

Determination of Physical Workload and the Ideal Number of Workers in Arsy Bakery using Full Time Equivalent (FTE) Method

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Abstract

Arsy Bakery is one of the MSMEs located in Karang Joang, Balikpapan. This bakery produces five types of bread: white bread, sweat bread, mocha bread, cheese chocolate bread, and three-flavored bread. Arsy bakery could produce approximately 4000 loaves of bread weekly. This study aims to calculate the quantity of physical workload of Arsy bakery workers based on Full Time Equivalent (FTE) method and determine the ideal number of workers required. FTE is a workload analysis method that measures the length of time to complete the tasks in production process. The workload quantity for every worker is obtained based on the time measurements and calculation results. Based on the results of this study, the amount of workload that carried out by Worker 1 is 1.67, meanwhile the amount of workload carried out by Worker 2 is 1.60. These values show that both workers can be categorized as overload. The total FTE value for two workers is 3.27 which means that there should be 3 employees to finish Worker 1 and Worker 2 tasks. In conclusion, Arsy Bakery needs to recruit 1 new employee to reduce high workload of the current employees.

Keywords: Full Time Equivalent (FTE), MSMEs, Physical Workload

1. Introduction

Micro, Small, and Medium Enterprises (MSMEs) contributed significantly to the increase of the Gross National Product (GNP) [1]. Furthermore, 70% of national income were earned from MSMEs [2], it also stated that MSMEs absorbed more than 55% workforce in economic activities [3].

MSMEs have the opportunity to grow continuously in the future by paying attention to current market movements and being able to compete with market competition. Meanwhile the growth of MSMEs in Balikpapan can be seen from the existing numbers. According to IDN Times East Kalimantan [4], there are approximately 27,000 MSMEs in Balikpapan. It shows that there are so many MSMEs with a lot of potential for the development in Balikpapan.

One of the sustainable MSMEs indicators is human resource is a factor that affect the competitiveness and sustainability of MSMEs [5]. Problems with workers are very diverse such as heavy workload. Workload is an effort to determine how many hours are needed by employees to complete the work [6]. Workload is related to work fatigue that will reduce performance and increase the work errors rate [7].

Arsy Bakery is one of the MSMEs located in Karang Joang, Balikpapan. This bakery produces

five bread types: white bread, sweet bread, mocha bread, chocolate cheese bread, and three-flavors bread. Arsy Bakery could produce about 4000 loaves of bread in a week. This bakery has 2 workers in the production department. Based on direct observations, the workers at Arsy Bakery work for six days every week with an average of 12 working hours per day from 10 am to 10 pm.

In contrast, according to Government Regulation No. 35/2021 [8] stated that the maximum working hours per day is seven hours for six working days and 8 hours for five working days. Because of the excessive working hours at production department of Arsy Bakery, there are several problems arises such as workers' fatigue and workers who get sick from exhaustion. The high workload also causes employee negligence and mistakes in making a dough. These mistakes could result a failure in production and reducing the sales level and income that will affect the bakery's profit.

With the existing problem, this study will use Full Time Equivalent method to determine the ideal number of workers for the bakery. FTE method will be performed by identifying the job activity of each workers. FTE is one of the methods that can be used in the workload analysis process [9]. FTE measures the number of permanent employees needed to complete a job [10]. Some research to calculate physical workload using FTE have been

performed at PVC manufacturing company [11], at pharmaceutical company [12], maintenance service company [13] and electricity national company [9]. The advantage FTE method is the optimization of worker performance and determine the ideal number of workers required for a company or factory so the underload or overload workers could be avoided.

2. Methods

This study uses the Full Time Equivalent (FTE) which is a time-based workload analysis method to measure the required time to complete a task and convert it into FTE value. The data collection was conducted by direct time measurement along with interview with the owners and the workers of Arsy Bakery. The time measurement was performed using a stopwatch to record worker's working time to finish every activity and complete a work cycle.

FTE is a time-based workload analysis method that converts working time into FTE value by measuring the time required to complete a job [9]. FTE workload method calculate the value by comparing the spent time to complete various activities with the available work hours. FTE aims to simplify job measurement by converting working hours into the number of workers required to complete a particular job [9].

FTE value index can be divided into three types: overload, normal and underload [9]. An overall FTE index value above 1.28 is considered overload, FTE index value between 1 and 1.28 is considered normal, and FTE index value between 0 and 0.99 is considered underload. Tabel 1.1 below showed the category of FTE index.

Table 1.
FTE index [3]

Workload calculation results	Category
0 - 0,99	Underload
1 - 1,28	Normal
>1,28	Overload

The following formula are used to calculate FTE value [9]:

$$FTE = \frac{\text{Total Available Time}}{\text{Total Activity Time} + \text{Allowance}} \quad (1)$$

3. Findings and Discussion

3.1. Time Study

The number of production employees in the bakery are two male workers. The factory produces five types of breads every day including

plain bread, sweet bread, brown bread, mocha bread, and three-flavors bread. The following are the activities of Worker 1 and Worker 2 in the production process for every working day:

Table 2.

Worker 1 Activities				
No	Activity	Period	Frequency	Duration (Minutes)
1	Mixing bread ingredient	daily	1	19,44
2	Knead	daily	10	8,68
3	Cut/split dough	daily	20	4,98
4	Cut into 36 parts	daily	10	3,31
5	Roll the dough into a round	daily	5	28,13
6	Filling jam into round dough	daily	5	58,11
7	Baking	daily	42	5,87

Table 3.

Worker 2 Activities				
No	Activity	Period	Frequency	Duration (Minutes)
1	Cleaning pans	daily	1	34,47
2	Making mocha jam	daily	1	29,16
3	Roll the dough into a round	daily	5	30,69
4	Filling jam into round dough	daily	5	59,04
5	Arrange in the pan	daily	20	13,15
6	Polishing and adding cheese	daily	1	58,06
7	Mocha coating	daily	1	43,89

3.2. Allowance

Allowance time for the workers was determined by the factory owner, the following table is the allowance percentage at Arsy Bakery:

Table 4.

Allowance		
Factor	Category	Percentage (%)
A	Energy expended	6
B	Work attitude	2
C	Work movement	1
D	Eye fatigue	1
E	Workplace temperature	1
F	Atmospheric state	1
G	Good environmental condition	1
H	men's personal needs	2
Total		15

3.3. Number of days available

FTE method required the total number of working days to calculate the workload. The following tables show the total number of working days and the annual total working hours.

Table 5.
Number of Working Days and Holidays

Weekdays	Amount	Unit
1 day	12	hours
1 week	6	days
1 year	365	days
Holiday		
Monthly holiday	4	days
Eid Al-Fitr	5	days
Sick leave (average)	3	days
August 17 th holiday	1	days
Total days off	57	days

Table 6.
Annual Total Working Hours

Calculation	Amount
Working days in 2022	308 days
Total working hours per year	3696 hours
Wprk effectiveness	85%
Total effective working hours per year	3141,6 hours/ 188496 minutes

Based on Table 3.5, the total working hours for the workers in a year is 3696 hours/year. Hereafter, the total effective working time is obtained from reducing the total working hours with the allowance time which is $100\% - 15\% = 85\%$. After calculating the allowance, the effective working hours is 3141.6 hours/year.

3.4. FTE Calculation

Calculation on Worker 1

$$\begin{aligned} \text{Allowance} &= \text{Allowance} \times \\ &\text{Number of Working Days a Year} \times \text{Working} \\ &\text{Hours a Day} \\ &= 15\% \times 308 \times 720 \\ &= 33264 \text{ minutes} \end{aligned}$$

$$\begin{aligned} \text{Total Activity Time} &= 282473,57 \text{ minutes} \\ \text{Total Available Time} &= 188496 \text{ minutes} \end{aligned}$$

Accordingly:

$$\begin{aligned} \text{FTE} &= \frac{282473,57 + 33264}{188496} \\ &= 1,67 \end{aligned}$$

Based on the FTE calculation result of Worker 1 which is 1,67, it can be concluded that Worker 1 is an overload worker. The owner of the bakery should recruit more workers or reduce the workload of Worker 1 to prevent fatigue.

2. Calculation on Worker 2

$$\begin{aligned} \text{Allowance} &= \text{Allowance} \times \\ &\text{Number of Working Days a Year} \times \\ &\text{Working Hours a Day} \\ &= 15\% \times 308 \times 720 \\ &= 33264 \text{ minutes} \end{aligned}$$

$$\text{Total Activity Time} = 270171,44 \text{ minutes}$$

$$\text{Total Available Time} = 188496 \text{ minutes}$$

Accordingly:

$$\begin{aligned} \text{FTE} &= \frac{270171,44 + 33264}{188496} \\ &= 1,60 \end{aligned}$$

Based on the FTE calculation result of Worker 2 which is 1.60, it can be concluded that Worker 2 is also an overload worker. The owner of the bakery also should recruit more workers or reduce the workload of Worker 2 to prevent fatigue. The total FTE value for two workers is 3.27, it means that the owner should recruit 1 more worker to help the activity of both workers. By having 3 workers, the workload of every workers will be 3.27 divided into 3 or FTE value 1.09/worker. The FTE value of 1.09 can be categorized as a normal workload.

4. Conclusion

Based on the calculation result, the following statements are the conclusion that can be drawn from this research:

1. The FTE value for Worker 1 is 1.67 and the FTE value for Worker 2 is 1.60. Both workers are categorized as overload.
2. The total FTE value for two workers is 3.27 which means that Arsy Bakery need to recruit 1 more employee to resolve the current overload workers.

References

- [1] World Bank (2017). <https://www.worldbank.org/en/topic/mefinance> [Accessed on 14 February 2022]
- [2] Asare, R., Akuffo-bea, M., Quay, W. & Atta-Antwi, K. (2015). Characteristics of Micro, Small, and Medium Enterprises in Ghana: Gender and Implications for Economic Growth. *Afr. J. Sci. Technol. Innov. Dev.* 7, 26–35.
- [3] Martin, F. M., Ciovea, L. & Cristescu, M. P. (2013). The implication of Human Capital in the Development of SMEs Through ICT Adoption. *Procedia Econ. Finance*.
- [4] Idntimes. (2022). Wujudkan digitalisasi umkm Pemkot Balikpapan data produk unggulan. [online] tersedia di: <https://kaltim.idntimes.com/news/kaltim/fatmawati-8/wujudkan-digitalisasi>

- umkm-pemkot-balikpapan-data-produk-unggulan/2 [Accessed on 12 February 2022].
- [5] Sung, C. Y., Kim, K.C., & In, S. (2016), Small and Medium-Sized Enterprises Policy in Korea from the 1960s to the 2000s and Beyond.
- [6] Ahmad, Komaruddin. (1996), Dasar-Dasar Manajemen Investasi, Edisi Revisi Jakarta, Rineka Cipta.
- [7] Tarwaka, Bakri, S. H. A., dan Sudiajeng, L. (2004). Ergonomi: Untuk keselamatan, kesehatan kerja dan produktivitas. Surakarta: UNIBA Press, 2.
- [8] Peraturan Pemerintah Republik Indonesia. (2021), Peraturan Pemerintah Republik Indonesia Nomor 35 Tahun 2021.
- [9] Dewi. V, dan Satya.A. (2012). Analisis Kebutuhan Tenaga Kerja Berdasarkan Beban Kerja Karyawan Pada PT PLN (Persero) Distribusi Jakarta Raya dan Tangerang Bidang Sumber Daya Manusia dan Organisasi. Jakarta, Universitas Indonesia.
- [10] Purnomo, W. Bramantoro, T. (2018), Pengantar Metodologi Penelitian Bidang Kesehatan, Airlangga University Press.
- [11] Kabul, E. R. Febrianto, M. N. (2022). Implementasi Metode Full Time Equivalent (FTE) Dalam Analisis Kebutuhan Tenaga Kerja. IKRAITH-Ekonomi, Vol. 5, No.1.
- [12] Murdiansyah, H. Widharto, Y. (2018). Workload Analysis dengan Metode Full Time Equivalent untuk Menentukan Kebutuhan Tenaga Kerja pada Dept Produksi Unit Betalactam PT. Phapros Tbk. Jurnal UNDIP.
- [13] Febriantoro, A. (2019). Menentukan Kebutuhan Tenaga Kerja dengan Metode FTE pada Pekerja Shutdown di PT Patriatama Mandiri Makassar.