International Journal of Education, Information Technology and Others (IJEIT), August 2022, 5 (4), 1-7
DOI: https://doi.org/10.5281/zenodo.6965151
p-ISSN: 2654-2528 e-ISSN: 2623-2324
Accredited by Directorate General of Strengthening for Research and Development
Available online at https://jurnal.peneliti.net/index.php/IJEIT

Using Work Sampling Method to Calculate Raw Time and Production Capacity of Roll Pallets at PT. Xyz

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Received: 5 Juli 2022
Revised: 13 Juli 2022
Accepted: 23 Juli 2022

Abstract

This study aims to determine the standard time required in one cycle of pallet roll production work so that the production capacity can be known. In this study, the work sampling method was used to calculate the standard time, and an objective method was used to determine the adjustment factor. There are several steps to obtain the standard time from a soap chip sack work cycle, namely: conducting preliminary measurements, testing data uniformity, testing data adequacy, determining adjustment factors, determining allowance factors, and calculating cycle times and normal times. From the calculation results, the standard time needed to work on pallet rolls for 7 days is 0.1165 minutes/pcs, or the equivalent of 6.99 seconds/pcs. So that the production capacity that can be produced depends on the number of hours on the existing shift. For shifts I and II with a total of 7 hours of work, the capacity can reach 3605 pallets. As for shift III with a total of 6 hours of work, the capacity can reach 3090 pallets

Keywords: *Work Sampling, Standard Time, Production Capacity*

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How to Cite: Taqwatullah, B. F., & Nugraha, A. (2022). Using Work Sampling Method to Calculate Raw Time and Production Capacity of Roll Pallets at PT. Xyz. *International Journal of Education, Information Technology, and Others*, *5*(4), 1-7. https://doi.org/10.5281/zenodo.6965151

INTRODUCTION

In a company that has a mass production type, production planning plays an important role in making production scheduling, one of which is the measurement of process time. Time measurement is the work of observing and recording the working times of each element or cycle using the tools that have been prepared. The ideal measurement is a measurement with a lot of data to get a definite answer (Rachman, 2013). However, this is not possible due to time, cost and manpower constraints. On the other hand, if the measurement is only carried out a few times, the results are not satisfactory. The measurement of working time referred to here is the measurement of working time (Time Study), which is an activity to determine the time needed by an operator in carrying out a work activity under normal conditions and tempo (Prayuda, 2020). Therefore, it is necessary to measure work with an amount that does not take too much time, cost and effort, but the results can be trusted, namely measurements that are adjusted to the level of trust and confidence used. One of the measurements of working time carried out is the measurement of work time for pallet roll production at PT. XYZ which uses work sampling time to determine the processing time in production activities.

RESEARCH METHOD

Several methods were used in the preparation of this research, namely library research and field data collection. Literature study was carried out as the

first stage with the aim of understanding the basic theories and theoretical calculations obtained from reference books. While the collection of technical data obtained by conducting research directly to the field, namely by taking the data that will be needed through interviews with production operators and direct observation of the work of PT. XYZ.

This study aims to determine the standard time required in one pallet roll production cycle in order to know the production capacity. Work Measurement According to (Wignjosoebroto, 2008), work measurement is a method of determining the balance between human activities that are contributed to the unit of output produced. Measurement of working time is related to efforts to determine the standard time needed to complete a job. This standard time is the time required by a worker who has an average level of ability to complete the job. In this case, it includes the slack time given by taking into account the situation and conditions of the work that must be completed. Thus, time can be used as a tool to make a work scheduling plan that states how long an activity must last and how much output is produced and how many workers are needed to complete the work.

RESEARCH RESULTS AND DISCUSSION

The first step to calculate the standard time is to carry out preliminary measurements, namely to take data on the pallet roll production process activities as shown in table 1. Standard time is the time required to do or complete an activity or job by a reasonable workforce in normal situations and conditions (Rahayu & Juhara, 2020). Sampling or in a foreign language often referred to as Work Sampling, Ratio Delay Study, or Random Observation Method is a technique for conducting a large number of observations on the work activities of machines, processes or workers/operators. Measurement of work with this work sampling method as with the measurement of stop-watch time (stop-watch time study) is classified as a direct work measurement, because the implementation of measurement activities must be carried out directly at the work place under study (Izzhati & Anendra, 2012). The activity data taken are activities that have been categorized into 4 categories, namely productive, less productive, inevitable, fatigue in the pallet roll production process for 7 days using the following random numbers.

Table 1. observation random number

NO	RANDOM NUMBER	VISITING HOURS	
1	2	10	07:40
2	3	15	07:45
3	5	26	07:55
4	16	80	08:10
5	23	115	08:15
6	26	130	08:30
7	27	135	09:45
8	35	175	10:25
9	37	185	10:35
10	38	190	10:40

NO	RANDOM NUMBER	VISITING HOURS	
11	42	210	11:00
12	44	220	11:10
13	47	235	11:25
14	60	300	12:30
15	63	315	12:45
16	68	340	13:10
17	70	350	13:20
18	78	390	14:00
19	79	395	14:05
20	82	410	14:20
21	86	430	14:40
22	90	450	15:00
23	91	455	15:05
24	93	465	15:15
25	95	475	15:25
26	96	480	15:30
27	98	490	15:40
28	102	510	16:00
29	104	520	16:10
30	107	535	16:25
31	109	545	16:35
32	114	570	17:00
33	117	585	17:15
34	122	610	17:40
35	123	615	17:45
36	124	620	17:50

After observing for seven days with the data listed, then it is obtained that it is recapitulated to make it easier to read the information that has been obtained. The results of the recapitulation are listed in table 2 below.

Table 2. Recapitulation of Observations

DAY TO	ACTIVITY				TOTAL	PRODUCTIVE PERCENTAGE (%)	PRODUCTIVE PERCENTAGE
	P	KP	TT	F			
1	29	2	1	4	36	80,55%	0,8055
2	30	1	1	4	36	83,33%	0,8333
3	31	0	1	4	36	86,11%	0,8611
4	31	0	1	4	36	86,11%	0,8611
5	28	2	1	5	36	77,78%	0,7778
6	31	0	1	4	36	86,11%	0,8611
7	31	0	1	4	36	86,11%	0,8611
TOTAL	221	5	7	29	252	586,10%	5,861

Uniformity Test

After obtaining a recapitulation of the observations, the next step is to calculate the data uniformity test as follows.

1. Calculation $\bar{p}$

$$\bar{p} = \frac{\sum \bar{p}}{7} = \frac{586{,}10\%}{7} = 0{,}84$$

2. Calculation n

$$\bar{n} = \frac{\sum n}{k} = \frac{252}{7} = 36$$

3. Calculation of Upper Control Limit and Lower Control Limit

$$UCL = \bar{P} + 2\sqrt{\frac{\bar{P}(1-\bar{P})}{N}}$$

$$UCL = 0{,}84 + 2\sqrt{\frac{0{,}84(1-0{,}84)}{7}} = 1{,}12$$

$$LCL = \bar{P} - 2\sqrt{\frac{\bar{P}(1-\bar{P})}{N}}$$

$$LCL = 0{,}84 - 2\sqrt{\frac{0{,}84(1-0{,}84)}{7}} = 0{,}56$$

Data Sufficiency Test

The next step is to test the adequacy of the data. In calculating the Data Sufficiency Test, if N' N is considered sufficient, but if N' > N then the data is insufficient or insufficient and additional data are needed. Assuming 95% confidence level and 5% accuracy level.

$$N' = \frac{\left(\frac{k}{s}\right)^2 (1-\bar{p})}{\bar{p}}$$

$$N' = \frac{\left(\frac{2}{0{,}05}\right)^2 (1-0{,}84)}{0{,}84}$$

$$N' = \frac{(1600)(0{,}16)}{0{,}84}$$

$$N' = 304{,}76$$

So, it can be concluded that N' = 304.76 and the result is N = 252, because N' N, the data is considered insufficient or insufficient, so 52.76 data is still needed.

Calculation of Workload of Workers

To calculate the workload of workers, the calculation steps that must be carried out are as follows:

1. Calculation of adjustments using the Shummard Method. If it is considered to work normally, it is given a score of 60 and if the performance is considered excellent then it gets a score of 80. Then the adjustment factors are:

$$P = \frac{80}{60}$$

$$P = 1{,}33$$

2. Determine the allowance factor

   The next step is to determine the allowance or allowance which is denoted by L. Here is the determination of the value of L allowance on job sampling.

Table 3. Allowance Data

Factor	Description	Allowance(%)
Expended Labor	Work at the desk, sit down	10
work attitude	Work Sitting, Light	0,7
work movement	Normal	0
eye fatigue	Continuous view with fixed focus	10
Workplace temperature	Normal	0
Atmospheric state	Good	0
Good environmental condition	Repeated duty cycle	0,7
Total		21,4

Number of Minutes of Observation = Working hours × number of visiting days × 60 minutes
= 10 x 7 x 60 minutes
= 4,200 minutes

Number of Minutes Productivity = Percentage of productivity x number of minutes of observation
= 86.11% x 4200 = 3616 minutes

Number of goods produced for 7 days: 50,400 pcs

Calculation of Cycle Time (Ws)

$$Ws = \frac{(\text{Number of Productivity Minutes})}{(\text{Number of items produced for 7 days})}$$

$$Ws = \frac{3616}{50400} = 0.072 \text{ minutes}$$

Normal Time Calculation (Wn)

P value or adjustment using the Shummard method.

Then the normal time is:

$$Wn = Ws \times P$$

$$Wn = 0.072 \times 1.33$$

$$Wn = 0.096$$

Calculation of Standard Time (Wb)

$$Wb = Wn \times (1+L)$$

$$Wb = Wn \times (1+L)$$

$$Wb = 0.096 \times (1 + 0.214)$$

$$Wb = 0.1165 \text{ minutes/pcs} = 6{,}99 \text{ detik/pcs}$$

$$\text{Standard production} = \frac{(\text{Number of minutes of observation})}{(\text{Standard time})}$$

$$= \frac{4200}{0.1165} = 3605$$

$$\text{Calculation of workload} = \frac{(Number\ of\ productive\ observations)}{(Total\ observations)} \times 100\%$$

$$= \frac{221}{252} \times 100\%$$

$$= 87.70\%$$

The percentage of productivity or workload received in completing the work is 87.70% operator working hours are 11 hours per day, so productivity activities are 87.70% x 11 hours = 9.65 hours and the remaining 1.35 hours are used for unproductive activities. The calculation for capacity per shift is as follows.

Shifts 1 and 2 (number of hours worked = 7 hours = 25200 seconds)

Shift capacity 1 and 2 = $\frac{25200}{6{,}99}$ = 3605,15 ≈ 3605

Shift 3 (number of hours worked = 6 hours = 21600 seconds)

3 shift capacity = $\frac{21600}{6{,}99}$ = 3090,12 ≈ 3090

CONCLUSION

Work sampling is an appropriate method to determine the standard time of production process activities and determine the production capacity that can be achieved. From the calculation results, the standard time needed to work on pallet rolls for 7 days is 0.1165 minutes/pcs, or the equivalent of 6.99 seconds/pcs. So that the production capacity that can be produced depends on the number of hours on the existing shift. For shifts I and II with a total of 7 hours of work, the capacity can reach 3605 pallets. As for shift III with a total of 6 hours of work, the capacity can reach 3090 pallets.

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