

Workload Analysis Using the Full-Time Equivalent and Rating Scale Mental Effort Methods in the Production Division

Annisa Rahmi Azizy¹, Rusindiyanto¹, Rizqi Novita Sari¹

¹The National Development University "Veteran" of East Java, Industrial Engineering, Surabaya, Indonesia

*Corresponding Author: Annisa Rahmi Azizy

Email: 19032010147@student.upnjatim.ac.id



Article Info

Article history:

Received 21 August 2024

Received in revised form 7

October 2024

Accepted 23 October 2024

Keywords:

Full Time Equivalent

Production

Rating Scale Mental Effort

Workload Analysis

Abstract

CV Aurexell is an industry engaged in the food sector, namely bread. In the production process, several problems cause physical and mental workloads, where employees at dough-making, weighing, and molding workstations feel physically burdened because they have to work standing up for a day and mentally burdened because they have to meet production targets every day but there is a shortage of employees at the fermentation and baking, also cream filling workstations. To solve these problems, we must take workload measurements to find the optimal number of employees. Based on data processing using the FTE method, it is evident that the physical workload of all employees falls within the normal category, which ranges from 1 to 1.28, which means that the number of employees at CV Aurexell is optimal because the physical workload is normal. Based on data processing using the RSME method, it is evident that operators 7 and 9 have mental workloads of 85.33 and 83, respectively, classified as great effort. At the same time, other operators require rather much too considerable effort. The optimal number of workers in the RSME method is six people for the dough-making, weighing, and molding workstation, three for the fermentation and baking workstation, three for the cream-filling workstation, and thirteen for the packaging workstation.

Introduction

In today's challenging food and beverage industry, the bakery industry is one sector that can survive and compete fiercely in Indonesia. The bread industry is currently spread across Indonesia. One of the bread industries used as a research site by the author is CV Aurexell. CV Aurexell is in Plaosan Village, Wonoayu District, Sidoarjo Regency, East Java, Indonesia. The production process at CV Aurexell starts with dough making, weighing, molding, fermentation and baking, cream filling, and packaging.

In the production process at CV Aurexell, some problems can cause physical and mental workload. Physical workload occurs because employees who work at the dough-making, weighing, and molding workstation feel physically burdened as they work standing up for a full day, while employees at other workstations can flexibly way, either sitting or standing. Meanwhile, mental workload occurs due to the need for operators or employees at the fermentation and baking and cream filling workstations. The number of operators at both workstations is two people. However, during the production process, employees at both stations often complain that the workload received is large. At the same time, they have to meet production targets every day, which can lead to decreased productivity in the bread production process at CV Aurexell. Therefore, to overcome these problems, we must measure

the employee's workload to overcome insufficient or excessive workload. Full-Time Equivalent and Rating Scale Mental Effort methods are needed to calculate the physical and mental workload. CV Aurexell researched to evaluate employees' workload in the production department and determine the optimal number of workers. Expected outcomes include increased work efficiency and productivity in the production process.

Workload

Workload analysis is a process for determining the number of hours employees need to complete a job in a certain period. In other words, workload analysis aims to determine the number of employees and the right amount of workload given to an employee. A workload that is too heavy can result in physical and mental fatigue, decreased motivation, and an increased risk of production errors. A workload that is too light can cause employee dissatisfaction and reduce work productivity (Sukmawati & Hermana, 2024; Mahawati et al., 2021). Physical workload requires human physical energy as a power source, and energy consumption is the main factor determining the weight or lightness of a job (Rahayu et al., 2022). According to (Suparmi et al., 2023), the mental workload indicates the amount of attention or mental demand required to complete a job.

Workload Measurement

According to Erliana & Mawaddah (2019), workload measurement is a technique for generating information about the effectiveness and efficiency of the work of an organizational unit or position holder, which is carried out in a structured manner using job analysis techniques, workload, or other analysis techniques. Workload measurement, according to (Diana, 2019), is broadly classified into three categories, namely subjective measurement, performance measurement, and physiological measurement. (Neksen et al., 2021; Rizqiansyah, 2017) Explain that a primary reason for measuring workload is to quantify the mental costs involved in doing a job to predict system and worker performance.

Working Time Measurement (Stopwatch Time Study)

Measurement of work time with a stopwatch is a work measurement technique using a stopwatch as a measuring device for the time shown in the completion of an observed activity. The time is successfully measured and recorded and is then modified by considering the operator's work tempo and adding it to the allowance (Wignjosoebroto, 2003). Measuring and recording work time usually uses the continuous method. First, divide the work activities into detailed work elements to be measured. Work elements are jobs that must be done in an assembly activity and can consist of one or more jobs that must be completed in one workstation (Dasanti et al., 2020; Prabowo, 2016).

Data Uniformity Test and Data Sufficiency Test

(Pangestu & Asmungi, 2023) Says that the data uniformity test is used to determine whether the data that has been observed is uniform or there is uncontrolled data. The data sufficiency test is a form of testing to determine whether the data obtained in the observation is sufficient for calculation (Arif, 2016). According to (Asarela & Sari, 2023), here are the formulas to calculate the Upper Control Limit (UCL) and Lower Control Limit (LCL):

$$\text{UCL} = \bar{x} + k \sigma_x \dots \dots \dots (2.1)$$

$$\text{LCL} = \bar{x} - k \sigma_x \dots \dots \dots (2.2)$$

Allowance

Allowance is given to the operator to produce a standard time equal to the actual situation (Alfredo & Raharjo, 2023). The allowance aims to provide operators with opportunities to do what they must do so that the standard time is obtained, which can be said to be complete work time data representing the observed work system (Purbasari, 2020).

Cycle Time

According to (Sutalaksana, 2006), cycle time is when it takes to complete a unit product since the raw material starts processing. Cycle time has the following formula:

$$\text{Cycle Time} = \frac{\sum x_i}{N} \dots\dots\dots(2.3)$$

Normal Time

Normal time is the time required to complete one cycle of work activities carried out by each stage of task implementation. Normal time has the following formula:

$$\text{Normal Time} = \text{Cycle Time} \times \text{Performance Rating} \dots\dots\dots(2.4)$$

(Sutalaksana, 2006)

Standard Time

According to (Astuti et al., 2020), standard time is the time required to complete a job that is carried out in the best work system. Standard time has the following formula:

$$\text{Standard Time} = \text{Normal Time} \times \left(\frac{100\%}{100\% - \text{allowance}} \right) \dots\dots\dots(2.5)$$

Full Time Equivalent (FTE)

Based on research (Kabul & Febrianto, 2022), full-time equivalent is one method used to analyze time-based workload by measuring the length of time needed to complete the work. Then, the time is converted into the FTE value index. According to (Damayanti et al., 2023), the formula used to calculate the full-time equivalent is as follows:

$$\text{FTE} = \frac{\text{Total Working Hours}}{\text{Effective Working Hours}} \dots\dots\dots(2.6)$$

Rating Scale Mental Effort (RSME)

Rating Scale Mental Effort is a method used to analyze the mental workload faced by workers who must perform various activities in their work. This method uses a rating scale or score to assess a mental workload level (Siahaan & Pramestari, 2021). According to (Satria et al., 2023), the Rating Scale Mental Effort method has the following formula:

$$\text{RSME} = \frac{\text{Total Respondent Answer Scale Results}}{\text{Number of Question Items}} \dots\dots\dots(2.7)$$

Methods

This research was conducted at CV Aurexell in Plaosan Village, Wonoayu District, Sidoarjo Regency, East Java, Indonesia. This research was carried out in December 2023 until the required data was fulfilled. The problem-solving steps of this research are described in the flowchart below:

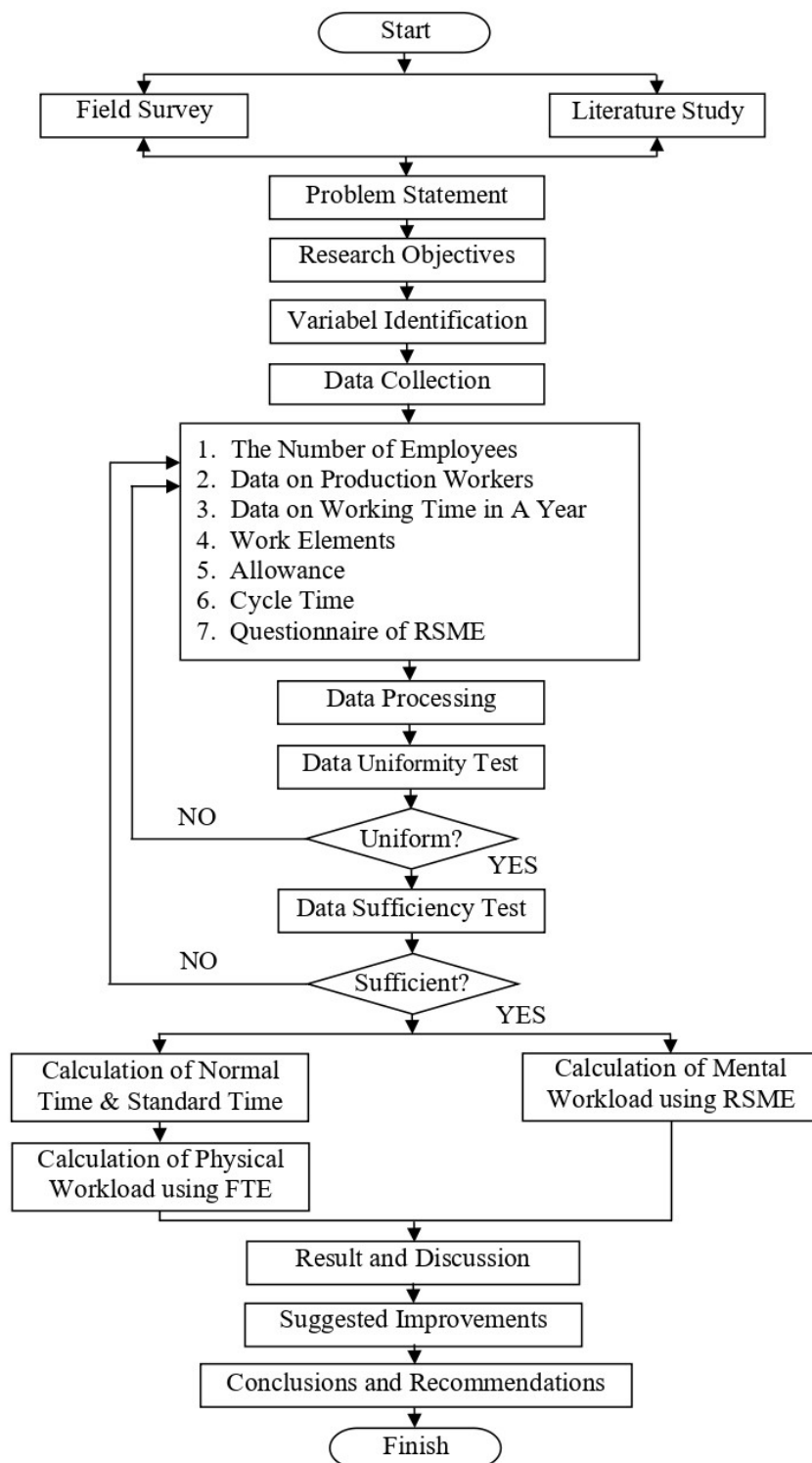


Figure 1. Research Flowchart

Results and Discussion

The Results of Full Time Equivalent Value

Here is the way to calculate the FTA values for operator 1:

The allowance value used for operator 1 is 2.

$$UCL = \bar{x} + k \sigma_x$$

$$\begin{aligned}
&= \frac{58,53}{10} + \left(2 \times \sqrt{\frac{1,338}{10-1}} \right) \\
&= 5,853 + (2 \times 0.39) \\
&= 6.62
\end{aligned}$$

$$\begin{aligned}
\text{LCL} &= \bar{x} - k \sigma_x \\
&= \frac{58,53}{10} - \left(2 \times \sqrt{\frac{1,338}{10-1}} \right) \\
&= 5,853 - (2 \times 0.39) \\
&= 5.08
\end{aligned}$$

Based on the calculation of the data uniformity test above, the data used in this study are uniform because they do not cross the Upper Control Limit (UCL) and Lower Control Limit (LCL).

$$\begin{aligned}
N' &= \left[\frac{k/s \sqrt{N \sum x^2 - (\sum x)^2}}{\sum x} \right]^2 \\
&= \left[\frac{2/0,0659 \sqrt{10(343,9137) - (58,53)^2}}{58,53} \right]^2 \\
&= 3.60
\end{aligned}$$

Based on the calculation of the data sufficiency test above, the data used in this study are sufficient because they are less than or equal to the observed data.

$$\begin{aligned}
\text{Normal Time} &= \text{RF} \times \text{Mean Cycle Time} \\
&= 1.07 \times 5.853 \\
&= 6.26
\end{aligned}$$

Based on the calculation of normal time above, finding the rating factor requires adding the value of 1 with the performance rating, where the performance rating for operator 1 is 0.07.

$$\begin{aligned}
\text{Standard Time} &= \text{Normal Time} \times \left(\frac{100\%}{100\% - \text{allowance}} \right) \\
&= 6.26 \times \left(\frac{100\%}{100\% - 19.5\%} \right) \\
&= 7.78
\end{aligned}$$

$$\begin{aligned}
\text{Total Working Hours} &= \text{Frequency} \times \text{Normal Time} \times \frac{\text{Number of Workdays}}{60} \\
&= 15 \times 6.26 \times \frac{287}{60} \\
&= 449.12
\end{aligned}$$

Based on the total working hours above, calculate the number of working days by subtracting the total days in 1 year from the total days off, where the total days in 2023 are 365 days and the total days off are 78 days.

$$\begin{aligned}
\text{Effective Working Hours} &= \text{Working Hours/Year} \times \text{Work Effectiveness} \\
&= 2296 \times 85\% \\
&= 1951.6
\end{aligned}$$

Based on the effective working hours above, the working hours/year are calculated by multiplying the number of workdays by the working hours/day, where the number of workdays is 287 and the working hours/day is 8 hours.

$$\begin{aligned} \text{FTE} &= \frac{\text{Total Working Hours}}{\text{Effective Working Hours}} \\ &= \frac{449.12}{1951.6} \\ &= 1.017 \end{aligned}$$

Based on the FTE calculation above, operator 1 got an FTE value of 1.017, and the physical workload obtained is in the normal category.

Table 1. Result of FTE Values

Operator	Workstations	Intensity	FTE
Operator 1	Dough Making, Weighing, and Molding	Daily	1.017
Operator 2	Dough Making, Weighing, and Molding	Daily	1.059
Operator 3	Dough Making, Weighing, and Molding	Daily	1.003
Operator 4	Dough Making, Weighing, and Molding	Daily	1.068
Operator 5	Dough Making, Weighing, and Molding	Daily	1.081
Operator 6	Dough Making, Weighing, and Molding	Daily	1.090
Operator	Workstations	Intensity	FTE
Operator 7	Fermentation and Baking	Daily	1.238
Operator 8	Fermentation and Baking	Daily	1.207
Operator 9	Cream Filling	Daily	1.093
Operator 10	Cream Filling	Daily	1.114
Operator 11	Packaging	Daily	1.265
Operator 12	Packaging	Daily	1.256
Operator 13	Packaging	Daily	1.260
Operator 14	Packaging	Daily	1.253
Operator 15	Packaging	Daily	1.251
Operator 16	Packaging	Daily	1.265
Operator 17	Packaging	Daily	1.029
Operator 18	Packaging	Daily	1.196
Operator 19	Packaging	Daily	1.039
Operator 20	Packaging	Daily	1.017
Operator 21	Packaging	Daily	1.027
Operator 22	Packaging	Daily	1.022
Operator 23	Packaging	Daily	1.043

In the calculation of FTE values, it is known that the workload obtained by operator 1 is 1.017, operator 2 is 1.059, operator 3 is 1.003, operator 4 is 1.068, operator 5 is 1.081, operator 6 is 1.090, operator 7 is 1.238, operator 8 is 1.207, operator 9 is 1.093, operator 10 is 1.114, operator 11 is 1.265, operator 12 is 1.256, operator 13 is 1.260, operator 14 is 1.253, operator 15 is 1.251, operator 16 is 1.265, operator 17 is 1.029, operator 18 is 1.196, operator 19 is 1.039, operator 20 is 1.017, operator 21 is 1.027, operator 22 is 1.022, operator 23 is 1.043. It can be seen that all employees at CV Aurexell get a physical workload in the normal category. Physical workload in the normal category means that employees receive an optimal workload, so there is no need to increase or reduce the number of employees. An optimal workload means that the company has managed its human resources well and by industry standards, aiming to maximize productivity without sacrificing employee health. An optimal workload also contributes to the company's operational efficiency. When employees work within

reasonable limits, they tend to be more productive and suffer fewer injuries, which aligns with the company's goal of achieving optimal results. However, there are suggestions for CV Aurexell in maintaining the physical workload of employees to remain in optimal conditions, one of which is to provide seating or flexible chairs (can be raised and lowered) for employees at the dough-making, weighing, and molding work stations. Providing this seat can reduce the physical workload received by employees so that employee performance is more optimal when performing their duties. SOPs applicable at CV Aurexell must also be considered so that employees can work optimally, such as monitoring employee performance regularly to ensure employees are not physically exhausted.

Discussion of RSME Value

Here is the way to calculate the RSME value for indicator BK:

The allowance value used for all operator is 2.

$$\begin{aligned} \text{UCL} &= \bar{x} + k \sigma_x \\ &= \frac{1823}{23} + \left(2 \times \sqrt{\frac{288.43}{22}} \right) \end{aligned}$$

$$= 86.50 \text{ (Uniform)}$$

$$\begin{aligned} \text{LCL} &= \bar{x} - k \sigma_x \\ &= \frac{1823}{23} - \left(2 \times \sqrt{\frac{288.43}{22}} \right) \end{aligned}$$

$$= 72.02 \text{ (Uniform)}$$

Based on the calculation of the data uniformity test above, the data used in this study are uniform because they do not cross the Upper Control Limit (UCL) and Lower Control Limit (LCL).

$$\begin{aligned} N' &= \left[\frac{k/s \sqrt{N \sum x^2 - (\sum x)^2}}{\sum x} \right]^2 \\ &= \left[\frac{2/0.05 \sqrt{23(144781) - (1823)^2}}{1823} \right]^2 \\ &= 3.19 \end{aligned}$$

Based on the calculation of the data sufficiency test above, the data used in this study are enough because they are less than or equal to the observed data.

The following is an example of calculating the RSME value on operator 1:

$$\begin{aligned} \bar{x} &= \frac{78+77+76+72+71+73}{6} \\ &= 74.5 \end{aligned}$$

Based on the RSME calculation above, operator 1 got an RSME value of 74.5, and the mental workload category required considerable effort.

Table 2. Result of RSME Values

Name	Age	BK	KK	PK	UMK	KgK	KIK	$\bar{x}$
Rohman	44	78	77	76	72	71	73	74.5
Name	Age	BK	KK	PK	UMK	KgK	KIK	$\bar{x}$
Yuli	30	80	75	71	75	79	80	76.67

Pandu	45	83	83	85	75	84	70	80
Wati	41	84	80	78	80	72	74	78
Haris	48	82	75	75	82	80	74	78
Lukman	46	79	76	75	80	79	76	77.5
Andi	51	86	86	85	86	85	84	85.33
Lasman	44	82	80	74	80	71	80	77.83
Minah	47	86	85	79	76	87	85	83
Mirna	40	78	83	78	86	75	72	78.67
Ratna	42	76	74	84	76	80	75	77.5
Santi	40	81	76	74	73	83	74	76.83
Tutik	40	75	80	78	83	81	72	78.17
Novita	27	79	81	78	80	76	73	77.83
Darti	39	77	82	68	74	70	74	74.17
Lela	31	79	74	82	76	80	72	77.17
Dewi	36	75	74	76	69	79	78	75.17
Endang	40	74	76	67	68	77	85	74.5
Naning	41	76	73	72	70	68	80	73.17
Tina	44	78	77	80	75	81	76	77.83
Anis	42	80	79	82	72	71	76	76.67
Nurul	38	73	84	71	75	82	79	77.33
Sri	45	82	75	76	71	82	77	77.17
$\bar{x}$		79.26	78.48	76.70	76.26	77.96	76.48	
σ_x		3.62	3.96	4.99	5.09	5.30	4.27	
UCL		86.50	86.41	86.69	86.44	88.55	85.02	
LCL		72.02	70.55	66.71	66.08	67.37	67.93	

Table description:

BK: Workload

KK: Working Difficulty

PK: Work Performance

UMK: Work Mental Effort

KgK: Work Anxiety

KIK: Work Fatigue

$\bar{x}$: RSME Values

σ_x : Standard Deviation

UCL: Upper Control Limit

LCL: Lower Control Limit

Based on the calculation of the RSME value, it is found that operator 1 gets an RSME value of 74.5, operator 2 of 76.67, operator 3 of 80, operator 4 of 78, operator 5 of 78, operator 6 of 77.5, operator 7 of 85.33, operator 8 of 77.83, operator 9 of 83, operator 10 of 78.67, operator 11 of 77, 5, operator 12 by 76.83, operator 13 by 78.17, operator 14 by 77.83, operator 15 by 74.17, operator 16 by 77.17, operator 17 by 75.17, operator 18 by 74.5, operator 19 by 73.17, operator 20 by 77.83, operator 21 by 76.67, operator 22 by 77.33, operator 23 by 77.17. Based on the RSME value, Operator 7 at the fermentation and roasting workstation and Operator 9 at the cream filling workstation get a great effort. Still, other operators get considerable effort category. The mental workload in a great effort means that the mental workload received by

employees could be more optimal, so additional operators or employees are needed at both workstations. A high mental workload is also caused by financial pressure, which affects employee performance, focus, and morale. When employees feel financially stressed, they tend to experience anxiety that can interfere with concentration and work productivity. This can lead to errors in work, such as overfilling the bread with cream or delays in the fermentation process. In addition, this pressure can reduce motivation and morale, leaving employees feeling overwhelmed and less committed to their tasks. To overcome the mental workload caused by the insufficient number of operators, operators should be added to the fermentation and baking process and cream-filling workstations. The following is how it is calculated:

$$\begin{aligned}\text{Fermentation and baking process workstation} &= \frac{\text{Mental workload result of RSME method}}{2 \text{ operators}} \\ &= \frac{163,17}{2} \\ &= 81,58\end{aligned}$$

In optimizing the number of operators, one person should be added so that there are three operators in the fermentation and baking process workstation.

$$\begin{aligned}\text{Operator addition} &= \frac{\text{Mental workload result of RSME method}}{3 \text{ operators}} \\ &= \frac{163,17}{3} \\ &= 54,39\end{aligned}$$

$$\begin{aligned}\text{Cream-filling workstation} &= \frac{\text{Mental workload result of RSME method}}{2 \text{ operators}} \\ &= \frac{161,67}{2} \\ &= 80,83\end{aligned}$$

In optimizing the number of operators, one person should be added so that there are three operators in the cream-filling workstation.

$$\begin{aligned}\text{Operator addition} &= \frac{\text{Mental workload result of RSME method}}{3 \text{ operators}} \\ &= \frac{161,67}{3} \\ &= 53,89\end{aligned}$$

From the operators' calculation above, adding operators in the fermentation and baking process, as well as cream-filling workstations, can reduce the mental workload and effort previously exerted. In the fermentation and baking process, the original mental workload of 81.58 is now 54.39. Similarly, the previous mental workload of 80.83 in cream filling is now 53.89, so the number of operators or employees is optimal. Suppose the goal of adding more operators is not feasible. In that case, it can be overcome in another way, namely by cross-training employees to handle various roles to increase flexibility and reduce pressure on specific workstations. As for overcoming mental workload related to financial issues, it is by conducting a counseling program for employees, where this program not only empowers employees with financial knowledge but also provides them with a support system that can help manage stress and anxiety more effectively. In addition, improving how communication is conducted in the workplace also plays a vital role in addressing mental workload and financial stress. Open lines of communication can encourage employees to express concerns regarding their workload and financial situations. Regular check-in or feedback sessions can

create a more supportive environment where employees feel comfortable discussing challenges, improving workplace morale and productivity.

Conclusion

Based on the analysis and discussion above, it is concluded that the physical workload of all employees obtained using the FTE method gets a value between 1-1.28. it means the number of employees at CV Aurexell is optimal because the physical workload is normal. The mental workload obtained using the RSME method is 73.17 to 85.33, where operator 7 in the fermentation and baking process and operator 9 in cream-filling workstations get a great effort, and employees at other workstations get considerable effort. The optimal number of workers in the RSME method is six people for the dough-making, weighing, and molding workstation, 3 for the fermentation and baking workstation, 3 for the cream-filling workstation, and 13 for the packaging workstation, which means the number of employees could be more optimal, so it must be increased. If adding employees is not possible, it can be overcome in another way, namely by cross-training employees to handle various roles so as to increase flexibility and reduce pressure on certain workstations.

References

- Alfredo, A., & Raharjo, S. (2023). Upaya Peningkatan Kapasitas Produksi & Koefisien Efisiensi Improvement di Proses K-Contactor Backend pada PT X. *Jurnal Titra*, 11(2), 273–280.
- Arif, M. (2016). *Bahan ajar rancangan teknik industri*. Yogyakarta: Deepublish.
- Asarela, S., & Sari, R. P. (2023). Analisis Pengukuran Kerja Menentukan Waktu Baku Menggunakan Metode Jam Henti Terhadap Operator Persiapan Komponen (Studi Kasus: PT XYZ). *Jurnal Serambi Engineering*, 8(3), 6479–6486.
- Astuti, S., Lusua, V., & Khairunnisa, A. (2020). Perhitungan Waktu Standart Untuk Menentukan Jumlah Tenaga Kerja dan Kebutuhan Mesin/Alat pada Proses Produksi Reagen Alat/Asat (GPT) FS (IFCC mod) di PT PDL. *Jurnal Kalibrasi*, 3(2), 1–19. <https://doi.org/10.37721/kalibrasi.v3i2.738>
- Damayanti, M. K., Anindita, N., & Ahmad, F. (2023). Perencanaan Kebutuhan Pegawai Berdasarkan Analisis Beban Kerja Melalui Metode Fte (*Full Time Equivalent*) Pada Instansi X. *Jurnal Kebijakan dan Manajemen PNS*, 17(1), 1-14. <https://doi.org/10.61133/pns.v17i1.388>
- Dasanti, A. F., Jakdan, F., & Santoso, T. (2020). Penerapan Konsep Line Balancing Untuk Mencapai Kerja Di PT GARMENT JAKARTA. *Bulletin of Applied Industrial Engineering Theory*, 1(2), 2–7.
- Diana, Y. (2019). Pengaruh Beban Kerja Terhadap Kinerja Karyawan Di Housekeeping Departement Pada Hotel Bintang Lagoon Resort. *Jurnal Manajemen Tools*, 53(9), 193–205. <https://doi.org/10.54066/jurma.v2i2.1988>
- Erliana, C. I., & Mawaddah, S. (2019). Analisis Pengukuran Beban Kerja Supervisor Dan Fireman PT Perta Arun Gas Menggunakan Metode Defence Research Agency Workload Scale. *Industrial Engineering Journal*, 8(2), 4-9. <https://doi.org/10.53912/iejm.v8i2.411>
- Kabul, E. R., & Febrianto, M. N. (2022). Implementasi Metode Full Time Equivalent (FTE) dalam Analisis Kebutuhan Tenaga Kerja. *Ikraith-Ekonomika*, 5(1), 162–168.
- Mahawati, E., Yuniwati, I., Ferinia, R., Rahayu, P. F., Fani, T., Sari, A. P., ... & Bahri, S. (2021). Analisis Beban Kerja dan produktivitas kerja.

- Neksen, A., Wadud, M., & Handayani, S. (2021). Pengaruh Beban Kerja dan Jam Kerja terhadap Kinerja Karyawan pada PT Grup Global Sumatera. *Jurnal Nasional Manajemen Pemasaran & SDM*, 2(2), 105–112. <https://doi.org/10.47747/jnmpsdm.v2i2.282>
- Pangestu, D. A., & Asmungi. (2023). Analisis Kebutuhan Jumlah Tenaga Kerja Guna Meningkatkan Kapasitas Produksi Pada Ud. Sukri Dana Abad. *Journal of Industrial Engineering and Management System*, 16(1), 15–21. <http://dx.doi.org/10.30813/jiems.v16i1.4563>
- Prabowo, R. (2016). Penerapan Konsep Line Balancing Untuk Mencapai Efisiensi Kerja Yang Optimal Pada Setiap Stasiun Kerja Pada PT. HM. Sampoerna Tbk. *Jurnal Iptek*, 20(2), 9-20. <https://doi.org/10.31284/j.iptek.2016.v20i2.25>
- Purbasari, A. (2020). Pengukuran Waktu Baku Pada Proses Pemasangan Ic Program Menggunakan Metode Jam Henti. *PROFISIENSI: Jurnal Program Studi Teknik Industri*, 8(2), 116–128. <https://doi.org/10.33373/profis.v8i2.2805>
- Rahayu, E. P., Ratnasari, A. V., Wardani, R. W. K., Pratiwi, A. I., Ernawati, L., Lestari, S., ... & Prasetyo, E. (2022). *Kesehatan dan Keselamatan Kerja*. Pradina Pustaka.
- Rizqiansyah, M. Z. A. (2017). Hubungan antara beban kerja fisik dan beban kerja mental berbasis ergonomi terhadap tingkat kejenuhan kerja pada karyawan PT JASA MARGA (PERSERO) Tbk Cabang Surabaya Gempol. *Jurnal Sains Psikologi*, 6(1), 128817. <http://dx.doi.org/10.17977/um023v6i12017p37-42>
- Satria, D., Tiara, T., & Widjajanto, T. (2023). Analisis Beban Kerja Fisik Menggunakan Metode Cardiovascular Load Dan Beban Kerja Mental Menggunakan Metode Rating Scale Mental Effort Pada PT Citra Abadi Sejati Bogor. *Jurnal Teknologi Dan Manajemen*, 21(1), 25–34. <https://doi.org/10.52330/jtm.v21i1.77>
- Siahaan, H. D., & Pramestari, D. (2021). Analisis Beban Kerja Menggunakan Metode Rating Scale Mental Effort (Rsme) Dan Modified Cooper Harper (Mch) Di Pt. Bank X. *IKRAITH-Teknologi*, 5(2), 6–16.
- Sukmawati, R., & Hermana, C. (2024). Pengaruh Beban Kerja dan Stres Kerja terhadap Kinerja Karyawan. *Jurnal Riset Manajemen dan Bisnis*, 51-56. <https://doi.org/10.29313/jrmb.v4i1.4019>
- Suparmi, S., Siswanto, A., Siswadhi, F., Utami, S. S., Wahyudi, I., Hidayati, L., ... & Junitasari, J. (2023). *Manajemen Sumber Daya Manusia: Prinsip-Prinsip Dan Praktik Dalam Mengelola Organisasi*. PT. Sonpedia Publishing Indonesia.
- Sutalaksana, I. Z. (2006). *Teknik Perancangan Sistem Kerja*. Bandung: ITB.
- Wignjosoebroto, S. (2003). *Tata Letak Pabrik dan Pemindahan Bahan*. Surabaya: Guna Widya.