



Workforce Design And Employee Workload Using The Full-Time Equivalent Method At PT XZY

Amri Amri

Department of Industrial Engineering, Faculty of Engineering, Universitas Malikussaleh, Aceh, Indonesia

*Corresponding author Email: iramri@unimal.ac.id

Manuscript received 30 May 2023; revised 2 June 2023; accepted 14 June 2023. Date of publication 14 June 2023

Abstract

One of the factors that affect employee performance is workload. If employees are given too much work, problems will arise. For example, some representatives have too high responsibilities (overloaded), while other workers have small responsibilities (underloaded). This kind of problem also occurs at PT. XZY, so it is essential to research the status of responsibility, which can then be used to design the Number of employees. The workload of each station is calculated using the Full Time Equivalent (FTE) method, which converts workload hours into the Number of people needed to complete a particular task. From the results of the review, it was found that there were deviations in responsibility at five workstations where three stations had overloaded workloads or values between > 1.28 found at the wedding, cutting, and packing stations. A further two stations have standard work with values 1-1.28 found at co-gas filling stations and packaging and vacuum. The findings show that 18 employees are the ideal workforce. Changing the composition of the Number of workers according to the calculation of the optimal Number of workers can improve employee performance. The manuscript should contain an abstract. The abstract should be self-contained and citation-free and should not exceed 250 words. The abstract should state the work's purpose, approach, results, and conclusions. The author should assume that the reader has some knowledge of the subject but has not read the paper. Thus, the abstract should be intelligible and complete (no numerical references); it should not cite figures, tables, or sections of the paper. The abstract should be written using the third person instead of the first person.

Keywords: Workload, Full-Time Equivalent, Optimal Workforce.

1. Introduction

Knowing the workload can help determine how much human resources are needed. The administrative unit workload is the total Number of tasks that must be completed within a certain period. The results achieved are below standard because the operator only has a limited time to complete the many responsibilities and functions. An uneven workload can result in an uncomfortable working atmosphere because the operator feels that his workload is too excessive or lacking. [1]. To determine the operator's workload, it is necessary to carry out a workload analysis.

Workers are placed under the workload in typical, excessive, and too-low workloads. Work inefficiency will be caused by a workload that is too light or heavy. The term "work overload" refers to a situation where the amount of work done by employees is disproportionate to the amount of work being done. This can lead to physical and mental exhaustion, reducing output due to burnout. Meanwhile, too low responsibility indicates that the amount of labor used is large, so the Company needs to pay something else for workers' wages with the same efficiency level. This causes failure (waste) costs [2].

This Company produces Frozen Tuna with five workstations: a Weeding Station, CO Gas Injecting Station, Cutting Station, Packaging and Vacuum Station, and Packing Station. This Company operates with working hours of approximately 7 hours per day, which starts from 08.00 to 12.00 WIB and continues again from 13.00 to 16.00 WIB. This Company has 13 workers in the Frozen Tuna section with five workstations consisting of a wedding station (cleaning the fish by weeding the scales and excrement of the fish, removing the fish bones, and separating the meat from the skin), a CO gas injection station, a cutting station. (cutting frozen tuna that has been in the form of loin into cubes, pockets, and steaks using a bandsaw), packing and vacuum packing stations, and packing stations.

Based on the observations, it was found that there was a lack of equal division of workload in this Company, such as the existence of workers who had concurrent jobs and there were unemployed workers. From the interviews conducted with one of the employees, there is a discrepancy between the workload and the Number of employees employed, so some workers are overloaded with work. So it is necessary to calculate the workload to determine the optimal Number of workers. Workers with excessive workloads tend to tire quickly and be



unproductive at work. This study aimed to determine the workload level of employees based on the Full Time Equivalent method and the optimal Number of employees in this Company based on the Full Time Equivalent method.

2. Literature Review

2.1. Ergonomics

Ergonomics can be defined as a scientific discipline that studies human limitations, advantages, and characteristics and uses this knowledge to design products, machines, spaces, environments, and even work systems. The main goal is to achieve the best possible quality of work without neglecting human health, safety, and comfort. In connection with this definition, it can be said that almost all design objects that relate (communicate) with humans require ergonomics [3][4][5][6].

2.2. Workload

The effort required to fulfill a job's "needs" is called workload. At the same time, capacity refers to human ability [7]. A person's physical and mental state can be used to measure this capacity. The responsibility is a measure (segment) of limited administrator limits expected to complete a particular job. The Number of tasks a person or group of people has to finish in a certain amount of time under normal circumstances is known as their workload [8]. Even though the deviation is slight, inequality always occurs because achieving a normal workload in terms of work volume is quite complex compared to workability. There are three levels of workload: [9] [10]:

1. Above normal workload is when the work or time required to complete a task exceeds work capacity.
2. Normal workload refers to the time required to complete the same work in the available hours or the work volume close to the worker's capacity.
3. A below-normal workload indicates that the amount of time required to complete the work is less than the volume or Number of hours worked. ll, paragraphs must be justified in alignment. With justified alignment, both sides of the section are straight.

2.3. Full Time Equivalent (FTE)

The Full Time Equivalent method is a workload measurement method based on working hours by measuring the time required to complete a particular task, which is then converted into an RTD index value [11]. Moreover, FTE is the Number of permanent employees for a certain period, e.g., B. month or year, working hours. FTE refers to the Number of individuals required to perform all tasks in a process over a certain period. This FTE calculates the time spent working hours to complete a study [12].

The effect of the FTE value is divided into three types: overload, standard, and underload. Based on the workload analysis guidelines published by the agency in 2010, an FTE index value greater than 1.28 is considered overworked, 1-1.28 is standard, while an FTE index between 0 and 0.99 is considered overworked, or The workload is still not enough. The FTE value of the work process is determined as follows [13]:

$$FTE = \frac{\text{Total activity time} + \text{Allowance}}{\text{Total available time}}$$

To get the total activity time for a year, Allowance and available time for a year can be calculated through the following equation [14] [15] [16]:

1. Total Activity Time

The formula for total activity time is as follows:

$$\text{Full Activity Time} = \text{primary activity time} + \text{support activity time} + \text{incidental Activity time}$$

2. Allowances

The formula for the Allowance is as follows:

$$\text{Allowance} = \text{Allowance} \times \text{Effective Number of days per year} \times \text{Working hours per day}$$

3. Total Available Time

The formula for the total time available is as follows:

$$\text{Available Time} = \text{Hours worked a day} \times \text{Number of effective days}$$

Full Time Equivalent Index workload (usual / overload/underload). The following Full-Time Equivalent Index is determined based on workload calculations, as shown in Table 1.

Full Time Equivalent Index workload (usual / overload/underload). The following Full-Time Equivalent Index is determined based on workload calculations, as shown in Table 1.

Table 1. Full-Time Equivalent Index

Workload calculation results	Category
0 – 0.99	<i>Underloaded</i>
1 – 1.28	Normal
>1.28	<i>Overloaded</i>

2.4. Full-Time Equivalent (FTE)

To achieve a balance between human activity and the output units produced, measure work time. The work measurement principles and methods (work measurement or time study) must be applied to determine the standard amount of time required to complete work to select the most suitable alternative work method. A work scheduling plan that determines how long the activity should last, how much output is

produced, and how many workers are needed to complete the work can be made using the standard time generated by this work measurement activity [17].

Generally, there are three methods of measuring work items with a stopwatch: continuous time, repeated time, and cumulative time. [18] [19][20]. In measuring working time, cycle time will be calculated. Normal time can be seen as follows:

1. Average Cycle Time
The formula for calculating cycle time:
Calculate the average cycle time (average cycle time)
 $CT = (\sum X_1)/N$
2. Normal Time
The formula for calculating normal time:
Normal Time = CT (1+ Rating Factors)
3. Standard Time
The formula for calculating standard time :
Standard Time (ST) = NT x (1+A)

3. Method

3.1. Data Collection

The research was conducted at a company that processes frozen tuna production. With five workstations, namely: Weeding Station, CO Gas Injecting Station, Cutting Station, Packaging and Vacuum Station, and Packing Station, Aceh Province. The entire research time was carried out this year, starting with the preparation stage of compiling a research proposal to complement the research report to date. In this study, there are 2 data used, namely:

1. Primary data (primary sources)
The data needed in this observation are working hours in one day, Number of hours worked, Number of working days of employees, and elements of work.
2. Secondary Data (secondary sources)
The secondary data used in this research is the general description of the Company, operational time, library books, and journals, and the entire internet document should be in Times New Roman. The font sizes to be used are specified in Table 1.

3.2. Data Analysis Methods

The stages in measuring the workload of employees working at PT. Aceh Lampulo Jaya Bahari is as follows:

1. Summary of Data Collection Results
2. Collect data on employee working time.
3. Create Periodical jobs.
4. A prodigal job is a routine work done by someone because it is their primary job.
5. Calculating Activity Time
Total Activity Time = Main Work Time + Support Work Time + Incidental Work Time
Calculating Available Time
Time Available = Number of Days in a Year × Working Hours per Day
Determine Allowances
Allowance is determined based on the standard provisions in the table, according to the labor criteria at PT ZYX
Allowance = Allowance × Number of Effective Working Days per Year × Working Hours per Day
Calculating the FTE value can be calculated by the following formula:
 $FTE = (\text{Total Waktu Aktivitas} + \text{Kelonggaran}) / (\text{Total Waktu Tersedia})$

4. Results and Discussion

Number of Labor and Working Time PT ZXY employs 13 operators, while the duties of each can be seen in table 2 as follows:

Part	Amount
Weeding	2
CO gas injection	2
Cutting	2
Packaging and Vacuum	4
Packing	3

The working days at this Company in process production are six working days Monday-Saturday, working 7 hours per day.

4.1. Figures and tables

Data on effective working days in a year is needed to calculate workload. Concerning the effective working days of PT ZXY in Table 3 as follows:

Table 3. Number of Working Days and Holidays in 2022

Calculation	Amount	Unit
One day	7	O'clock
One week	5	Day
One month	30	Day
One year	365	Day
Holiday		
Weekly Holidays	53	Day
National holiday	14	Day
Sick Leave	3	
Annual leave	7	Day
Total Holidays	77	Day
Effective Working Day	288	Day

4.2. Elements of Work

The job element is the job description — the job in the Company or job description. There are stages of frozen tuna production that are sequential and carried out according to the specified conditions. The elements of the work can be seen in Table 4 as follows:

Table 4. Work Elements

No.	Work Station	Activity
1.	Weeding	Cutting Fish Heads Defecating on Fish Separating the Meat from the Bones and Skin of the Fish
2.	CO gas injection	Injecting <i>Carbon Monoxide</i> (CO) Gas
3.	Cutting	Cuts <i>loin</i> into <i>cubes</i> , <i>pockets</i> , and <i>steaks</i>
4.	Packaging and Vacuum	Entering Products Into Packaging Doing Pressing Using a Vacuum Machine
5.	Packing	After entering the packaged product into the cardboard box, it is put into <i>the styrofoam</i> .

4.3. Calculating the Full Time Equivalent (FTE) Value

To calculate the value of the total time equivalent (FTE), it is necessary to determine the value of the total activity time, Allowance, and total available time to get the FTE index value. To find out the whole activity time, it is necessary to make a periodic job table that aims to convert activity time to adequate working time in a year. Unit time conversion is done by multiplying the daily period by the Number of working days in a year, month/year, week/year. Based on periodic weeding jobs, the total primary workload is 605328 minutes, the supporting workload is 180 minutes, and the incidental workload is 60 minutes. An example of a periodic fish weeding job can be seen in Table 5.

- Total time for weeding activities. The formula for total activity time is as follows:
Total activity time = w.main + w.support + w.incidental
Total activity time = 605088 + 180 + 60 = 605328
- Weeding allowance time
Allowance time = Allowance x Effective Number of days a year x Working hours
Time allowance = 22% x 288 x 420
Allowance time = 26611.2
- Weeding time available
Available Time = Hours worked a day x Number of effective days
Available Time = 420 x 288
Available Time = 120960
- FTE value on weeding
$$FTE = \frac{((TotalWaktuAktivitas+Allowance))}{(Total Waktu Tersedia)}$$
$$FTE = \frac{((605328+26611,2))}{120960} = 5.22$$

Table 5. Periodical Job in Weeding

No	Activity	Period	Connection With Task			Frequency	Duration (Minute)	HR (per-son)	Conversion	Workload		
			Main	Supporters	Incidental					Main	Supporters	Incidental
1.	Tool preparation	Daily	1			1	5	2	288	1440	0	0

2.	Weeding	Daily	1	100	20,91	2	288	602208	0	0
3.	Tool Cleaning	Daily	1	1	5	2	288	1440	0	0
4.	briefings	Monthly	1	1	15	2	12	0	180	0
5.	Meetings	Annual	1	2	30	2	1	0	0	60
Total Workload								605088	180	60

4.4. Determination of the Optimal Number of Workers

Based on the calculation results, the weeding station gets an FTE workload value of 5.22, which is in the overload category, meaning that the wedding station requires three proposed employees. At the co-gas injection station, an FTE workload value of 2.28 only requires two employees and does not require additional employees categorized as usual. At the cutting station, the FTE workload value is 3.27, which is in the overload category, meaning that the cutting station requires one proposed employee. At the packaging and vacuum stations, an FTE workload value of 4.91 only requires four employees, does not require additional employees, and is categorized as usual. At the packing station, the FTE workload value is 4.22, which is in the overload category, meaning that the packing station requires one proposed employee.

The results of calculating the FTE value show that the optimal employee is 18 employees with an even workload distribution. With equal weeding of 5 employees, injecting CO gas with two employees, cutting with three employees, packaging and vacuuming with four employees, and packing with four employees. Due to the presence of unemployed employees, PT Aceh Lampulo Jaya Bahari does not need to recruit new employees to change the overloaded workload to normal. But by placing unemployed employees in stations that experience an overloaded workload. The determination of the optimal Number of workers can be seen in Table 6.

Table 6. Determination of the Optimal Number of Workers

No	Station	Workload	Number of employees Initial (Actual)	Number of employees (proposal)
1	Weeding	5,22	2	3
2	CO gas injection	2,28	2	0
3	Cutting	3,27	2	1
4	Packaging and Vacuum	4.91	4	0
5	Packing	4,22	3	1

5. Conclusion

The conclusion from the results of this study is as follows:

1. The results of the workload analysis for PT Aceh Lampulo Jaya Bahari employees based on calculations using the Full Time Equivalent (FTE) method are that the wedding station gets an FTE workload value of 5.22 which is in the overload category, meaning that the wedding station requires three proposed employees. At the co-gas injection station, an FTE workload value of 2.28 only requires two employees and does not require additional employees categorized as usual. At the cutting station, the FTE workload value is 3.27, which is in the overload category, meaning that the cutting station requires one proposed employee. At the packaging and vacuum stations, an FTE workload value of 4.91 only requires four employees, does not require additional employees, and is categorized as usual. At the packing station, the FTE workload value is 4.22, which is in the overload category, meaning that the packing station requires one proposed employee.
2. Determining the optimal Number of workers for employees of PT Aceh Lampulo Jaya Bahari is by analyzing the workload at each workstation using the Full Time Equivalent (FTE) method to obtain the FTE value, which will be used as the basis for determining the optimal Number of workers in the frozen tuna production section.

References

- [1] Moekijat, M. (2008). Application of Productivity in Organizations. Jakarta: Earth Script .
- [2] Lubis, MS, Nasution, IA, Mery, M., Jenvony, J., Yulia, V., Devika, V., & Novera, V. (2019). Effect of Asset Turnover, Cash Turnover, and Loan to Deposit Ratio (LDR) on Return On Assets (ROA) in Banking Listed on the Indonesia Stock Exchange in 2013-2017. Owner: Accounting Research and Journal , 3 (2), 307–319.
- [3] Iridiastadi, H. (2014). Yassierli. (2014). Ergonomics An Introduction, 60–75.
- [4] Tarwaka, D. (2004). Ergonomics for Work Safety and Work Productivity. Semarang.
- [5] Ifitkar, Z. (nd). Sutalak. 2006. Work System Design Techniques. Bandung. ITB.
- [6] Tjutju, Y. (2008). Human Resource Management. Bandung: Alfabet.
- [7] Badriyah, N., Sari, RN, & Basri, YM (2015). The effect of corporate governance and firm characteristics on firm performance and risk management as an intervening variable. Procedia Economics and Finance , 31, 868–875.
- [8] Fahrezy, IA, ST Salmia, LA, & Soemanto, S. (2020). Workload Analysis Using the Full Time Equivalent Method to Optimize Performance in the Production Section at Erlangga Convection, Malang. Innovative Industries: Journal of Industrial Engineering, 10(2), 55–59.
- [9] Suma'mur, PK, & Heryuni, S. (1984). Odnos koncentracije olova i mangana u krvi Profesionalno neekspoziranih ljudi. Arhiv Za Higijenu Rada i Toksikologiju , 35(2), 169–172 .
- [10] Pulat, BM (1997). Fundamentals of industrial ergonomics . Waveland Press Inc.
- [11] Kakerissa, AL (2017). Analysis of Production Department Employee Workload Using the Full Time Equivalent (FTE) Method at Ud Roti Alvine. Arika, 11(2), 89–96.
- [12] Sari, AD, Hardiansa, F., & Suryoputro, MR (2018). Workload assessment on SME foundry to increase productivity using full time equivalent . MATEC Web of Conferences , 154 , 1081.

- [13] Dewi, U., & Satrya, A. (2012). Analysis of workforce needs based on employee workload at PT PLN (Persero) Jakarta Raya and Tangerang distribution in the field of human resources and organization. Department of HR Management, Faculty of Economics, University of Indonesia, Depok.
- [14] Phapros, PT (2018). Workload Analysis Using the Full Time Equivalent (Fte) Method to Determine Manpower Requirements at the Dept. Production of Betalactam Units. *Industrial Engineering Online Journal*, v(Vol.6), 1–8.
- [15] Susetyo, J., Oesman, TI, & Sudharman, ST (2012). Effect of work shifts on employee fatigue with the Bourdon Wiersma method and 30 items of rating scale. *Journal of Technology*, 5(1), 32–39 .
- [16] Fatona, L., Tarwaka, Pgd. S., Erg, M., & Werdani, KE (2015). Differences in Fatigue Levels Between Morning, Evening and Night Shifts in Inpatient Nurses at PKU Aisyiyah Boyolali Hospital. Muhammadiyah Surakarta university.
- [17] Groover, MP, Aguilar, JEA, Lopez, UF, & Palafox, FJS (2014). *Introducción a los procesos de manufactura* . McGraw-Hill Interamericana .
- [18] Wignjosoebroto, S. (2006). *The Development of Ergonomics Method : Ergonomic Approach to Answering Industrial Problems*. Surabaya: Ergonomics and Work System Design Laboratory, Industrial Engineering, ITS.
- [19] Yasmin, ZA, & Ariyanti, S. (2019). Workload Analysis on BdCheck Maintenance Using the Full Time Equivalent Method. *Industrial Engineering Scientific Journal*, 6(1).
- [20] DI Rinawati, D. Puspitasari, and F. Muljadi, "Optimal Work on Stamped Batik Production (Case Study: Ikm Batik Saud Effendy, Laweyan)," *J. Tek. ind. Undip*, vol. 7, no. 3, pp. 143–150, 2012.