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Analysis of employee workload optimization on manual packing operators in the preparation of goods "all type 20 gr gusset bag" by using the workload analysis method in PT XYZ

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ABSTRACT

PT. XYZ is a manufacturing company that produces chemicals, namely industrial glue located in Batamindo Industrial Park, Muka Kuning, Batam. The packing department is an important department in the production process if in this process there are obstacles and problems there will be delays in delivery. One of the concerns is the workload in the gusset bag packing process. Workload is measured based on the work station and each individual packing operator. By making observations using the workload analysis (WLA) method which is seen from several assessment factors such as identification of productive and non-productive activities, productive percentage, performance rating, and allowance or allowance, the workload value in the gusset bag packing process can be known. The observation results show that the finish goods packing station experiences an overload workload of 135%. The workload at this station is high because this process requires extra energy to do a lot of job desc compared to other stations. For workload per individual operator, it is known that operators who have worked longer have a high workload than new operators. The workload for the workstation is more influenced by the high allowance factor and for the operator workload the influencing aspect is the performance rating.

INTRODUCTION

In the production section of a manufacturing company, there are logistics activities, one of which is the process of preparing goods (packing) before the goods are distributed or sent to the customer. The packing station plays an important role because this is where the finishing of the final product takes place. In the context of manufacturing companies, ergonomics is very important to improve employee work efficiency, comfort and safety. Ergonomics is a discipline of science, art, and technology that seeks to adapt tools, work environments, and human abilities to their limitations so that they can work optimally without interfering with their work results (Tarwaka & Sudjaeng, 2004)

This research was conducted at XYZ Company which is a manufacturing company and produces chemical raw materials, namely producing glue with various types, types and sizes. PT.XYZ located in Batamindo industrial park is the only branch of the company in Indonesia and its center is in Singapore. PT.XYZ has two buildings and is divided into seven departments, namely, filling, tube, flame, packing, store, quality control and administrative staff.

The focus of researchers in the packing department is Ind Glue or manual packing. Manual packing here is different from group A&B packing which uses machines to package a product. In manual packing all processes are carried out by the operators themselves without the help of machines. Starting from box identification, product accessories, product packaging, checking

products until they enter the finish goods box which is then weighed and recorded. In this indglue packing there are various processes to make 1 box of finish goods.

The five-member indglue packing feels a little overwhelmed to achieve the target of working on products. Often they do not reach the daily target despite their best efforts. The results of the daily output of packing indglue when working on all types of 20gr gusset bag products illustrate that operators cannot meet the target. Not achieving the target is indicated by several problem factors, which can be from manpower or labor, materials, techniques / ways of working, etc.

For the problem of not meeting the production target in a day there are several indications that make the target not achieved. The target calculation was made before there was a material change where at that time the specified number of targets could be achieved by the indglue operator.

This study focuses on the packaging department, specifically the final step before a product is transformed into finished items and delivered to a consumer. The majority of the packaging department's employees are women. The packaging department is divided into three sections: Group A, Group B, and Indglue (packaging Manual). One supervisor, two leaders, one assistant leader, and one technician and maintenance person are assigned to each group. Manual packing here is different from group A&B packing, which uses machines to pack a product. In manual packing, all processes are carried out by the operator himself without the help of machines. Starting from box identification, product accessories, product packaging, and checking products until they enter the finished goods box, which is then weighed and recorded. In this indglue packing, there are various processes to make 1 box of finished goods.

Packing indglue, which now consists of 5 people, feels a little overwhelmed to achieve the target of working on products. Often they do not reach the daily target despite their best efforts. Packing indglue, which now consists of 5 members, feels a little overwhelmed to reach the target of product work. Often they do not reach the daily target despite their best efforts.

Seeing the condition of the work in packing indglue, the researcher wants to provide a solution, namely by determining the workload and whether the number of workers is in accordance with the workload generated by a job in each work station. By observing the existing work process, productive and non-productive activities will be known as material for calculating workload.

The following elements must be in good balance to ensure optimal health and work productivity, namely (Mahawati et al., 2021): 1) Workload 2) Additional burden due to work environment 3). Work capacity. The amount of work an employee has to do, both mentally and physically, is referred to as workload. Every profession has constraints on its performance, and every employee is capable of handling responsibilities that may involve social, mental, or physical difficulties.

Unevenly distributed workloads can result in an uncomfortable work atmosphere because employees feel that their workload is too much or too little (Wibawa, Sugiono, & Efranto, 2014). This research measures workload to determine the optimal labor requirement based on the workload received by packaging workers using workload analyses. (Nasyith Fahmi Ramadhani Zein, 2022). Consistent with the findings of the study **.** (Usman, 2020)**,** (Candrianto, 2020)**,** (S.F.I.Mahmudin, 2020) The appropriate labor needs may be ascertained by workload analysis utilizing the Workload Analysis (WLA) approach, which can also offer information on how to allocate staff resources to finish the assignment.

LITERATURE REVIEW

The theoretical review is used as a foundation, based on references, and arranged as stages in analyzing the problem. Broadly speaking, the theoretical review includes the packing

and packaging process, workload, and previous research studies used as a reference and determination of the analysis.

Human Resources

Humans were created by God as the smartest creatures among others. Individual humans differ in terms of intelligence, characteristics, and behavior. However, humans can be managed and organized to achieve common goals. A person's physical and mental capacities are his or her human resources. Although environment and heredity have an impact on behavior and attributes, the desire to satisfy personal desires drives work motivation. Innate intelligence is the foundation, while skills are learned through effort. The best concepts, innovations, creativity and ways of working are generated by utilizing each person's unique intelligence and abilities (Marnis, 2008).

Human Resource Management (HRM)

Human resource management (HRM), is the act of utilizing humans as workers as much as possible, both mentally and physically. Individual utilization management is a set of tactics, procedures, and efforts aimed at achieving business goals through the integration of organizational and people demands (Sedarmayanti, 2017).

Workforce

Labor is the main asset of a company, and its needs must be maintained and met. Therefore, the workforce is the main wealth of the company, and without them, the company's activities will not occur (Syukron, 2014). Labor is involved in making plans, systems, procedures, and goals.

Workload

Some experts in the book (Rino, 2020) define workload as follows:

1) Nurmianto (2003) workload is a series of tasks that must be completed by staff members within a certain period of time.
2) Workload is defined by Irwandy (2007) as the average frequency of activity for all work performed within a certain period of time. It includes both mental and physical workload.
3) Haryanto (2010) workload refers to the quantity of tasks that a person or group of people must perform as part of routine activities within a certain period of time.

Productivity

The productivity of a company is defined as its capacity to produce goods within a certain period of time. Productivity capacity is determined by the quantity produced, the speed of production, and the quality of the product in relation to established organizational requirements (Fahmi, 2016).

Packaging of Goods

(Kotler & Armstrong, 2012) defines "Packaging involves designing and producing the container or wrapper for a product" which means "packaging involves designing and producing the container or wrapper for a product" indicating that activities related to design and production are part of the packaging process; the main purpose of packaging is to keep the product to maintain its quality.

METHOD

This research uses quantitative descriptive methodology. Research data in the form of numbers are assessed using statistics as a test instrument for calculation, and the findings of

quantitative research are based on positivism (concrete data), according to (Sugiyono, 2019). Research used to provide a methodical, accurate, and correct description of a social or natural event is called quantitative descriptive research, according to (Sugiyono, 2019). The purpose of providing facts and research findings as data in the form of calculated numbers is to enable researchers to conduct scientific investigations methodically. This research uses the work load analysis (WLA) method.

The work load analysis (WLA) method is an explanation of the workload required in a company unit. This method will provide information regarding the allocation of employee resources to complete the workload. Work Load Analysis (WLA) is a method to determine how many workers are needed to complete a job. The determination of the number of workers in this method considers the workload factor. Workload is the difference between a worker's capacity or ability and the responsibilities or demands of the work given. (Hancock & Meshkati, 1988)

Workload can be both physical and mental. Therefore, determining the number of workers must be in accordance with the mental and physical workload to avoid fatigue that can harm the workforce and the company. The components that will be processed in WLA are the working hours of each worker, the amount of production, working days, and standard time.

This method can inform the optimal allocation of human resources in accordance with the workload (Wardah & Adrian, 2017). The use of the WLA method can fulfil the need to increase the effectiveness, efficiency, and professionalism of human resources in each task. The WLA method can be used in various problems, such as analysing ergonomic levels, occupational safety and health levels, and so on.

In this research, there are several stages of research conducted at PT.XYZ for 6 months (January-June 2024). The first stage is done by direct work measurement. Data collection is done by taking direct work measurements with work sampling of the workforce in the ind glue packing section. All activities carried out by operators are adjusted to the specified activity elements which are then categorized as productive and activities outside those that have been determined are categorized as non-productive activities

The sample of this research is operator workers who are in five work stations namely capping, packing GB, Insert accessories, Sealing, and packing FG. In the implementation of this research, observations were made and workload calculations were calculated based on operator workers who worked in manual packing when working on gussetbag products. Observations are made to determine productive and non-productive activities, determine allowances and rating factors/performance ratings for each worker. The research uses a 5% level of accuracy, which means that observations are allowed to average a maximum deviation of measurement results of 5% and a 90% confidence level, which is the possibility of successfully getting it by 90%.

When conducting work sampling observations, all activities by workers in accordance with the work elements are categorised as productive and activities outside the work elements are categorised as non-productive activities.

The second stage in this research is to determine the performance rating and allowance value using the wasting house method. The wasting house method is a measurement on the assessment of 4 factors that are considered to determine the conditions in a job and how to work.

Table 1. Table Performance Rating Wasting House System

Skill			**Effort**		
+0.15	A1	Super skill	+0.15	A1	Super skill
+0.13	A2		+0.13	A2	
+0.11	B1	Excellent	+0.11	B1	Excellent
+0.08	B2		+0.08	B2	
+0.06	C1	Good	+0.06	C1	Good
+0.03	C2		+0.03	C2	
+0.00	D	Average	+0.00	D	Average
-0.05	E1	Fair	-0.05	E1	Fair
-0.10	E2		-0.10	E2	
-0.16	F1	Poor	-0.16	F1	Poor
-0.22	F2		-0.22	F2	
Conditions			**Consistency**		
+0.06	A	Ideal	+0.06	A	Ideal
+0.04	B	Excellent	+0.04	B	Excellent
+0.02	C	Good	+0.02	C	Good
0.00	D	Average	0.00	D	Average
-0.03	E	Fair	-0.03	E	Fair
-0.07	F	Poor	-0.07	F	Poor

Sumber: Wignjosoebroto(2003)

The formula for calculating the adjustment factor (Sutalaksana, 2006).

TF = F. Skill + F. Effort + F. Condition+ F. Consistency .....(1)

Formula for calculating adjustments

P = 1+ TF .....(2)

Description:

TF = Total factor value

F = Factor based on wasting house table

P = Adjustment value

Table 2. Allowance Value Weighting Table: Allowance ILO

No	Factors	Work Example	Load Equivalent	Allowance	
A	**Labour expended**			**Male**	**Female**
1	Negligible	Working at a desk, sitting	No load	0.0-6.0	0.0-0.6
2	Very light	Working at a desk, standing	0.0-2.25 kg	6.0-7.5	6.0-7.5
3	Mild	Shovelling, light	2.25-9.00	7.5-12.0	7.5-16.0
4	Medium	Hoeing	9.00-18.00	12.0-19.0	16.0-30.0
5	Heavy	Swinging heavy hammer	18.00-27.00	19.0-30.0	
6	Very Heavy	Heavy shouldering	27.00-50.00	30.0-50.0	
7	Unusually Heavy	Carrying heavy sacks	Diatas 50 kg		
B	**Work Attitude**				
1	Sitting	Work Light sitting	0.00-1.0		
2	Standing on two feet	Body rests on two legs	1.0-2.5		
3	Standing on one leg	One foot works on a control device	2.5-4.0		
4	Lying down	At the side, back or front of the body	2.5-4.0		
5	Bending	Body bent over resting on both feet	4.0-10.00		
C	**Work Movement**				
1	Normal	Hammer-free swing	0		
2	Somewhat restricted	Limited swing of the hammer	0-5		
3	Difficult	Carrying heavy loads with one hand	0-5		
4	In limited limbs	Working with hands above the head	5-10.0		
5	All limbs limited	Working in narrow mining aisles	10.00-15.00		
D	**Eye Fatigue**		**Lighting**		
1	Intermittent vision	Carrying measuring instruments	Good	Bad	
2	gaze that must be continuous	Meticulous work	0.0-6.0	0.0-6.0	
3	vision that must be continuous Fixed focus	Meticulous inspection	6.0-7.5	6.0-7.5	
4	gaze that must be continuous Changeable focus	Checking for defects in the fabric	7.5-12.0	7.5-16.0	
5	vision that must be continuous with high concentration and fixed Focus		12.0-19.0	16.0-30.0	
6	gaze that must be continuous with high concentration and changing focus		19.0-30.00		

E	**Temperature State of Workplace**	Temperature (°C)	Normal Fatigue	Excessive	
1	Frozen	Below 0	Above 10	above 12	
2	Low	0-13	10-0	12.-5	
3	Medium	13-22	5-0	8-0	
4	Normal	22-28	0-5	0-8	
5	High	28-38	5.-40	8-100	
6	Very high	Above 38	Above 40	Above 100	
F	**State of Atmosphere**				
1	Good	ventilated room	0		
2	Fair	Ventilation is poor, odours are present and not harmful	0-5		
3	Not good	The presence of toxic dusts is non-toxic but numerous	5.-10		
4	Poor	presence of harmful odours that require the use of protection	10.-20		
G	**Good environmental conditions**	0			
1	clean, healthy, bright, low noise	0			
2	Repetitive work cycles between 5-10 seconds	0-1			
3	Repetitive duty cycle between 0-5 seconds	1.-3			
4	Very noisy	0-5			
5	If influential factors can reduce quality	0-5			
6	Feeling of floor vibration	5.-10			
7	Exceptional circumstances (sound, cleanliness, etc.)	5.-15			
8	Supplementary Notes: Allowance for personal needs for men =0-2.5% and women=2-5%				

The third stage is a statistical test or data uniformity test which is carried out to determine whether the data collected is uniform according to the level of confidence of the observations marked by the data still being between the upper control limit (BKA) and the lower control limit (BKB). Before looking for BKA and BKB, first calculate the standard deviation with the formula:

$$\alpha = \sqrt{\frac{\sum(x-\bar{x})^2}{N-1}} \quad \text{.....(3)}$$

Description:

$\bar{x}$= average

α = Standard deviation

k = Confidence level

Finding the upper control limit (BKA) and lower control limit (BKB)

BKA =$\bar{x}$ + kα ..... (4)
BKB = x̄ – kα ..... (5)

After the data is said to be uniform, then do a data sufficiency test. The data sufficiency test is carried out to determine whether the data collected is sufficient and meets the specified accuracy requirements. if the data collected is insufficient, it is necessary to increase the amount of data.

$$N' = \left[\frac{\frac{k}{s}\sqrt{N\sum x^2-(\sum x)^2}}{\sum x}\right]^2 \quad \text{..... (6)}$$

Description:
k = Confidence level
90%=3
95%=2
s = degree of accuracy (5%-15%)
N = Amount of observation data
N' = Number of theoretical data
The provisions if N'< N data is sufficient, N'>N data is lacking and additional data must be added.

The next step after knowing productive and non-productive activities will be to find the percentage of productive time for each work element. Using the formula:

$$Pi = \frac{e}{n} \quad \text{..... (7)}$$

Description:
Pi = percentage of time in
e = productive/non-productive time
n = total time available

The last stage is to calculate the workload using the workload analysis method which aims to find out how much workload is received by the workforce so that the next step can be taken if it is known that the workload is too large. Workload can be calculated using the formula:
Worklooad = % Productivity x Performance rating x (1+Allowance) ..... (8)

The workload assessment category consists of several levels including the following (Sutalaksana, 2006):

Category	Scale
Very high	81-100
High	61-80
Medium	41-60
Low	21-40
Very low	0-20

From the results obtained in the workload analysis, it will be known where the excessive workload is. Researchers calculate the workload at each workstation and each operator.

RESULTS AND DISCUSSION

Identification of productive and non-productive activities in the gusset bag packing process which consists of five work stations, namely capping, inserting accessories, packing gusset bag, sealing and packing finish goods. Productive activities at work stations in the Gusset bag packing process can be identified through job descriptions by direct observation and interviews with workers and leaders in the manual packing section. Explained by the results of interviews with the leader of the packing section that there are several non-productive activities at each work station.

When conducting work sampling observations, all activities by workers in accordance with the work elements above are categorized as productive and activities outside the work elements above are categorized as non-productive activities.

Table 3. Productive and Non-Productive Activities

Work Station	Productive	Non Productive
Capping and glue-checking	• Putting a cap on the glue • Stacking the stamped glue • Checking the glue • Separating reject glue	• Discarding empty boxes • Calling general
Insert Acsosoris	• Checking GB type and lot • Giving accessories • Putting the GB into the box	• Separating rejects
Packing Gussetbag	• Weighing GB per box • Putting glue into GB • Stacking into boxes	• Separating rejects
Sealing	• Sealing the GB • Picking up the goods that have been arranged	• Redoing a bad seal • Pouring the product onto the table
Packing Finish Goods	• Making inner box • Making finished goods box • Packing GB into inner boxes • Weighing the packed inner boxes • Laying protective packaging on the inner box • Packing inner boxes into finishgoods boxes	• Organizing the inner box • Replacing tape and duct tape • Patching inner box/carton box

Source: Data processed, 2024

Adjustment (Performance Rating)

Adjustment of performance rating at each gusset bag packing work station. Determination of the adjustment factor using the Westinghouse system method, in this case because the method considers more complete factors so that the results obtained are more accurate. In the Westinghouse system method considers four factors that are considered to determine reasonableness or impropriety at work. The four factors are ability (skill), effort, working conditions (condition), and consistency. The data obtained are the results of observations of researchers accompanied by the leader who guards or person in charge (PIC) of production in the manual packing section.

Table 4. Workstation Performance Rating Table

Work Station	*Skill*	*Effort*	*Condition*	*Consistency*	*Performance Rating* 1+TF
Capping and checking	+0,03 Good	+0,02 Good	0,00 Average	+0,01 Good	1,06
Insert Acsosoris	+0,03 Good	+0,02 Good	-0,03 Fair	+0,01 Good	1,03
Packing Gussetbag	+0,03 Good	+0,02 Good	0,00 Average	+0,01 Good	1,06
Sealing	+0,03 Good	+0,02 Good	-0,07 Poor	+0,01 Good	0,9
Packing Finish Goods	+0,03 Good	+0,02 Good	-0,03 Fair	0,00 Average	1,02

Source: Data processed, 2024

The results of the analysis in Table 4 are adjustments to the gusset bag packing process at each work station. The first station is the Capping and glue checking process where in this station has a factor value of skill (+0.03), effort (+0.02), and consistency (+0.01) in the good category because this process is a basic process that is generally easy to understand, namely providing a cap on each product unit. And it can also be said that workers work with good quality, work stably, coordinated movements well and quickly. For the conditions factor (0.00) at the capping station, the value is average because the work has a repetitive cycle and must pour glue onto the table when there are few items on the table, and work at the table sitting not standing.

The second station is insert accessories, which is providing applicators for products that will be packaged. This station also has a factor value of expertise (skill: +0.03), effort (+0.02), and consistency (+0.01) in the good category because in essence the work done is still easy and also not too risky so that workers can still work stably and are still well coordinated. It requires good effort to move quickly so that the next process does not run out of goods. For the condition (-0.03), which is fair in the process of inserting accessories, there are activities to check the lot and type on the gusset bag and after that it is filled with accessories such as safety pins, capillary and silica gel, the movement during this process must be fast and make workers rush for fear of running out of goods so that conditions will panic and the goods will be given untidy, allowing the accessories to come out of the gusset bag packaging and accessories to fall apart on the table.

The third station, gusset bag packing, is the process of putting the glue that has been molded into the gusset bag that has been filled with accessories. This station has a factor value of skill (+0.03), effort (+0.02), and consistency (+0.01) in the good category because this process is also done in the same way and requires good effort so that the packing process moves quickly and produces good folds to facilitate the next process. For the condition factor (0.00) at the gusset bag packing station, the value is average because the gusset bag packing process is done sitting at the table and the gusset bag packing is in line with the capping and insert accessories process so when these two processes are hampered, the gusset bag packing process will also stop.

The fourth station is the sealing process carried out using a sealing machine operated by one operator. This station has a factor value of skill (+0.03), effort (+0.02), and consistency (+0.01) in the good category because the sealing process requires good ability and effort at work. Proficiency and knowledge of techniques or how to seal is very influential on the output that will be packaged into finished goods. But unfortunately for working conditions (-0.07) because this

process is carried out standing in front of a sealing machine that emits heat, taking goods to the previous process, namely packing gusset bags and handing over goods to the process of packing finish goods.

And the last station on packing gusset bag is packing finish goods, namely packing goods that have been sealed into the inner box and then into the finish goods box. For this station has a factor value of expertise (skill: +0.03) and effort (+0.02) good category where expertise and effort in this process must be mastered and well coordinated and work stably so as not to be overwhelmed in the finish goods packing process. For consistency (0.00), which is average because packing finish goods is in line with the sealing process if the goods in the sealing process are there, packing finishgoods will be smooth. Then in condition (-0.03) fair is the same as insert accessories because this process must have a fast movement such as rushing because if the movement is long the goods will accumulate on the table and if at the end the goods are not packed then it is not counted as output that day.

Adjustment of performance rating for each individual gusset bag packing operator.

Table 5. Individual Operator Performance Rating Table

Operator	Skill	Effort	Condition	Consistency	Performance Rating 1+TF
OPR 1	+0.08	+0.08	+0.04	+0.04	1.24
	Excellent	Excellent	Excellent	Excellent	
OPR 2	+0.06	+0.06	+0.02	+0.04	1.18
	Good	Good	Good	Excellent	
OPR 3	+0.06	+0.03	+0.02	+0.04	1.15
	Good	Good	Good	Excellent	
OPR 4	+0.03	+0.03	0.00	0.00	1.06
	Good	Good	Average	Average	
OPR 5	+0.03	0.00	0.00	0.00	1.03
	Good	Average	Average	Average	

Source: Data processed, 2024

From table 5, it can be seen that the adjustment of individual operator workers explains that OPR 1 has a high adjustment value, which is excellent for each assessment factor such as skill (+0.08), effort (+0.08), working conditions (+0.04) and consistency in doing work (+0.04). OPR 1 has a very good ability or ability to work with 4 years of work experience. Efforts to always meet targets and efforts to teach new operators in the gusset bag packing process. Conditions and consistency in doing good work, namely rarely taking leave or sick leave, working neatly, quickly and well organized and able to handle team members after being entrusted by the leader.

For the adjustment value, OPR 2 and OPR 3 have almost equal values because they have both mastered the work process and all materials in the gusset bag packing process. For expertise (skill: +0.06) both are categorized as good but for effort OPR 2 (effort: +0.06) is greater than OPR 3 (effort: +0.03) because there are slight differences in responsibilities in the work process. OPR 2 is more entrusted with helping from the sealing process to packing finish goods while OPR 3 helps with the GB packing process and insert accessories. The condition and consistency of both are also almost equal, namely good for (condition: +0.02) and excellent in consistency (+0.04) doing their work.

While OPR 4 and OPR 5 are new employees who of course have not mastered the field of work and job descriptions so that for expertise they are still learning or still average and for their responsibilities are also less than operators who have worked longer. For OPR 4 effort (+0.03),

the category is good because OPR 4 is more sensitive to the work at hand, not having to wait to be told or told what to do and how. Reinforced by the results of an interview with the leader of manual packing who said "I divide or place opr according to their work abilities. Placing employees who have longer work experience at complex work stations and new employees at work stations that are easy and less risky".

Allowance

Allowance is a leeway factor in doing work. Below are the results of the allowance assessment at each workstation. The assessment below is based on observations and adjusted to the table of determining the value of each observed factor. Allowances are given for three things, namely personal needs, eliminating fatique and unavoidable obstacles (Sutalaksana, 2006).

Table 6. Workstation Allowance Table

Workstation	Labor	Work Attitude	Work Movement	Eye Fatigue Mata	Room Temperature	atmospher	Environment	Woman's personal	Allowance (%)
Capping	4	1	0	3	3	2	2	3	18
Packing GB	5	1	4	3	3	2	3	3	24
Insert Acsesoris	4	1	3	3	3	2	3	3	22
Sealing	5	2	3	4	4	4	4	3	29
Packing FG	7,5	1	5	4	6	4	5	3	35,5

Source: Data processed, 2024

From table 6, it is known that there are five work stations, namely capping, GB packing, Insert accessories, Sealing, and FG packing, each of which has different allowances. The capping station for the energy expended is negligible because it works at the table, sits "4" and puts glue on the table. The working posture is sitting and the work is light "1". Work movements are normal and easy "0". For eyestrain "3" due to almost continuous gaze on the glue to be stamped and careful checking. Normal room temperature "3" in an air-conditioned place is 22°C. The atmosphere is "2" because the ventilation conditions are poor and there are harmless odors from chemicals such as acetone, glue, and kerosene. Finally, the environment is "2" because the work cycle repeats between 0-5 seconds.

The Gusset bag Packing Station (GB) expends "5" of the same energy working at a desk, sitting but expends more energy to put glue into the gusset bag and fold and arrange it into boxes. For work attitude "1" because the work is sitting and light. Work movement "4" is somewhat limited because this process must be fast. Eye fatigue, room temperature and atmosphere are the same as in the capping process due to the continuous view of the GB and glue to be packaged to ensure again that no rejects escape. The room temperature is normal and the atmosphere lacks ventilation or blowers. And also gusset bag packing also has a repetitive work cycle of 0-5 seconds.

Next is the insert accessories station which has a value of energy expended of "4" because it is still the same work at the table and sitting. Work attitude "1" because it is still sitting and light. For work movement "3" is somewhat limited because after GB is sorted, it is immediately filled with accessories and must be fast because it can run out of goods and also

checking lots and types must focus because rejects are still often passed. Eye fatigue, room temperature, atmosphere, and work environment are the same as packing gusset bags.

The sealing station for the energy expended is "5" and the work attitude is "2" because the sealing process is carried out by standing on two feet and working at a table. Work movement "3" because you have to follow the lines and grooves on the sealing machine so that the seal results are perfect. Eye fatigue "4" is still in a state of almost continuous vision and focus to adjust the point that must be sealed. Room temperature "4" due to heat from the sealing machine reached a temperature of 28℃. For the atmosphere "4" there is still a lack of ventilation or blowers and there is also a scorching smell / smell of burnt plastic from the sealing process. Environment "4" repetitive work cycles of 0-5 seconds and noise from the machine and from falling items after sealing.

The last station packing finish goods (FG) the most energy-consuming "7.5" and work attitude "1" because even though it is done at the table and sitting is said to be light but a lot has to be done in this process such as prepare inner box and cardboard finish goods, packing into the inner, check the scales per-inner according to quantity, then provide protective packaging (plastic) and finally packing into cardboard finish goods. Work movement "5 " is difficult because the process of inserting items that have been sealed into the inner must be folded neatly to fit and not damage the visual shape of the inner box. Eye fatigue "4 " is still the same because of the almost continuous view of the lot and the result of the seal to be packed must be good no less and no more. For room temperature "6 " because of the amount of energy expended and a lot of moving will make the temperature hot. The atmosphere is still the same because it is in the same room. And for the state of the environment "5 " the narrowness of the packing table area plus the sound of the goods that after being sealed were poured on the table for packing.

After making observations and assessments in each work station in the process of packing gusset bag researchers also observed for each individual labor force that performs work in this process. Similar to the allowance table based on work stations, the following are the results of observations and assessments of allowance for each operator or workforce.

Information related to the workforce working in the gusset bag packing process.

Table 7. Packing Operator Information

Operator	Work experience	Age	Last education
OPR 1	4 years	29 years	high school equivalent
OPR 2	2.5 years	24 years	high school equivalent
OPR 3	2.5 years	23 years	high school equivalent
OPR 4	6 months	23 years	high school equivalent
OPR 5	4 months	19 years	high school equivalent

Source: Data processed, 2024

Allowance for each operator on the packing Ind glue.

Table 8. Individual Operator Table Allowance

Operator	Labor	Work Attitude	Work Movement	Eye Fatigue	Room Temperature	AtmosFer	Environment	Woman's personal	Allowance (%)
OPR 1	7	1	0	6	5	2	3	3	27
OPR 2	6	1	0	5	5	2	3	3	25
OPR 3	5	1	0	5	5	2	3	3	24
OPR 4	4	1	0	3	5	2	1	3	19
OPR 5	3	1	0	3	5	2	1	3	18

Source: Data processed, 2024

Analysis results for Table 8 shows the allowance allowance of each operator. OPR 1 the energy expended "7 " is high because the operator spends more energy, for example teaching or training new people, more help is requested from the leader. for work attitude "1 "and work Movement" 0 " the same is still normal light work and work at the table sitting. Eye fatigue "6 " because it requires careful vision in working opr 1 more checking material and asked by the new opr about work.

OPR 2 and OPR 3 are also included in the old employees who have mastered the work process a little difference for the energy expended according to the leader OPR 2 "6" is more helpful if OPR 1 is overwhelmed OPR 3 "5" because it helps in easier processes. New employees such as OPR 4 and OPR 5 work normally, it's just that there is a difference in the energy expended because the leader's interview results convey that "I divide or place opr according to the work ability owned. Placing oprs with longer work experience in complementary workstations and New opr in convenient and less risky workstations".

For room temperature " 5 "atmosphere" 2 "and work environment" 3" which can be said to be normal room temperature and insufficient ventilation due to harmless odors and repeated work cycles between 0-5 seconds.

Percentage of Productive

Percentage of productive and non-productive obtained from observations with each element of the work done on the workmanship of 30 boxes of finish goods. Productive and non-productive seen from the average workmanship 1 box finish goods that is 50 minutes. The following is the percentage of productive and non-productive of each worker for each work element in the gusset bag packing process:

Table 9. Workstation Productive Percentage Table

Workstation	Productive	%Productive	Non-Productive	%Non-Productive
Capping	37	74%	13	26%
Packing GB	40	80%	10	20%
Insert Acsessoris	45	90%	5	10%
Sealing	47	94%	3	6%
Packing FG	48	96%	2	4%

Source: Data processed, 2024

Known from Table 9 productive percentage that is at the time of processing 1 box finish goods average processing time for 50 minutes. And at this time at all work stations observed how long the productive and non-productive time. It is said that the non-productive time of the capping process is the greatest because in this process the way it works is easier and the speed can be set by the workers. It could be that the capping process can help packing finish goods so that non-productive time turns into productive. The process of sealing and packing finish goods known % high productivity because in this process almost all that is done to increase output for packing.

Similarly, in this analysis technique also made observations and measurements based on individual labor working on packing gusset bag. Observations were made in the product processing time of 50 minutes to observe the activities and productive time.

Table 10. Percentage Of Earning Individual Operators

	Productive	% Productive	Non-Productive	% Non-Productive
OPR 1	45	90%	5	10%
OPR 2	45	90%	5	10%
OPR 3	45	90%	5	10%
OPR 4	35	70%	15	30%
OPR 5	35	70%	15	30%

Source: Data processed, 2024

Based on the observations in the table is the operator who has more work experience has a high percentage of productive results that is 90%. Because the operator has understood and adept at doing the job works fast and organized aware of the work that must be done without having to be given direction. New operators have more non-productive time because it takes time to understand the work process. Over time when the new operator has understood and has quickly done the work of non-productive time was reduced.

Test data adequacy and uniformity

The processed Data is the data from the observations of researchers in the process of packing gusset bag. Data taken from the processing time of a work process at each workstation. There are five observed work stations, namely capping, packing gusset bag, insert acsesoris, sealing and finally packing finish goods. Researchers observed 30 observations for all workstations.

In conducting measurements required uniform data, so the required data uniformity test. a group of data is said to be uniform when it is between the two control limits. If the data obtained outside the control limits, expressed as non-uniform data. Here is a test of data uniformity in (Sutalaksana ,2006)

Table 11. Timing on Packing Gusset Bag

Observation	Capping	Packing Gusset Bag	Insert Acsesoris	Sealing	Packing Finish Goods
1	30	38	35	35	40
2	30	38	35	35	41
3	33	38	35	37	42
4	33	39	35	38	43
5	30	39	35	38	45

Observation	Capping	Packing Gusset Bag	Insert Acsesoris	Sealing	Packing Finish Goods
6	30	39	35	35	46
7	35	38	38	38	49
8	35	38	38	38	49
9	34	38	38	38	48
10	34	37	38	40	50
11	35	37	38	43	51
12	35	37	38	39	55
13	37	40	42	40	50
14	37	40	42	41	58
15	40	40	45	44	60
16	40	40	45	47	60
17	37	40	42	44	50
18	37	40	45	45	55
19	35	40	45	47	60
20	30	40	45	45	55
21	30	38	35	36	46
22	32	38	36	34	47
23	32	38	37	35	48
24	32	37	35	34	49
25	35	37	40	38	50
26	35	38	35	34	40
27	34	37	35	37	45
28	34	38	43	41	50
29	35	40	44	46	55
30	34	40	42	47	55

Source: Data processed, 2024

The data in table 11 above is processed using formulas 3,4,5, and 6 which are processed using ms.excel and get the following results:
Looking for standard deviation:

$$\alpha = \sqrt{\frac{\sum(x-\bar{x})^2}{N-1}}$$

BKA $=\bar{x}$ + kα
BKB = $\bar{x}$ – kα

Data adequacy test :

$$N' = \left[\frac{\frac{k}{s}\sqrt{N\sum x^2 - (\sum x)^2}}{\sum x}\right]^2$$

The confidence level in this study is 90% which is worth 3.

Table 12. Calculation Result Table of BKA and BKB

Sigma X	1020	1157	1171	1189	1492
N times sigmaX2	1E+06	1E+06	1E+06	1E+06	2E+06
SigmaX Squared	1E+06	1E+06	1E+06	1E+06	2E+06
Substraction result	6780	1181	13109	16169	29516
Root result	82	34	114	127	171
Multiplied by k/s	3293	1374	4579	5086	6872
Dvided by sigmax	3,22	1,18	3,91	4,27	4,6
Squared (N')	10,42	1,41	15,29	18,29	21,21
mean	34	38,5	39	39,6	49,7
standar deviation	2,79	1,16	3,88	4,31	5,82
BKA	42,37	42,06	50,67	52,56	67,2
BKB	25,62	35,07	27,38	26,7	32,25

Source: Data processed, 2024

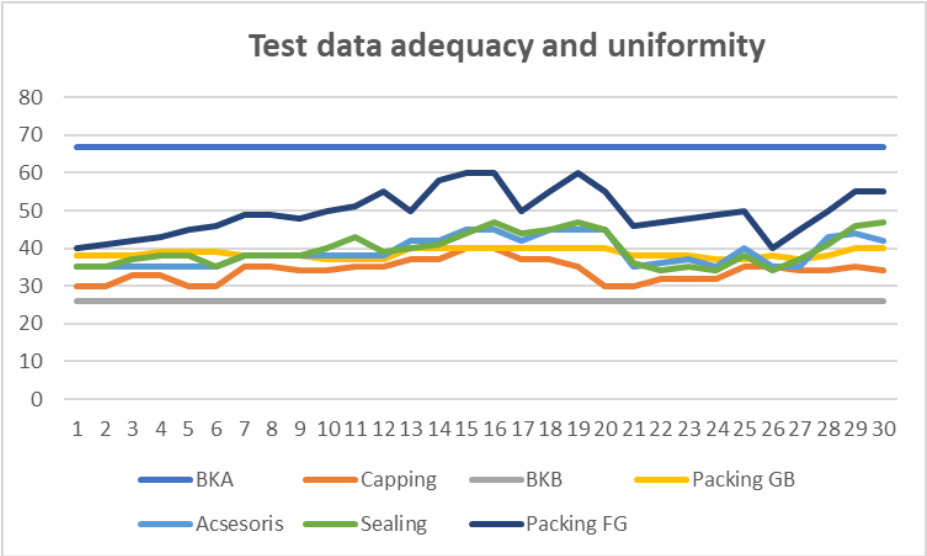

Figure 1. Data uniformity graph
Source: Data processed, 2024

Analysis of the data that has been processed in table 11 above is that all data is said to be uniform and sufficient for research. It can be seen from the graph that each station that has been observed 30 times for 30 boxes of finish goods is still safe or in the middle of the upper limit and lower limit of the data being analyzed. In accordance with the provisions if N'< N data is said to be sufficient.

It can be seen from the table that the value of N'<N (Capping; 10.42, Packing GB: 1.41, Insert Accessories: 15.29, Sealing: 18.29 and Packing finish goods: 21.21). N' is smaller than 30, so the data is said to be sufficient to perform calculations.

And in the graph 1 image, it can be seen that the data is still within the safe limit, which does not exceed the upper control limit (BKA) and is not below the lower control limit (BKB).

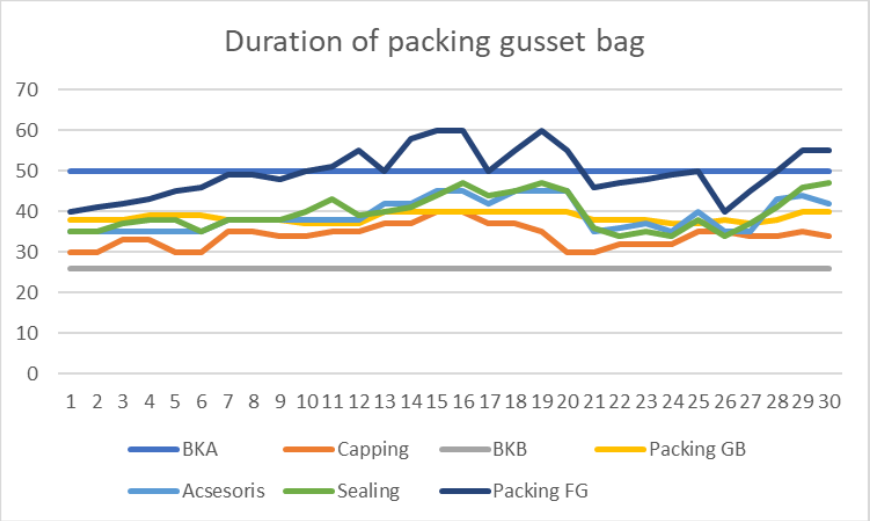

Figure 2. Duration of packing gusset bag
Source: Data processed,2024

In Figure 2, it is known that during the gusset bag packing process there are those who pass the limit set by the company, which is 50 minutes. Of the 30 observations, there are 10 data that have a processing time of more than 50 minutes. Because the process is done by junior operators who may not be able to work on time.

Results of Workload Calculation with Workload Analysis Method (WLA)

The results of the workload calculation can be known after carrying out some of the above analysis techniques such as determining the performance rating, allowance, percent productivity from observations for a week that observe the packing of gusset bags as many as 30 boxes of finish goods. This workload calculation is calculated based on the work stations that exist in the gusset bag packing process, namely there are five work stations. Each station has a significant difference in the processing of a product. Calculation of workload using the formula:

Workload = (% Productive x Performance rating x (1+Allowance)

Table 13. Workstation Workload Evaluation Table

Workstation	% Productivity	Performance Rating	1+ Allowance%	Workload	Description
Capping	74	1,06	118,00%	92,5592	Very high
Packing GB	80	1,03	124,00%	102,176	overload
Insert Accessories	90	1,06	122,00%	116,388	overload
Sealing	94	0,9	129,00%	109,134	overload
Packing FG	96	1,02	1,355	132,6816	overload

Source: Data processed, 2024

It can be seen from table 13 that the results of the workload calculation for each workstation get an excess workload value at the GB packing station (102%), insert accessories (116%), sealing (109%) and the highest is packing finish goods (132%). It can be seen from the table that if the workstation has high productivity, the workload is also high. In the capping process, the workload (92%) is included in the very high category because this process has the most non-productive time so that the %productive is lower than other stations. For the performance rating of the sealing station (0.9) because in this process it has different working conditions, namely

working in front of a machine that is done manually and emits heat. And for the looseness value of packing finish goods, it appears to have a large value because the energy expended and work movements are more than other work stations.

The results of the workload calculation are calculated based on operator workers who work in manual packing when working on gusset bag products. Operator employees are a valuable asset to a company. Without employees, the company would not be able to run well. Employees are human beings who also feel tired. The feeling of fatigue can be caused by various things, for example from the workload that is done daily.(Wardah & Adrian, 2017). Employees perception of workload balance influences their satisfaction. Furthermore, comparison of workload with those of colleagues and employees role alignment influence their perception of workload balance and job satisfaction. In accordance with the results of research by Inegbedion et.al (2020) Employees perceptions of workload balance affect their satisfaction. Furthermore, comparison of workload with colleagues workload and employees role alignment affect their perceived workload balance and job satisfaction.

Table 14. Individual Workload Evaluation Table

Operator	% Productivity	Performance Rating	1+ Allowance	Workload	Description
OPR 1	90%	1,24	128,00%	142,848	Overload
OPR 2	90%	1,18	126,00%	133,812	Overload
OPR 3	90%	1,15	125,00%	129,375	Overload
OPR 4	70%	1,06	120,00%	89,04	Very high
OPR 5	70%	1,03	119,00%	85,799	Very high

Source: Data processed, 2024

From table 14 above, it can be seen that the workload of operators 1, 2, and 3 has reached the category of work overload with values above 100% OPR 1 (142%), OPR 2 (133%), and OPR 3 (129%). Judging from the productivity value of 90% obtained from productive and non-productive activities in doing a job. the productivity is high because in this condition operators who have 90% productivity are operators who have worked for 2-4 years so they already know and are able to position themselves and work with concentration, stable and directed. The productivity of new employees such as operators 4 and 5 is 70% because even though they are still training, they have to be fast in adjusting to work. For the performance rating that has been in the previous discussion, it is known that the skill and effort of senior operators is high because it is seen from the ability and proficiency in mastering the job. The same is the case with allowance even though in some factors it is the same value because it works in the same room but there are differences in the effort or energy expended depending on the number of job description and responsibilities of each operator.

Discussion

Based on the workload evaluation table at work stations, there are several work stations that have an overload workload. For GB packing station (102%), insert accessories (116%), sealing (109%) and the highest is packing finish goods (132%). This indicates that this station may require additional labour to reduce workload and improve efficiency. Referring to the statement according to Ilyas in Cega, et al (2017), the optimal productive working time reaches 80%. The workload has reached 100%, meaning that for 8 working hours workers are able to work continuously under normal conditions. In accordance with the research of Yunaris et.all (20213) The results of the calculation of workload in the production section can be said to be low because it does not exceed100%.This results in worker idle time higher than productive time. Workload is

the technique of calculating how many person hours are needed to complete a task in a certain time. (Hendrayanti, 2008)

It is said (Muna, 2021) that workers have high intensity with a large number of products produced every minute. High workloads are generated by monotonous activities, requiring fast movements, long process times, requiring high accuracy, and machines in a down state. This is what makes employees have to spend higher effort compared to other work sections. The company must have a standard time in order to reduce the number of defective products, reduce the risk of work accidents, and be able to determine the amount of labour needed for each specified target.(Budiono, 2020)

Discussion of the results of the workload evaluation at each workstation based on Table 13 is as follows:

Capping: % Productivity: 74%, Performance Rating: 1.06, Workload: 92.5592 Description: Very high. At the capping station, although the measured workload is 92.55, which falls into the very high category, the productivity is relatively low (74%). This shows that although the non-productive time is quite high, the workload is still in the very high category, indicating low work efficiency.

Packing GB: % Productivity: 80%, Performance Rating: 1.03, Workload: 102,176, Description: Overload. GB packing station shows an overload workload with a value of 102.176. Although the productivity at this station is 80%, the relatively high performance rating (1.03) indicates that this station is facing work pressure that exceeds normal capacity.

Insert Accessories: % Productivity: 90%, Performance Rating: 1.06, Workload: 116,388. Description: Overload. At the accessories insert station, the workload of 116.388 indicates overload, even though the productivity is quite high at 90%. The performance rating is also high (1.06) indicating that this station faces significant work demands.

Sealing: % Productivity: 94%, Performance Rating: 0.9, Workload: 109,134. Description: Overload. With a productivity of 94% and a performance rating of 0.9, the sealing station faces an overload workload (109,134). Despite the lower performance rating, the high workload indicates high demands on labor, possibly related to working conditions such as the hot temperature of the machine.

Packing FG: % Productivity: 96%, Performance Rating: 1.02, Workload: 132.6816, Description: Overload. The finish goods packing station shows the highest workload of 132.6816, with a productivity of 96% and a performance rating of 1.02. This indicates an extreme overload, where more labor and movement are required compared to other stations.

Packing finish goods does have complex work and requires a lot of energy and concentration. This is supported by the results of interviews with leaders and operators on manual packing. "When in packing finish goods because there are many stages that must be done such as checking the type, lot, seal results, and also make your own inner and box and also have to make sure again the inner box. The amount of workload received by workers is used to determine the optimal number of workers. The workload results are said to be overloaded if the workload calculation results exceed 100%. (Ernawati, 2022)

The current condition is that each work station is filled by one operator. For stations that have excessive workload to reduce it can be by adding labor to the process of packing finish goods which initially the workload (132%) if added one more operator then the workload will be 66% done or filled by 2 operators. And for the insert accessories station, GB packing and sealing the total workload is 327% carried out by 3 operators if 1 more operator is added the workload will change to 81% so for these 3 work stations will be done by 4 operators for the division can be arranged by the leader who keeps or person in charge (PIC) in the process of packing manual gusset bag.

For individual workload based on the individual operator workload table, it can be seen that the difference in performance rating significantly affects the workload level of each operator. OPR 1 with the highest performance rating has a high workload, while OPR 5 with a low rating has a lower workload. This indicates the need for proper management strategies in human resource management to ensure efficiency and balance in workload in the work environment.

OPR 1 has the highest performance rating, which indicates the ability to complete tasks with high efficiency. This implies that by assigning more responsibilities or tasks to OPR 1, the company can optimize the use of available human resources. In contrast, for OPR 4 and OPR 5 with lower performance ratings, additional development and support strategies may be needed to help them improve their performance and reduce potential workload imbalances among the team.

Operators with higher performance ratings tend to have higher workloads to the point of overload (e.g., OPR 1 with a workload of 142%), for overloads per individual operator it can be concluded that additional manpower is needed to maintain human resources, while operators with lower performance ratings have lower workloads (e.g., OPR 5 with a workload of 85%). If given an additional 2 operators, the workload of senior employees will be reduced and more efficient at work. Explained by the leader of manual packing in the division of operators in the work of the work station seen from the ability and proficiency to do the job "I divide or place staff according to their work abilities. Placing those with longer work experience at complex work stations and newer staff at work stations that are easy and less risky. That is why the workload of officers who have worked longer has an excessive workload than new officers. Because the responsibilities increase. New officers must quickly understand the way of working that has been taught so as not to overburden other officers."

CONCLUSION

From the results of research and observations on the gusset bag packing process, the researcher concludes that the station packing finish goods, insert accessories, GB packing, and sealing has an excessive workload. This may indicate that the amount of production or complexity of tasks at this station exceeds capacity or optimal operational efficiency. For the capping process, it is still under 100%, indicating that although it has not reached the overload level, there is potential for workload expansion in the future if it is not considered and managed properly by the company.

The Workload Condition at the Capping Station Workstation is The workload of 92.5592 is categorized as very high, with a productivity of 74%. Although the workload is high, the low productivity indicates that there is significant non-productive time. And for GB Packing, Accessory Insert, Sealing, and Finish goods Packing stations: These four stations are overloaded with workloads of 102%, 116%, 109%, and 132% respectively. Although productivity at these stations varies, workloads that exceed normal capacity indicate that additional labor may be required to ease the load.

The need for additional labor for the Finish goods Packing station with the highest workload (132%), adding one operator from one to two operators will reduce the workload per operator to 66%. This will help lower the overload rate and improve efficiency. Packing gusset bag, Accessory Insert, and Sealing stations considering the total workload of these three stations is 327% for three operators, adding one more operator will reduce the workload per person to 81%. Thus, these four stations can be better managed with a total of four operators.

Relationship between Individual Workload and Performance Rating OPR 1 with the highest performance rating and a very high workload (142%), indicates the need for a management strategy that considers the division of responsibilities so as not to overburden high-

performing operators. For new employees such as OPR4 and OPR 5 with low performance rating and lower workload (85%), indicating the need for more training and support to improve their performance. Operators with lower performance ratings need additional training to improve their performance. This will help to even out the workload and improve overall productivity. Worker productivity is important for every company because with worker productivity the company can see the performance of each worker. (Hermanto, 2015)

In the future, the Company can re-analyse processes and workflows to reduce workload. The company can re-map the workload for each workstation. Ensure that the workload allocated is in accordance with the capacity and capability of each workstation in the packing process. Management strategies A fair distribution of workload should be done by considering the ability and experience of the operators. More experienced operators can be placed on more complex stations, while new ones can be placed on simpler stations. This will help optimize work efficiency and prevent overload on more experienced operators.

For individual workloads, the Company can provide necessary training to new operators to accelerate their learning of the work process. Ensure that all operators understand their duties well and have the necessary skills to perform their tasks efficiently to balance the workload between operators.

From these conclusions, it can be concluded that it is important to properly manage workload distribution between different operators and consider training and development for new operators in order to improve their understanding and skills in the long run. In addition, it is necessary to consider strategies to optimize the workload at the finish goods packing station to achieve better efficiency.

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