



The Measurement of Operator Level Labor Productivity in PT. X Packaging

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ABSTRACT

The aim of the study is to find out the measurement of operator level labor productivity in X packaging workstation company. The problem of the study is Measurement of Workforce Productivity Level Operator Using the Work Sampling Method. The study of work measurement is intended to determine the standard / standard time of work and can provide good decisions in determining the optimal number of workers. the method use is qualitative descriptive data in the form of words, pictures, and not numbers. These data can be obtained from interviews, field notes, photos, videos, tapes, personal documentation, notes or memos, and other documentation. the result of the study are 1)The Average Earning Percentage for each worker 2)For worker 1 is 0.8978 for worker 2 is 0.8843 for workers 3 is 0.88453) The standard time required to complete one work cycle (completing one unit) is 0.188 hours4) The Number of Actual Workers = 3 people5) The number of Standard Workers based on the calculation results is 4 people.

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1. Introduction

One way to increase productivity is to use the work measurement method. This method aims to determine the work speed of a worker by taking into account the factors that affect the activities of a worker, so that a person can work in normal circumstances. In companies, there is often suboptimal use of resources, namely excessive human resources that can cause losses due to waste. Another condition is insufficient human resources, so that when the production load increases, a number of workers must be added which causes an increase in production costs, delays at other work stations, late production so that it can harm the company.

At PT. X often occurs the accumulation of goods to be produced at work stations. This buildup can occur due to a lack of manpower at the work station. To overcome this, it is necessary to measure work. Work measurement aims to determine the standard time for workers so that from this standard time it can be seen the optimal number of workers in a company

PT. X as a leading foreign-owned company in Indonesia sees the need to measure its workforce. The measurement method used is to use the work sampling method or commonly known as the work sampling method. With this measurement method, it can be seen whether the company's resources, in this case labor, have been managed properly in order to achieve business goals. From the measurement results, it will be known that the proportion of activity (productive and non-productive) of the workforce of a part during a certain period, the productive working hours of the workforce, the labor load and the amount of labor needed in a particular division.

From the description above, it can be seen that the Measurement of Productivity Levels Manpower is important and becomes the focus of company attention for the sake of smooth production and productivity. The formulation of the problem in this final project research is "Measurement of Operator Level Workforce Productivity" Using the Work Sampling Method The study of work measurement is aimed at determining the standard / standard time of work and can provide good decisions in determining the number of workers optimal



2. Review of Literature

2.1 Definition of Work Productivity

Every company always tries to make employees can achieve in the form of providing high work productivity maximum. Employee productivity for a company very important as a measure of success in run a business. Because the higher productivity of work employees in the company, means company profits and productivity will increase. International Labor Organization (ILO) cited by Malayu S.P Hasibuan (2005: 127) reveals that more simple means of productivity is scientific comparison count between the number generated and the number of each source used during production. The source can in the form of:

- a. Land
- b. Raw materials and auxiliary materials
- c. Factory, machines and tools
- d. Labor

2.2 The Measurement of Work Productivity

To find out the work productivity of each employee it is necessary to measure work productivity. Measurement of labor productivity according to the physical income system per person or per person working hour is widely accepted, with using the labor time measurement method (hours, days or year). Measurements are converted into defined units of labor as the amount of work a worker can do in an hour who work according to implementing standards (Muchdarsyah Sinungan, 2005: 262 in the journal GD. Wayan Darmadi). According to Henry Simamora (2004: 612) the factors are used in measuring work productivity includes quantity work, quality of work and timeliness:

- a. The quantity of work is a result achieved by a certain number of employees with standard comparisons exists or determined by the company.
- b. Quality of work is a related result standard with the quality of a product produced by employees in this case it is an employee's ability get the job done technically by comparison standards set by the company.
- c. Punctuality is the level of an activity completed at the beginning of the specified time, seen from a coordination point of view with the output and maximizing the available time for other activities. Timeliness is measured by perception employees against an activity that is provided at the beginning of time until it becomes output.

2.3 The Work Sampling

Work sampling or in foreign languages is often referred to as work sampling, Ratio Delay Study, or Random Observation Method is a technique for making a large number of observations on the work activities of machines, processes or workers / operators. Work measurement with the work sampling method is the same as the work measurement in stop hours (stop time study) is classified as a direct work measurement, because the implementation of measurement activities must be directly in the place of work under study.

This work sampling technique was first used by a British scholar named L.H.C Tippett in his research activities in the textile industry. Furthermore, the work sampling method or method has been proven to be very effective and efficient to be used in gathering information about the work of the machine or operator. It is said to be effective because quickly and easily this method can be used to determine the level of utilization of labor time, machines, processes, determining the allowance time available for one job, as well as for the standard time method for a process / operation. Compared to other work methods, the work sampling method is more efficient because the desired information will be obtained in a relatively short time and at a cost that is not too large.

2.4 The Working sampling method can be used to:

- a. Measure the delay ratio of workers, operators, machines, or other work facilities. An example is determining the percentage of hours or days that the workforce is actually engaged in work activities, and the percentage where no work activity is carried out at all (unemployed).
- b. Determine the performance level of the workforce during working hours based on the time this person works or does not work
- c. Determine the standard / standard time for a process performed by labor as can be carried out by other work measurements

The working sampling method is developed based on the law of probability, which is why the observation of an object does not need to be carried out thoroughly, but rather, it is sufficient to use a random sample. A sample or sample taken randomly from a large population group will tend to have the same distribution pattern as

that of that population group. If the sample taken is large enough, the characteristics of the sample will not be much different compared to the characteristics of the population group

Sampling is justified because of the limitations of time, energy and costs that make it impossible to make observations of all members of the population. Job sampling is very suitable to be used in observing work that is non-repetitive in nature and has a relatively long cycle time. Sampling was carried out at random at a specified time.

Before conducting sampling, we must first take the initial preparatory steps consisting of recording all information from all the facilities that we want to observe and planning a schedule of observation times based on the principle of randomization. After that, we did a sampling consisting of three steps, namely conducting occupation sampling, testing the uniformity of data and counting the number of work visits.

To obtain measurement results that can be accounted for statistically, it is necessary to take steps that are carried out before sampling is carried out, namely:

- a. Determining the purpose of the measurement, namely what sampling is carried out, which will determine the level of accuracy and level of confidence desired
- b. If the sampling is done to get the standard time, do a preliminary research to find out whether there is a good working system, if there is no improvement to the conditions and working methods first.
- c. Choose operators who can work normally and can work with them
- d. Conduct training for selected operators so that they can and are familiar with the work system being carried out
- e. Performing the separation of activities as desired as well as defining the work activities in question
- f. Prepare the necessary equipment in the form of observation boards or sheets
- g. Performing the separation of activities into the elements of work to be measured
- h. Determine the observation time via random numbers from a random number table or from a computer

2.5 The Introductory Sampling

In this step, a number of observations of work activities are carried out for randomly taken intervals. For this, usually one working day is divided into units of time whose amount is determined by the gauge. Usually the length of one unit of time is not too long. It is based on this one time unit that the time for the visit is determined. for example, one unit of time is 5 minutes long. So one working day (7 hours) has 84 units of time. This means that the number of visits per day is not more than 84 times. If 36 visits are carried out in one day, then with the help of a random number table it is determined the times of those visits

In the table of random numbers, we follow the numbers in this table in twos to 36 times. Of course, the condition is that the pairs of two numbers cannot be repeated. So you get:

39 65 75 45 19 54 (36 Pair)

]Thus the visit is carried out at 39, 65, ... (36 times) time units which means at 11.15, 14.25 and so on (if working hours start from 08.00 and end 16.00 with rest periods between 12.00-13.00)

Based on the random time, observations are made where the observer classifies work activities and idle activities. Of course, in this case the definitions of work and idle are determined in advance. After that work and idle activities are recorded and the percentage is determined.

2.6 Settlement Time With Rating Factor

To normalize the working time obtained from the observations, this is done by making adjustments, namely by multiplying the average observation time with the adjustment factor / rating factor. Of these factors are as follows:

- a. If the operator is declared too fast, namely working above the normal limit, the rating of this factor will be greater than one ($p > 1$ or $p > 100\%$)
- b. If the operator is working too slowly, i.e. working at a speed below normal (normal), then this rating factor will be smaller than one ($p < 1$ or $p < 100\%$)
- c. If the operator works normally or fairly, this factor rating is taken equal to one ($p = 1$ or $p = 100\%$)

Table 1.
Performance Ratings With Westing House System

Skill		Effort	
+ 0,15	A1 Superskill	+ 0,13	A1 Superskill
+ 0,13	A2	+ 0,12	A1
+ 0,11	B1 Excellent	+ 0,10	B1 Excellent



Skill		Effort	
+ 0,08 B2		+ 0,08 B2	
+ 0,06 C1	Good	+ 0,05 C1	Good
+ 0,03 C2		+ 0,02 C2	
+ 0,00 D	Average	+ 0,00 D	Average
+ 0,05 E1	Fair	+ 0,04 E1	Fair
+ 0,10 E2		+ 0,08 E2	
+ 0,16 F1	Poor	+ 0,12 F1	Poor
+ 0,22 F2		+ 0,17 F2	
Condition		Consistency	
+ 0,06 A	Ideal	+ 0,04 A	Ideal
+ 0,04 B	Excellent	+ 0,03 B	Excellent
+ 0,02 C	Good	+ 0,01 C	Good
+ 0,00 D	Average	+ 0,00 D	Average
+ 0,03 E	Fair	+ 0,02 E	Fair
+ 0,07 F	Poor	+ 0,04 F	Poorl

3. Research Methodology

This research is a qualitative research, which is adapted to the purpose of this study, namely to determine the measurement of the productivity level of the operator level in the company. according to the researcher's own perspective. According to Lexy J. Moleong (2005: 4), qualitative methods are research procedures that produce descriptive data in the form of words, pictures, and not numbers. These data can be obtained from interviews, field notes, photos, videos, tapes, personal documentation, notes or memos, and other documentation. Miles and Huberman (1992: 55) state that research is good Both qualitative and quantitative research acknowledge the existence of two types of data, namely quantitative data (relating to quantity) and data qualitative (related to quality). In qualitative research, the data extracted emphasizes the quality and meaning of the process the occurrence of something, and continued with its qualitative analysis. In In this study, researchers used two data sources to find data, collect data sources, and data results to be processed.

4. Result and Discussion

The Recapitulation of Observation

Table 2
The Occupational Sampling Observation Data on First Day

No	Random	Observation Time	Worker 1		Worker 2		Worker 3	
			A	B	A	B	A	B
1	02	8 : 36	✓			✓	✓	✓
2	05	8 : 45	✓			✓	✓	
3	09	8 : 57	✓		✓		✓	
4	12	9 : 06	✓		✓		✓	
5	13	9 : 09	✓		✓		✓	
6	18	9 : 42	✓					
7	20	9 : 30	✓		✓		✓	
8	21	9 : 33		✓	✓		✓	
9	29	9 : 57	✓		✓		✓	
10	32	10 : 06	✓		✓		✓	
11	35	10 : 15	✓		✓		✓	
12	38	10 : 24	✓		✓		✓	
13	39	10 : 27	✓		✓		✓	
14	40	10 : 30	✓		✓		✓	
15	46	10 : 48	✓		✓		✓	
16	48	10 : 54	✓		✓		✓	

No	Random	Observation Time	Worker 1		Worker 2		Worker 3	
			A	B	A	B	A	B
17	49	10 : 57	✓		✓		✓	
18	52	11 : 06	✓		✓		✓	
19	53	11 : 09	✓		✓		✓	
20	54	11 : 12	✓		✓		✓	
21	58	11 : 24	✓		✓		✓	
22	59	11 : 27	✓		✓		✓	
23	63	11 : 39	✓		✓		✓	
24	66	11 : 48	✓		✓		✓	
25	67	11 : 51	✓		✓		✓	
26	68	11 : 54	✓		✓		✓	
27	69	11 : 57	✓		✓		✓	
28	70	12 : 00		✓	✓	✓	✓	
29	72	13 : 06	✓			✓		✓
30	73	13 : 09		✓		✓		
31	74	13 : 12	✓		✓		✓	
32	75	13 : 15	✓		✓		✓	
33	76	13 : 18	✓		✓		✓	
34	78	13 : 24	✓		✓			✓
35	81	13 : 33	✓		✓		✓	✓
36	82	13 : 36	✓		✓		✓	
37	83	13 : 39	✓		✓		✓	
38	84	13 : 42	✓		✓		✓	
39	85	13 : 45	✓		✓		✓	
40	86	13 : 48	✓					
41	81	13 : 33	✓		✓		✓	
42	88	13 : 54	✓		✓		✓	
43	89	13 : 57	✓		✓		✓	
44	92	14 : 06		✓	✓		✓	
45	95	14 : 15	✓		✓		✓	
46	96	14 : 18	✓		✓		✓	
47	97	14 : 21	✓			✓	✓	
48	98	14 : 24	✓		✓		✓	
49	99	14 : 27	✓		✓		✓	
50	100	14 : 30	✓		✓		✓	
51	103	14 : 39	✓		✓		✓	
52	104	14 : 42	✓		✓		✓	
53	106	14 : 48	✓		✓		✓	
54	108	14 : 54	✓		✓			✓
55	109	14 : 57	✓		✓		✓	
56	110	15 : 00	✓		✓		✓	
57	112	15 : 06	✓		✓		✓	
58	117	15 : 21	✓			✓	✓	
59	118	15 : 24	✓		✓		✓	
60	119	15 : 27	✓		✓		✓	
61	120	15 : 30	✓		✓		✓	
62	121	15 : 33	✓		✓		✓	
63	122	15 : 36	✓		✓		✓	
64	123	15 : 39	✓		✓		✓	
65	125	15 : 45	✓		✓		✓	
66	127	15 : 51	✓		✓		✓	
67	128	15 : 54	✓		✓		✓	



No	Random	Observation Time	Worker 1		Worker 2		Worker 3	
			A	B	A	B	A	B
68	129	15 : 57	✓		✓			
69	130	16 : 00	✓		✓		✓	
70	132	16 : 06	✓		✓		✓	
71	133	16 : 09	✓		✓		✓	
72	134	16 : 12	✓		✓		✓	
73	135	16 : 15	✓		✓		✓	
74	136	16 : 18	✓		✓		✓	
75	137	16 : 21		✓		✓	✓	
Total	70	5	67	8	71	4		

Table 3
The Occupational Sampling Observation Data on Second Day

No	Random	Observation Time	Worker 1		Worker 2		Worker 3	
			A	B	A	B	A	B
1	3	8 : 39		✓	✓		✓	
2	4	8 : 42	✓			✓	✓	
3	6	8 : 48	✓		✓		✓	
4	9	8 : 57	✓		✓		✓	
5	13	9 : 09	✓		✓		✓	
6	14	9 : 12	✓					
7	15	9 : 15	✓		✓		✓	
8	19	9 : 27	✓	✓	✓		✓	
9	20	9 : 30	✓		✓		✓	
10	22	9 : 36	✓		✓		✓	
11	25	9 : 45			✓		✓	
12	26	9 : 48	✓			✓	✓	
13	27	9 : 51	✓		✓			✓
14	28	9 : 54	✓		✓			✓
15	29	9 : 57	✓		✓		✓	
16	30	10 : 00	✓		✓		✓	
17	32	10 : 06	✓		✓		✓	
18	33	10 : 09	✓		✓		✓	
19	37	10 : 21	✓		✓		✓	
20	40	10 : 30	✓		✓		✓	
21	41	10 : 33	✓		✓		✓	
22	43	10 : 39	✓		✓		✓	
23	45	10 : 45	✓		✓		✓	
24	46	10 : 48	✓		✓		✓	
25	47	10 : 51	✓		✓		✓	
26	48	10 : 54	✓		✓		✓	
27	49	10 : 57	✓		✓		✓	
28	52	11 : 06		✓	✓	✓		✓
29	53	11 : 09	✓		✓		✓	
30	56	11 : 18		✓		✓	✓	
31	61	11 : 33	✓		✓		✓	
32	62	11 : 36	✓		✓		✓	
33	63	11 : 39	✓		✓		✓	
34	64	11 : 42	✓		✓			✓



Table 4
The Occupational Sampling Observation Data on Third Day

No	Random	Observation Time	Worker 1		Worker 2		Worker 3	
			A	B	A	B	A	B
1	5	8 : 39	✓			✓		✓
2	6	8 : 42	✓		✓		✓	
3	7	8 : 48	✓		✓		✓	
4	8	8 : 57		✓	✓		✓	
5	10	9 : 09	✓		✓		✓	
6	15	9 : 12	✓					
7	16	9 : 15	✓		✓		✓	
8	17	9 : 27	✓		✓			✓
9	19	9 : 30	✓		✓		✓	
10	20	9 : 36	✓		✓		✓	
11	25	9 : 45	✓		✓		✓	
12	26	9 : 48	✓		✓		✓	
13	27	9 : 51	✓			✓	✓	
14	28	9 : 54	✓			✓	✓	
15	31	9 : 57	✓		✓		✓	
16	35	10 : 00	✓		✓		✓	
17	36	10 : 06	✓		✓		✓	
18	37	10 : 09		✓	✓		✓	
19	41	10 : 21	✓		✓		✓	
20	42	10 : 30	✓		✓		✓	
21	45	10 : 33	✓		✓		✓	
22	47	10 : 39	✓		✓			✓
23	48	10 : 45	✓		✓		✓	
24	51	10 : 48	✓		✓		✓	
25	55	10 : 51	✓		✓		✓	
26	56	10 : 54	✓		✓		✓	
27	57	10 : 57	✓		✓		✓	
28	58	11 : 06		✓	✓	✓		
29	61	11 : 09	✓		✓		✓	
30	63	11 : 18	✓		✓		✓	
31	64	11 : 33		✓		✓	✓	
32	68	11 : 36	✓		✓		✓	
33	73	11 : 39		✓		✓		✓
34	74	11 : 42	✓		✓		✓	

Table 5
Rating Factor For Each Worker

Factor	Worker 1		Worker 2		Worker 3	
	Class/ Symbol	Score	Class /Symbol	Score	Class/Symbol	Score
Skill	Average / D	0,00	Average / D	0,00	Average / D	0,00
Effort	Good / C2	0,03	Average / D	0,03	Good / C2	0,03
Condition	Average/D	0,00	Average/D	0,00	Average/D	0,00
Consistency	Good / C	+ 0,01	Good / C	+ 0,01	Good / C	+ 0,01
Total Rating Factor	+ 0,04		+ 0,01		+ 0,07	

4.1 Discussion

a. The Uniformity and Data Adequacy Test

For the data uniformity test, all data obtained in measurements with this work sampling method have been said to be uniform, because all the data tested are within the limits of data control (can be seen in the



operator production control map table) For the data uniformity test, the data needed for worker 1 is 209 data, for worker 2 is 227 and worker 3 is 167 data. The observations made have been collected as long as the observations are declared to be sufficient.

b. The Productivity and Productive Work Hours of Labor

The percentage of productivity for the three workers at the packaging work pension is for worker 1 of 89.78%, for worker 2 is 88.43% and for worker 3 is 88.45%. Meanwhile, the productive working hours for each operator are 68 hours of work, namely worker 1 is 6 hours 25 minutes, worker 2 is 6 hours 21 minutes and worker 3 is 6 hours 19 minutes. The three operators at the work station for packaging productive activities are classified as high, as evidenced by the fact that during working hours it is very rare to see the operators are idle of the three operators, operator one is the most productive and has the most tiring work activities. With workloads and repetitive work cycles, the need to compensate for automatic production speeds, coupled with less than ideal working situations and conditions, results in worker one being the most tired operator when working hours end.

c. The Number of Labor Requirements

Based on the results of data processing the number of labor requirements, it is found that the number of standard workers is 3.81 people = 4 people. Meanwhile, the number of workers currently (actual) available is 3 people. So it is necessary to add 1 person to the number of workers again. For normal production speeds, the workforce for a packaging workstation is three people. In this situation, the three operators, especially one worker, have a fairly heavy workload. Especially if you face an increase in product demand followed by production speed at this work station. For this reason, an additional workforce is needed to help the workloads of the three operators

d. The Standard By Actual Productivity

The Standard productivity is the productivity of the Packaging workstation worker at the time of observation while the actual productivity is the productivity of the packaging work station worker after taking work sampling measurements. From the calculation of the above calculation, the average standard productivity is 54 and the actual productivity is 40. This shows that in the standard state the productivity is 54 while in the actual state it can produce above the standard (have better productivity).

5. Conclusion

From the results of data processing obtained:

- a. The Average Earning Percentage for each worker
- b. For worker 1 is 0.8978 for worker 2 is 0.8843 for workers 3 is 0.8845
- c. The standard time required to complete one work cycle (completing one unit) is 0.188 hours
- d. The Number of Actual Workers = 3 people
- e. The number of Standard Workers based on the calculation results is 4 people

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