

## Workload Analysis in Quantity Optimization Labor Using FTE And RSME Methods in the Packaging Department of a Pharmaceutical Company

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### ABSTRACT

Human Resources (HR) is one of the most important parts of a company, as the main driver to achieve company goals. The company requires a workload calculation to determine the workload received by its employees. The method used in this workload calculation is Full Time Equivalent and Rating Scale Mental Effort to calculate the workload received by employees of the solid packing department in each packaging process. The results of this study on the blistering, sleeving, IPC, sealing, and shipping processes are in the normal category with a workload value in the range of 1-1.28, while the cartoning process is in the overload category with a workload value of 1.60. The results of the RSME value calculation on the blistering and sleeving processes get a weighting value in the range of 71-85 with a moderately large category, the IPC, sealing, and shipping processes get a weighting value in the range of 59-70 with a fairly large category, while the cartoning process gets a weighting value in the range of 86-100 with a large category. So it's necessary to add 1 employee so that the FTE value is distributed properly or the workload is normal and the RSME becomes fairly large.

**Keywords:** Workload analysis, Full Time Equivalent, Mental Effort Rating Scale.

### Introduction

Resources are human potential that is inherent in a person, which includes physical and non-physical potential. [1] In addition, human resources are also one of the input elements, together with other elements, such as: capital, materials, machines, and methods/technology are transformed through the management process into output in the form of goods and/or services in an effort to achieve company goals. [2]

The demands in facing challenges in the changes of this industrial revolution systematically have become a great need to face industry 4.0 as a tool to show the maturity of the company. The maturity model used is a model that targets employees to have comprehensive abilities in all fields. [3]

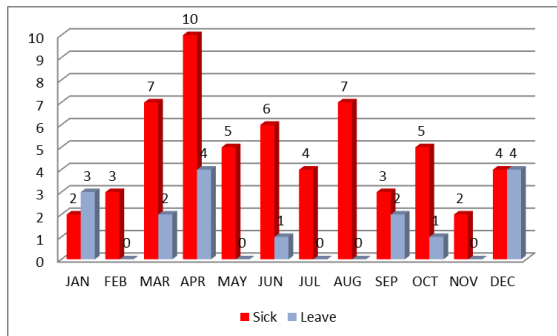
As the pharmaceutical industry in Indonesia develops, it indirectly encourages companies engaged in the pharmaceutical industry to be able to provide optimal service

and quality to meet market demand, where this is greatly influenced by HR factors and management system arrangements in the company. When these two factors synergize well, the company's goal of meeting market demand can be achieved. On the other hand, if one of the factors experiences obstacles in carrying out its duties, it will have a direct impact on the company's productivity.

The high demand for solid products has forced the company to increase its production capacity by bringing in new machines for the solid packing department's packing process in early 2023. With these changes, this study will focus on the solid packing department to see the factors affected by changes in the work process in the solid packing department.

Changes in the work process that occurred in the solid packing department to increase production capacity by bringing in new machines in the solid packing

department's packing process are indicated to be the cause of the decline in employee performance with high employee absences who were unable to come to work due to illness due to high workload or overload, as depicted in the graph of employee absences in the solid packing department as follows;



**Figure 1.** Solid Packing Department Attendance in 2023

Workforce or commonly called Human Resources (HR) according to Putri and Rahyuda [4] plays an important role in realizing the vision, mission and goals of the company that have been set and can determine the company's real achievements with existing resources. The success of an organization cannot be separated from the role of human resources through the quality of performance provided.

Human resource management is based on the concept that each employee is a human being, not a machine, and not merely a business resource. Human resource management is concerned with the policies and practices that managers must implement, regarding the human resource aspects of work management [5]

Ergonomics is a science or principle that studies humans as an internal component of a work system that includes physical and non-physical characteristics, human limitations, and the ability to design a system that is effective, safe, healthy, comfortable, and efficient so as not to cause musculoskeletal complaints.[6]

According to Wignjoesubroto [7] ergonomics is an effort in the form of science, technology and art to harmonize equipment, work machines, systems, organizations and the environment with human capabilities, abilities and limitations so that a healthy, safe,

comfortable, efficient and productive condition and environment is achieved through maximum and optimal use of the human body.

Ergonomics is known for its principles, which have distinctive characteristics, namely prioritizing health factors, safety, and comfort of human productivity. [8]

Workload is a task given to an employee to be completed using the employee's skills and potential and at a certain time. Workload refers to the amount of work or tasks an individual must complete in a given time period. Workload can be viewed from various dimensions, and one of them is by considering three main dimensions, namely physical workload, psychological workload, and time utilization aspects. [9]

According to Hastutiningsih [10] the workload imposed on employees can be categorized into three conditions, namely a workload that is too high (over capacity), a workload that meets standards, and a workload that is too low (under capacity).

In analyzing workload, a company/institution certainly wants the workload carried by an employee to be in accordance with the employee's competence/ability and not burden the employee. According to Koesmowidjojo, [11] the factors that influence workload are internal factors and external factors.

Workload analysis is a method for calculating the workload so that the number of workers needed to complete the workload can be calculated [12]. Workload analysis is the process of determining the number of hours of work used or needed to complete a job within a certain time. [13]

Working time measurement is a technique for conducting a large number of observations of the work activities of machines, processes or workers/operators. Work measurement by the sampling method is classified as direct performance measurement as is the case with measurement by the stopwatch method, because the measurement must be carried out directly at the workplace to be studied. The difference between the work sampling method and the stopwatch method is that the observer does not have to be continuously at the workplace but rather observes at times that have been determined randomly. [14]

This measurement of working time is related to efforts to determine the standard time required to complete a job. Simply put, measuring working time is a method for finding a balance between the human activities required and the output results produced. According to Ginting [15], basically time measurement is divided into two parts, namely the direct time measurement method and the indirect time measurement method.

Time Allowance is a factor that must be taken into account in determining standard time, allowance is given for three things, namely allowance for personal needs (needs allowance), eliminating fatigue (fatigue allowance), and obstacles that cannot be avoided during work (delay allowance). [16]

Rating performance is a process of assessment or evaluation carried out by observers on the speed of an employee's work. With the performance rating, it is expected to help employees to normalize their work tempo so that they can work consistently and efficiently. [16]

According to Sritomo [17] Performance rating can be calculated using the Westinghouse rating system table. "Here, in addition to the skills and effort stated by Bedaux as factors that influence humans, Westinghouse adds working conditions and consistency of employees in the work environment."

According to Dewi & Satrya [18] Full Time Equivalent (FTE) is a method used in time-based workload analysis by measuring the length of time to complete work and the time data is converted into the FTE time index. The implications of the FTE value are divided into 3 types, namely: underload, normal and overload. Based on the workload analysis guidelines issued by the State Civil Service Agency in 2010 as quoted in [19] the division can be seen in the following table:

**Table 1.** FTE table

No	FTE Value	Information
1	<1	<i>Underload</i>
2	1 – 1.28	Normal
3	>1.28	<i>Overload</i>

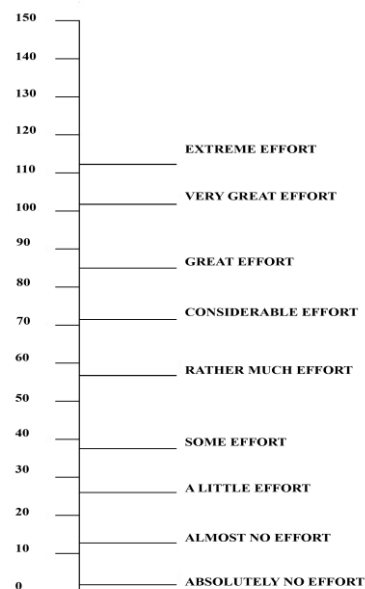
Source: State Civil Service Agency, 2010

To get the FTE value from the work process is as follows:

$$FTE = \frac{\text{Job completion time}}{\text{Effective working time}} \quad (1)$$

The Full Time Equivalent method is one method used in analyzing workload based on time by calculating the length of time needed to complete a job and then changing it into the FTE value index. [20] The purpose of using the Full Time Equivalent method is to simplify the calculation of workload by changing the hours of workload into the number of people needed to complete the job. [21]

Rating Scale Mental Effort (RSME) is a method that uses a rating/score scale for assessing mental work. This method is used to measure mental workload that only focuses on one dimension. The RSME method is a subjective mental workload measurement method with a single scale developed by Zijlstra et al (Zijlstra & Van Doom, 1985; Zijlstra & Meijman, 1989; Zijlstra, 1993; de Waard, 1996). [22]



**Figure 2.** RSME Method Rating Scale

The purpose of this study is based on the formulation of the problem, namely: 1. To determine the amount of workload in each process in the solid packing department, 2. To analyze the optimal workforce requirements based on workload calculations using the Full Time Equivalent (FTE) and Rating Scale

Mental Effort (RSME) methods, and 3. To recommend proposed workforce requirements in the solid packing department based on the results of workload analysis using the Full Time Equivalent (FTE) and Rating Scale Mental Effort (RSME) methods.

### Method

This research was conducted in one of the companies engaged in the pharmaceutical industry, located in North Jakarta City, DKI Jakarta Province. The research began with a literature study to determine the right method in analyzing workload, and research objectives, data collection, data processing and data analysis. The following is a research flowchart

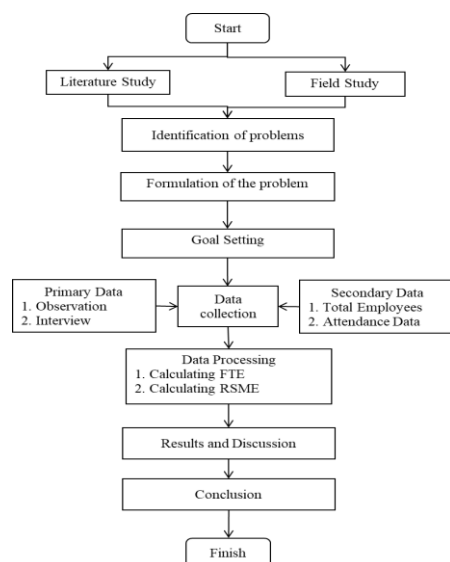


Figure 3. Research Steps

The purpose of the observation is to find out the real condition of the company at this time, especially those related to the object to be studied. In conducting observations, researchers are directly involved in the daily activities of the work process in each packing process in the solid packing department as a source of research data.

Interviews are used as a data collection technique to find problems that must be studied and also if researchers want to know things from respondents in more depth. In the interviews conducted, researchers conducted questions and answers with related parties in the solid packing department to find out more about the things needed for research needs.

Working time measurement is done to determine the time needed to carry out a work activity, which is done under normal working conditions and tempo. This working time measurement is measured to determine the cycle time which will later be used to calculate the normal time requirements and standard time.

The purpose of providing a percentage (%) allowance is to provide operators with the opportunity to do the things they have to do, so that the standard time obtained can be said to be complete working time data and represents the observed work system.

The purpose of providing adjustment values is to maintain the fairness of work, so that there will be no shortage of time due to the work being observed being too ideal. Adjustment factors in measuring working time are needed to determine the normal time of operators in a particular system. In this study, the method used in assigning adjustment factor values is the Westinghouse System Rating.

In this study, the calculation of normal time and standard time was carried out. The normal time and standard time calculated are times that have considered the calculation of the percentage of allowance and adjustment factors. This calculation is carried out to determine how long it takes for an operator to complete his normal work.

After obtaining the results of the normal time and standard time calculations, the research can be continued to calculate the optimal workforce at each work station studied using the Full Time Equivalent (FTE) method.

After conducting the interview, respondents will provide a rating on a scale of 0-150 for each Workload indicator, the research can be continued by providing a workload category after obtaining the average rating scale score for each indicator at each work station studied using the Rating Scale Mental Effort (RSME) method.

After knowing the total optimal workforce for each work station studied, data calculation analysis will be carried out using the Full Time Equivalent (FTE) and Rating Scale Mental Effort (RSME) methods. This calculation analysis contains a comparison of the actual number of workers with the optimal number of workers based on the FTE and RSME methods.

The conclusion and suggestion stage is carried out to briefly explain the formulation of the problem and its suitability to the objectives and benefits of the research. In addition to the conclusions given, the suggestions in this study can also be used as input and things that can be developed for researchers who will research similar problems.

### Results and Discussion

Data collection was conducted in the solid packing department which is divided into several work processes. The composition of the solid packing team can be seen in Table 2.

**Table 2.** Employee Composition

Process	Shift 1	Shift 2	Gender
Blistering	2	2	Man
Sleeve	1	1	Man
Cartoning	3	3	Woman
IPC	1	1	Woman
Sealing	1	1	Man
Shipping	1	1	Man
Amount	18		

The number of working days in the solid packing department is 5 days in one week, namely from Monday to Friday with 2 days off on Saturday and Sunday with 8 working hours per day which is in accordance with the provisions of working hours regulated in Article 81 number 23 of the Job Creation Perppu which amends Article 77 paragraph (2) of the Manpower Law. Working hours during a year in hours are presented in Table 3.

**Table 3.** Total Working Time

Red Dates and Weekends	Amount
1 Year 2024	366 Days
Annual leave	12 Days
National holiday	15 Days
Weekend	104 Days
Total Day Cuts	131 Days
<b>Total Working Days in 2024</b>	<b>235 days/year 1880 hours/year</b>

In this study, the factor allowance value used is the ILO (International Labor of Organization) Table approach. In determining

this allowance, researchers differentiate based on the job category in each process because the tasks performed are different and the fatigue caused will also be different.

**Table 4 .** Allowance

No	Process	Allowance (%)
1	Blistering	20
2	Sleeve	16
3	Cartoning	12
4	IPC	11
5	Sealing	9
6	Shipping	13

The mental workload effort rating questionnaire with the RSME method was conducted by giving six questions to employees of the solid packing department representing six mental workload variables in the RSME questionnaire. The results of the RSME questionnaire recapitulation are presented in Table

**Table 5.** RSME Questionnaire Results

Name	RSME Indicator					
	BK	KK	PK	UMK	KgK	KIC
HR	80	100	80	70	75	80
AW	90	95	75	75	80	85
GR	80	90	80	60	75	75
LA	85	80	75	80	70	90
NU	95	85	75	75	75	100
LI	100	90	80	95	70	110
IR	50	60	70	90	90	45
HE	70	50	70	50	55	70
TO	80	60	70	50	50	80
TB	85	90	85	80	85	80
AG	90	80	80	75	75	90
AL	90	85	80	70	80	80
US	95	85	80	85	85	95
DN	100	90	80	90	90	105
IT	90	90	85	95	80	95
AN	60	70	80	70	70	60
IW	70	70	70	65	50	70
CR	90	55	70	65	55	85

time is obtained from how long an employee does his work in 1 job description and the average time determined by the solid packing department in one job.

**Table 6.** Cycle Time

No	Process	Cycle Time
1	<i>Blistering</i>	1529.1
2	<i>Sleeve</i>	1498.1
3	<i>Cartoning</i>	2066.0
4	IPC	1400.2
5	<i>Sealing</i>	1684.2
6	<i>Shipping</i>	1598.5

To assess or evaluate the speed and accuracy of employees in the solid packing department according to the work carried out, an assessment is needed, namely a performance rating, because with this assessment it is hoped that the time required for work can be returned to normal.

**Table 7.** Adjustment Factors

No	Process	Rating Factor
1	<i>Blistering</i>	+0.25
2	<i>Sleeve</i>	+0.24
3	<i>Cartoning</i>	+0.28
4	IPC	+0.20
5	<i>Sealing</i>	+0.22
6	<i>Shipping</i>	+0.21

After getting the cycle time the next step is to calculate the standard time and normal time. The calculation of standard time and normal time is needed because to find out the time that is really needed by the technical team to complete one job description in reasonable conditions according to the % allowance and capabilities of each division.

**Table 8.** Recapitulation of Normal Time and Standard Time

Process	Cycle Time	Normal Time	Allo wanc e %	Standard Time
<i>Blistering</i>	1529.1	1911.3	20	2389.2
<i>Sleeve</i>	1498.1	1857.7	16	2211.5
<i>Cartoning</i>	2066.0	2644.5	12	3005.2
IPC	1400.2	1680.3	11	1887.9
<i>Sealing</i>	1684.2	2054.7	9	2257.9
<i>Shipping</i>	1598.5	1934.2	13	2223.2

In calculating the workload in this study, the method that will be used is the FTE method. The calculation is done by comparing the time used to complete one job with the available working time where the available working time during 2024 is 1880 hours/year

and the available working days are 235 days/year.

**Table 9.** Full Time Equivalent Recapitulation

No	Process	FTE Index	Information
1	<i>Blistering</i>	1.27	Normal
2	<i>Sleeve</i>	1.18	Normal
3	<i>Cartoning</i>	1.60	Overload
4	IPC	1.00	Normal
5	<i>Sealing</i>	1.20	Normal
6	<i>Shipping</i>	1.18	Normal

The mental workload analysis method used in this study is the Rating Scale Mental Effort (RSME). There are 6 main variables that are the instrument items in this questionnaire. The 6 instruments will be juxtaposed with 9 anchor points as an assessment of the mental burden of manpower using a rating scale. The results of the mental burden of employees in the solid packing department are presented in table 10 .

**Table 10.** Mental Workload Analysis

No	Process	RSME Average	Indicator Mental Burden
1	<i>Blistering</i>	82.08	Large enough
2	<i>Sleeve</i>	78.75	Large enough
3	<i>Cartoning</i>	87.36	Big
4	IPC	67.92	Quite Big
5	<i>Sealing</i>	63.33	Quite Big
6	<i>Shipping</i>	67.50	Quite Big

The calculation of the workload using the FTE method above shows that in the blistering, sleeving, IPC, sealing, and shipping processes the results are <1.28 and> 0.99 which means normal). While for the cartoning process the results are > 1.28 which means the workload received is overloaded. So it is necessary to calculate the number of recommended workers for the cartoning process which is presented in Table 11.

**Table 11.** Recommended Manpower Requirements

Process	FTE Index	Recommendations for Adding Workforce	FTE Index	Caption
<i>Blistering</i>	1.27	-	1.27	Normal
<i>Sleeve</i>	1.18	-	1.18	Normal
<i>Cartoning</i>	1.60	1	1.22	Normal

IPC	1.00	-	1.00	Normal
Sealing	1.20	-	1.20	Normal
Shipping	1.18	-	1.18	Normal

Calculation of mental workload using the RSME method, it is known that the results of the weighting of the six RSME indicators that have been carried out by employees of the solid packing department are the blistering and sleeving processes, getting a weight in the range of 71-85 which means quite large, for the IPC, sealing and shipping processes getting a weight in the range of 59-70 which means quite large, while for the cartoning process getting a weight in the range of 86-100 which means large

With the number of cartoning process employees as many as 6 people (3 people per shift) still having a mental burden category, it is necessary to add 2 workers (1 person per shift) to reduce the mental workload felt by cartoning process employees. Here is the calculation

$$\begin{aligned} & \text{Average initial mental workload} \\ & = \frac{\sum \text{RSME workload score}}{6 \text{ existing workers}} = \frac{524,17}{6} = 87,36 \text{ (Large)} \\ & \text{Mental workload reduction} \\ & \text{(recommendation)} \\ & = \frac{X}{(n+2)} = \frac{524,17}{6+2} = \frac{524,17}{8} = 65,52 \text{ (Quite Large)} \end{aligned}$$

## Conclusion

After calculating the Full Time Equivalent (FTE) and Rating Scale Mental Effort (RSME) in each packing process in the solid packing department, it is known that the amount of workload in the blistering process obtained an FTE value of 1.27 (norm/fit) and RSME 82.08 (quite large), sleeving obtained an FTE value of 1.18 (norm/fit) and RSME 78.75 (quite large), IPC obtained an FTE value of 1.00 (norm/fit) and RSME 67.92 (quite large), sealing obtained an FTE value of 1.20 (norm/fit) and RSME 63.33 (quite large), shipping obtained an FTE value of 1.18 (norm/fit) and RSME 67.50 (quite large), while for the cartoning process obtained an FTE value of 1.60 (overload) and RSME 87.36 (large).

Based on the results of FTE and RSME calculations, it can be seen that the optimal number of workers for the blistering, sleeving,

IPC, sealing, shipping processes is appropriate, so there is no need to add or reduce the number of employees. While for the cartoning process, 4 workers are needed per shift where currently the number of cartoning process employees is only 3 people per shift so that an additional 1 person per shift is needed.

The proposed improvement of workforce requirements so that the FTE value is distributed properly or normally and the RSME rating does not fall into the large category that can be carried out by the solid packing department is by adding cartoning process employees according to the calculations that have been made.

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## Author Contribution

GR, HW: Conceptualization, method, writing, analysis, supervision, review, HW :editing review, HW: methodology, GR:analyses, GR: drafting, GR: experiment, data experiment,

## Conflict of Interest

The Authors declare no conflict of interest

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