identify the productivity level or capability of a worker in completing the job in a specific time frame. This is a beneficial study method used by a lot of management to determine the performance and productivity of an individual worker. The basis for conducting work measurement is (Kjell, 2003):

i. To accomplish planning; or
ii. To determine performance; and
iii. To establish costs.

2.2. Stopwatch study

After the way of work is find out, the time study should be taken. The time measurement should be done to know the time taken to do the job. Many companies have their way of time study. There is equipment to use in measuring the time of a job. One of them is the stopwatch (Jain et al., 2016).

Below is the procedure for doing a stopwatch study:

i. Work procedure should be found out.
ii. The time required to do the job should find out.
iii. Work should be recorded using time machines (stopwatch).
iv. Time should be recorded by the supervisor or person in charge.
v. Recorded data later should be used for analysis.

2.3. Manpower arrangement

Manpower arrangement (planning) is planning a right capable worker and the right amount of worker to use at the right place and right time by line leader or supervisor. No conscious in both private and government sector towards this manpower planning to their own benefits. Manpower planning should be taken into consideration. Poor manpower planning always leads to a bad process flow. Manpower planning is highly needed in the achievement of an organization (Kareem, 2012).

2.4. Manpower planning

Planning is known as what should be done or implemented for a better future time frame and to achieve the goals that have been set", told Unugbro. Planning is an advanced step that determines whom and when should be a job done. Manpower should be skillful to better growth. This manpower planning is done due to avoid any manpower shortage that results in the poor output. Planning also needed much because it results in better use of human resources (Igbokwe-ibeto, 2015).

2.5. Absenteeism and Over time theory

Based on Thompson's view, absenteeism is happened due to the extended hours of work. Workers tend to be absent in order to relieve the fatigue caused by the extended hours of work. The rate of absenteeism is known with any certainty, the management has to plan their manpower accordingly and avoid the extended hours of working. Firms might be hiring standby workers to tackle absenteeism, yet absentee rates are so dynamic in nature and it is hard for companies always to have enough number of replacements available at all the time. Thompson also found that extended hours of works must be done by the existing employees in order to meet the production schedule (Kimmo et al., 2012).

2.6. Effective Manpower Management

Worker's requirement can be measured using work measurement for production and it can change as required for worker efficiency. If there is no work measurement, then the worker's planning will be done using the existing plan level. The manpower planning should be done by the engineer and manager as well. They are responsible to choose the workers responsibly using work measurement. This manpower management has focused on many types of research. An effective manpower management results when changes occur according to requirements (Simon, 2014).

3. Methodology

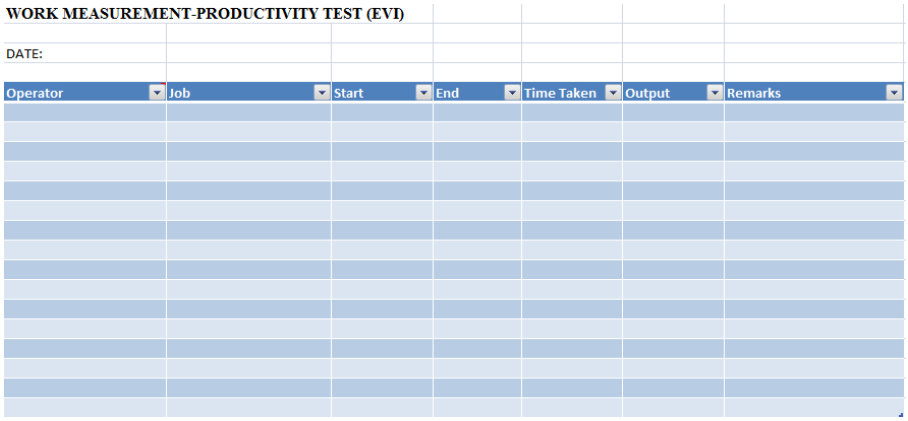
3.1 Stopwatch time study

Stopwatch time study is the work estimation to decide the benchmark for future improvement as shown in Figure 1. It is likewise used to dissect a particular procedure by qualified laborers with an end goal to locate the most productive routes as far as time. Besides, this technique gauges the time important for a work procedure to be finished utilizing the most ideal ways. The time was estimated utilizing snapback stopwatch hardware since it is simpler and quicker in information recording. Besides, this kind of stopwatch is appropriate for this exploration since it can create exact information. This permits the component times to be entered straightforwardly on the time study sheet without the requirement for subtractions.

Figure 1. Stopwatch used for collect productivity data

3.2. Data Collection Method

Data collection is the main part of this project before analyzing data. Each and every data contribute to this project is tabulated in Figure 2. In this project, the data called productivity data. This productivity data comes under work measurement. This productivity data collected 2 times per day. This data collection process took almost 4 weeks. 1 week of trial data and 3 weeks of exact data. Trial data were taken to confirm whether the data collection is done in which way and time. Data collection in this project did using the stopwatch. Before data collection a table was created to fill up it using productivity data. The table contains the worker's name, type of job, time is taken (min) and output (packs) column. The focus should be there when taking the reading of a worker. For this project the output of workers set to 20 packages. But, it differentiates in working time. So, the stopwatch shouldn't be a pause or stop meanwhile 20 packages were packed.


WORK MEASUREMENT-PRODUCTIVITY TEST (EVI)

DATE:

Operator	Job	Start	End	Time Taken	Output	Remarks

Figure 2. Work measurement template used.

3.3. Microsoft Excel

For doing data key in analyzation, I have chosen Microsoft Excel. Microsoft Excel is a worksheet invented by Microsoft for Windows, macOS, Android and iOS. In excel there is graphing tool, tables and calculations. Microsoft Excel developed in 1993 and use widely by people around the world. In this project, I've chosen Microsoft Excel to create graph for the data collected. In this project, I've create a table in Microsoft Excel. Then, the collected work measurement (productivity) data were key in the table. Later, the data were used to create bar and line (combined graph) graph to show the data analyzation.

3.4. Data Analyze (Bar and Line Graph)

Bar and line graph used in this project to differentiate the workers performance, so that an effective manpower arrangement can be developed. There are steps followed to create bar graph.

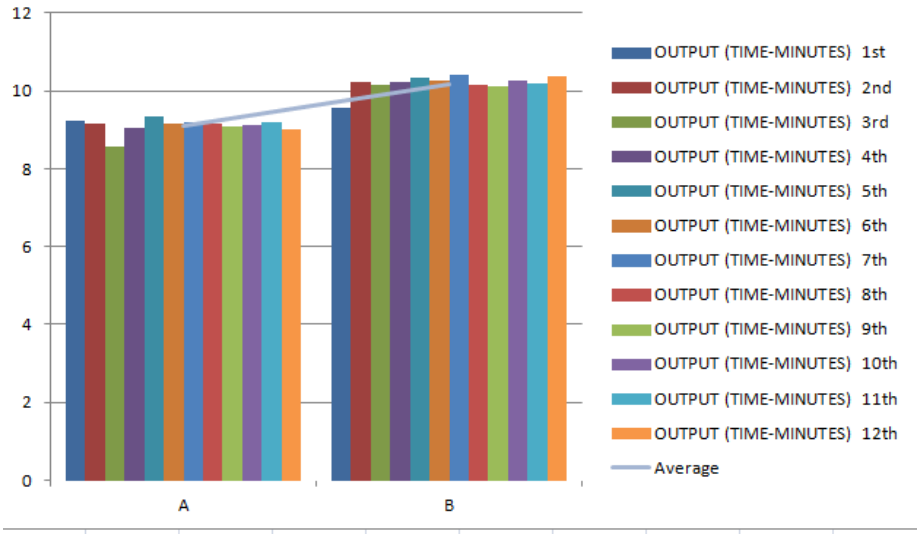


Figure 3. Bar graph made in this project.

Figure 3 shows the X-axis indicates the workers and Y-axis indicates the time taken for workers to complete their job. The workers studied in this project were given same task to get a correct work measurement data. Using this bar graph, we clearly can know the performance of workers as it makes easy to place them for better output.

3.5. Brainstorming

A group of people whom, production engineer, supervisor, line leader, and trainee discuss to fix well perform worker in each and every activity for better productivity. Focusing on one of the department in Company AD and brainstorming done to fix the way of the place the workers in each and every activity. The discussion ends up in a way where work measurement chosen to measure the worker's performance to develop the manpower arrangement schedule. The tool used in a brainstorming session is mind maps. In this mind map, the results of the discussion will be draw.

3.6. P-D-S-A Cycle

In this project, Plan Do Act Study (PDSA) was used as one of the problem-solving tools. This PDSA cycle used to do the project wisely. This PDSA cycle has 4 phases which are, Plan, Do, Study, Act where each of the phase guide this project to do successfully. In the Plan phase, the process of the job was studied. Later, process flow was created to follow the flow. The project was planned and the type of measurement was chosen, "work measurement". In the Do phase, work measurement was done. Each and every data for work measurement was key in. Productivity data for the chosen worker was recorded for 3 weeks continuously. In the Study phase, the work measurement data was studied and analyzed. The graph was created using Microsoft Excel to analyze the productivity data measured using work measurement.In the Act phase, the analyzed data will be used to create an develop manpower arrangement for better productivity output and reduce overtime working hours.

4. RESULT AND DISCUSSION

4.1. Example of data before implementation

Table 1. Example of work measurement data before implementation

OPERATOR	OUTPUT (TIME-MINUTES)												Average	TOTAL PACKS	REMARK
	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th			
A	9.03	8.56	10	9.25	8.35	9.02	8.52	9.05	9.00	9.22	9.08	10.02	9.09	20	
B	11.04	11.12	11	12	11.52	11.32	12.3	13.1	11.42	12.36	11.48	13.04	11.81		
C	11.58	13.02	12.34	13.28	12.5	12.2	13.05	12.11	12.00	13.30	12.58	12.36	12.53		
D	10.52	10.34	9.58	10.2	10	10.42	10.25	10.06	10.15	10.32	10.22	10.18	10.19		
E	15.58	16.02	16.23	16.05	16.18	15.46	16.33	16.24	16.12	16.05	16.14	16.05	16.04		
F	17.32	17.48	18.04	18.12	18.23	17.56	18.04	18.26	18.15	18.23	17.58	18.02	17.92		

Table 1 shows data collected 2 times per day for 6 days in a week. 6 workers been measured before arrange them accordingly. The measurement was done to find out the 2 workers whom suitable for the work that plotted in Figure 4.

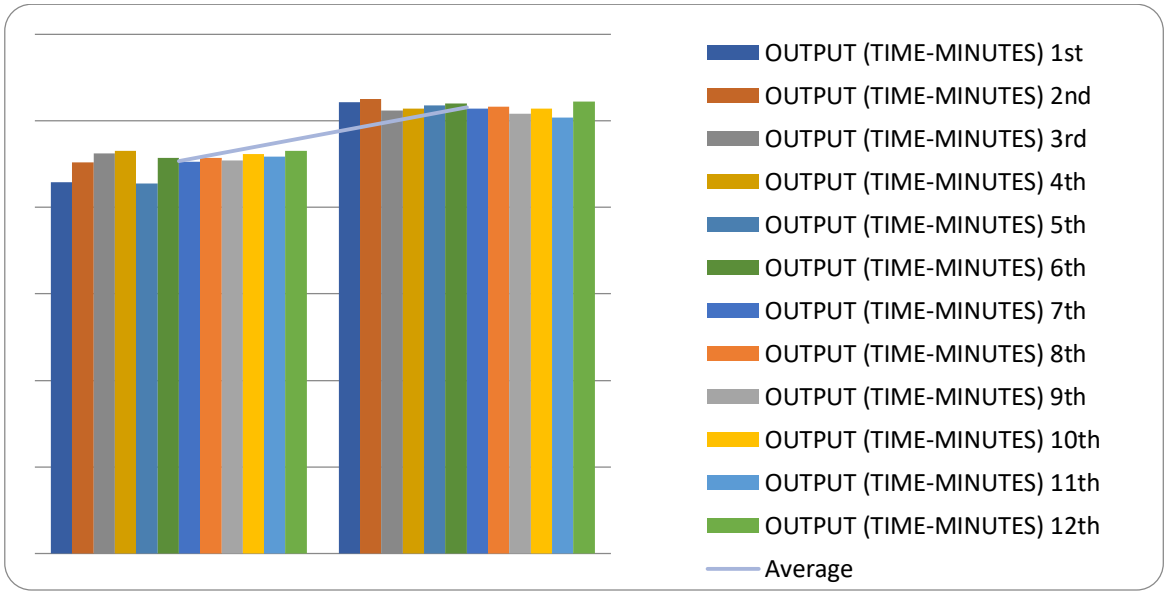


Figure 4. The combined bar and line graph shows work measurement of workers for before implementation

4.2. Example of data after implementation

Table 2. Example of work measurement data after implementation

OPERATOR	OUTPUT (TIME-MINUTES)												Average	TOTAL PACKS	REMARK
	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th			
A	8.58	9.04	9.24	9.31	8.55	9.14	9.06	9.15	9.08	9.23	9.18	9.30	9.07	20	
D	10.43	10.5	10.24	10.28	10.36	10.4	10.28	10.33	10.17	10.29	10.08	10.45	10.32		

Table 2 shows data collected 2 times per day for 6 days in a week. This work measurement done after 2 suitable workers chosen from the 6 worker. The data taken to prove the 2 workers are suitable for the work as plotted in Figure 5.

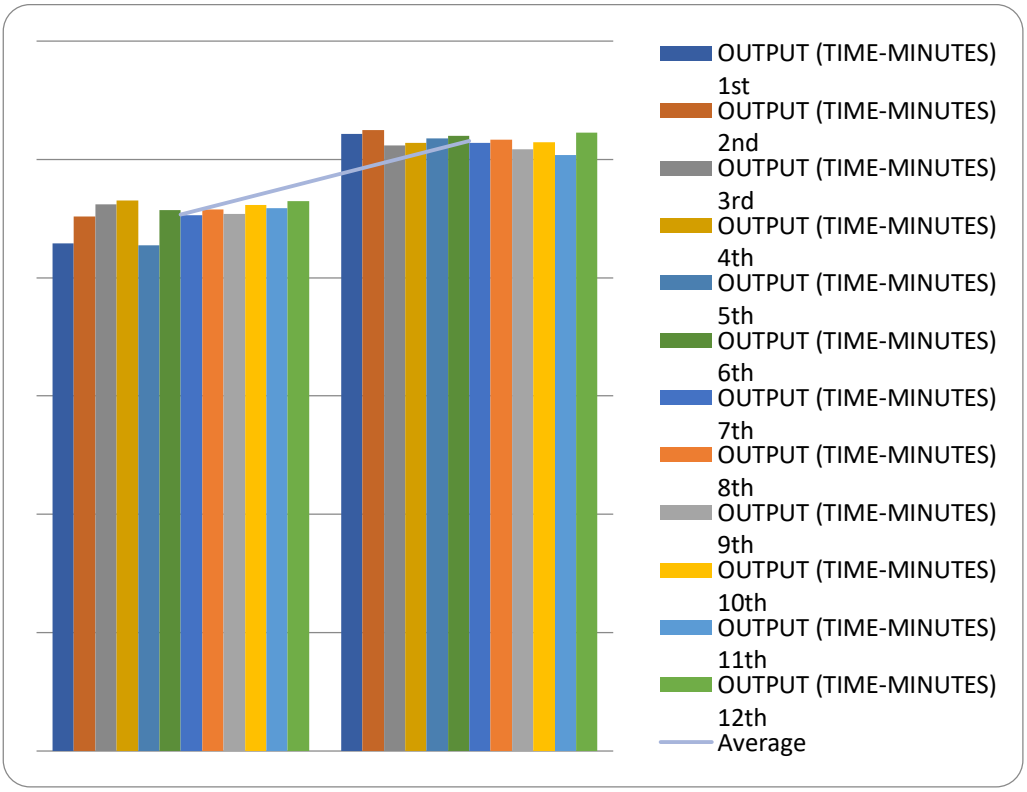


Figure 5. The combined bar and line graph shows work measurement of workers for after implementation

4.3. Working hours and overtime hours of before implementation

Table 3. Data of working hours and overtime hours of before implementation

OPERATOR	WORKING TIME	OVERTIME HOURS
A	144	73
D	144	94.5
TOTAL	288	167.5

Table 3 shows the chosen 2 workers normal working hours and overtime hours of the 3 weeks (before implementation). This data was collected to analyse the reduction of working overtime hours. The calculation as refer to Equation 1.

Calculation:

$$\text{Formula:} \quad \frac{\sum OT}{\sum(WT+OT)} \times 100\% \qquad (1)$$

$$\frac{167.5}{455.5} \times 100\% = 36.77\% \approx 37\%$$

The above calculation was done to find out the overtime hour percentage (before implementation). This overtime percentage was calculated to find the reduction percentage of working overtime later in the project as conclusion.

4.4. Working hours and overtime hours of before implementation

Table 4. Data of working hours and overtime hours of after implementation

OPERATOR	WORKING TIME	OVERTIME HOURS
A	144	51
D	144	64
TOTAL	288	105

Table 4 shows the chosen 2 workers normal working hours and overtime hours of the 3 weeks (after implementation). This data was collected to analyse the reduction of working overtime hours.

Calculation:

$$\text{Formula:} \quad \frac{\sum OT}{\sum(WT+OT)} \times 100\% \qquad (1)$$

$$\frac{105}{393} \times 100\% = 26.71\% \approx 27\%$$

The above calculation was done to find out the overtime hour percentage (after implementation). This overtime percentage was calculated to find the reduction percentage of working overtime later in the project as conclusion.

4.5. Result and Discussion

The result of this project will be the difference in percentage (%) of worker's overtime hours. In this project 6 workers are been measured and 2 of them were chosen for each activity. So, in this project 4 of them been chosen and measured again to find out the difference of overtime hours, respectively. Each worker has their own speciality and this project is for measure people performance and placed them in the suitable work.

Result Calculation (Percentage drop after implementation)

i. To find out the reduction in overtime working hours (%):-
Before percentage – After percen (1)

$$37\% - 27\% = 10\%$$

ii. To find out the reduction in overtime working hours (%):-
Before percentage – After percentage

$$36\% - 25\% = 11\%$$

This results shows the reduction in percentage of overtime working hours. The percentage has reduce 10% to 11%. As I mentioned earlier in this project correct placement of workers in the job can reduce overtime working hours.

5. Conclusion

Work measurement is biggest engineering tool where it helps more in manpower arrangement. In this project work measurement was used to gets the productivity data to compare the workers performance, to develop the manpower arrangement schedule and also to reduce the overtime working hours. In this case, the objective achieved where the overtime hours has reduced 10% and 11%. As I mentioned before manpower planning are in 2 types. One is short term manpower planning and another one is long term manpower planning. In this project, the concept of short term manpower planning was used to measure the workers performance and placed them in right place. According to this arrangement, the worker will finish their job earlier than the wrong placed worker before this. So, this will be result in reduction of overtime working hours. So, this project has bring an advantage to the company.

References

Igbokwe-ibeto, C. J., Osakede, K. O. and Anazodo, R.O. (2015). The effect of manpower planning and development in Lagos state (Nigeria) Civil Service performance. International Article. 1-13.

Jain, R. S., Gupta, M. M. and G. D. (2016). Optimisation of labour productivity using work measurement techniques. International Journal of Productivity and Quality Management. 19(4): 460-485.

Kareem, B. (2012). Knowledge-Graded Manpower Planning Model for the Manufacturing Industry Federal University of Technology. International Journal of Engineering Innovation and Management 2. 10(3):328-332.

Kimmo V., Pekka V., Tiina L. and Clas-Håkan N. (2012). Relationship Between Perceived Work Ability and Productivity Loss. International Journal of Occupational Safety and Ergonomics. 18(3):299-309.

Kjell B. Z. (2003). MOST work measurement system. 3rd edition.

Simon A. A. (2014). Conceptual Approach to Manpower Planning In Organizations. Journal of Management and Corporate Governance. 6(1):50-52.