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Original Article

Workload Measurement Model in Industry: Fish Processing Post Covid-19

Suradi Suradi[1], Ahmad Hanafie[2], M. Saripuddin[3]

[1,2]*Department of Industrial Engineering, Universitas Islam Makassar, Makassar, Indonesia*
[3] *Department of Mechanical Engineering, Universitas Islam Makassar, Makassar, Indonesia*

[1]*Corresponding Author : suradi.dpk@uim-makassar.ac.id*

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Abstract *- Reducing the number of employees during the pandemic is the reaction manufacturers mostly take to survive in doing business due to the impact of the Covid-19 pandemic. This study aims to analyze the effect of layoffs on the workload of the affected manufacturers. The data is taken from one of the fish processing companies in the Makassar Industrial Estate, which has reduced its workforce due to the impact of the Covid-19 pandemic. Based on the results of the study showed that from the three divisions in the company, namely the admission, retouching, and packing divisions, the admission division in the fillet section obtained a different score. This study concludes whether the decision to lay off during the pandemic is right or not so that it can be a reference for companies experiencing economic impacts in terms of production efficiency and effectiveness.*

Keywords *- Layoff, Manufactures, Workload, Production efficiency, Staff performance.*

1. Introduction

The spread and threat of Covid-19 have caused an unprecedented economic and public health reaction worldwide, including in Indonesia. (Gibson & Olivia, 2020). It has also exacerbated human misery, disrupted economies, upended the lives of billions of people worldwide, and profoundly impacted health, education, the environment and social sectors. (Mofijur et al., 2021). Therefore, the decision to reduce the workforce in a company needs to be taken into account because it will be a reaction or impact on the company. Furthermore, consider the decision to reduce the workforce after several considerations. In that case, it is necessary to consider the workload level because workloads often increase in budget and labor cuts (Greenglass et al., 2003); with the increasing number of sufferers, the government also took several strategic steps to prevent outbreaks, incl isolation from the community, spraying disinfectants, and using masks. (Syamsuddin RS et al., 2020).

The effect of termination of employment on companies affected by Covid-19 is very important; one of the efforts a company can make in dealing with these impacts is in the production field. The production process must be designed as efficiently and effectively as possible. In implementing the production process, there needs to be better planning and work evaluation so that the production process can run well and increase the number of quality products (Suradi, 2016). The process is defined as methe actual sources of production support, namely labor, machinery, materials, and existing funds can, be changed to obtain a result. Previous research (Muñoz-Bullón & Sánchez-Bueno, 2011) stated that no significant difference in post-downsizing performance arose between firms that did downsizing and those that did not, as well as layoffs, did not lead to increased levels of performance either. Based on previous research, this study aims to analyze the effect of workload due to a reduction in the workforce due to the impact of Covid-19 with the assumption that there is still a lack of knowledge in analyzing the effect of layoffs on workloads, especially when Covid-19 affects manufacturing productivity. This research aims to: 1) optimize the workload based on the production process to increase the quantity of production and efficiency in the company, 2) provide alternative considerations for the placement or reduction of labor in each section so that there is no imbalance in work-loading. work) in each section (section), 3) assessing the model to improve production efficiency in the company by reducing the number of workers.

2. Theoretical Background

The workload is several production targets or yield targets that must be achieved in a certain time unit and are a determinant of productivity (Hart & Wickens, 1990; Inegbedion et al., 2020; Suradi, 2016). Workload analysis is the average frequency of each type of work from each process, for example, how much work is done to complete production results within a certain time (Suradi, 2016). Meanwhile, layoffs are contract violations or job security expectations that are not met (Kim & Choi, 2010). Many production targets or

yield targets that must be achieved in a certain time unit are called workloads. While the workload analysis is the average frequency of each type of work in a certain period from each process, for example, how many jobs are done in completing the production output within a certain period of time—effective and efficient efforts on the output produced by each workforce to meet company targets. Based on the amount of output or work produced by each workforce, it can be seen how many workers the company needs to achieve the target. This can be done through a workload measurement so the workforce can work optimally according to their abilities.

Estimates of the company's workforce needs are determined by the estimated availability of manpower in the company and company plans. While the estimate of the availability of the workforce itself is determined from workload analysis, labor displacement analysis and analysis of excess or shortage of labor. Analysis of the excess or shortage of the company's workforce, related to a large number of workers in the company that is in excess or less condition if it is associated with the workload. The analysis can be carried out if the workload is known. Moreover, the workload analysis itself provides direction on productivity. Work productivity can be described in terms of the efficiency of the use of labor. The workforce can be used efficiently if the number of existing workers is balanced with the workload. Every workload a person receives must be appropriate and balanced to the physical and mental abilities of workers who receive the workload so that fatigue does not occur (Hart, 1990).

According to Wakui (2000,134), the activities carried out by each position or position in order to carry out their duties as stated in the job description provide a workload for the position/position. Time measurement can be used to get measure the load and performance that applies in a working system (Sutalaksana et al., 2006). Because the method used in this research is the scientific method, the results can be accounted for. Through these measurements, the gauge obtains correct quantitative performance and workload measures. Before analyzing the workload, it is necessary to know how the company's business processes are. A business process is a structured collection of interrelated activities or work to solve a particular problem or produce a product or service (to achieve a specific goal). A business process can be broken down into several subprocesses, each of which has its own attributes but also contributes to achieving the goals of the super process. Business process analysis generally involves mapping the processes and subprocesses within them to the level of activity or activity. Davenport (1993) defines a business process as a measurable and structured activity to produce certain outputs for certain customers. There is in it a strong emphasis on the “how” the job is done in an organization, unlike the focus of the product, which focuses on the “what” aspect. A process is a specific sequence of work activities across time and space, with a beginning and an ending, clearly defining inputs and outputs. Hammer and Champy's (1993) definition can be considered a derivative of Davenport's definition. They define a process as a collection of activities that require one or more inputs and produce outputs that are of value to the customer. The Business Process and the Manpower Planning Process in the Tuna Fish production section have been going well because if there are few raw materials, the working time of employees is reduced/maximized to half a day (8:00-12:00) and even closed, and if there are a lot of raw materials/ Under normal conditions, the production process is maximized to 7 working hours (8:00-16:00) with a 1-hour break or even overtime during the tuna harvest season.

3. Materials and Methods

The implementation of this research lasted for approximately 1 month, starting in early October 2021, at a fish processing company in the Kima Area. The company has laid off 18 employees, from 86 to 68 employees. One of the factors that influence production can be completed or fulfilled according to a set schedule is the time factor, workers or workers who are directly involved in the production process. Therefore, this study took data based on the number of workers and employee working time in the production division of the tuna fish division for 24 working days, starting from the Reception, Retouching and Packing sections.

The data collection method used is the survey sampling method. While the data collection tool uses a list of observations while the workers are on the move. Based on the data collection results from observations and interviews in the production division with sub-divisions, namely Reception, Retouching and Packing. The data collection procedures are as follows: 1) Identifying the activity, 2) Measuring the duration of the activity, 3) Recording the duration of the activity on the prepared table form, 4) The procedure is repeated for each activity to be studied, 5) Breaking down the work on elements profession.

Analysis The methodology used is the method of Work Design Analysis (WDA). Quantitative analysis in this study uses a workload analysis method calculation approach so that the workload calculation can be formulated as follows :

$$\text{Workload} = \frac{\text{Total Activity Time}}{\text{Total Available Time}} \quad \text{.....(1)}$$

$$\text{Workload} = \frac{\text{Total Activity Time + Allowance}}{\text{Total Available Time}} \quad \text{.....(2)}$$

In order to get the value of the variable in the above formulation, the calculation is carried out:

3.1. Cycle Time Test

$X = (\sum x)/n$

3.2. Normal Time Test

Normal Time = Observation Time x (Rating factor%)/ (100%)

3.3. Standard Time (ST)

ST = Normal Time x (Normal Time x % Allowance)

Based on the above formula, an analysis is carried out, which includes the following:

Evaluation of the implementation of manpower usage planning to minimize the risk of labor/production cost overruns based on the results of labor calculations in the production section due to the impact of the Covid-19 pandemic.

Evaluating the decision-making by using the concept of workload analysis model in reducing the number of workers in the company.

3.4. Calculating Labor Needs

Total Man Power = (ST x Output) / Working Time

4. Results and Discussion

4.1. Business Process

Based on the data collection results in one of the processing industries in Makassar, especially the tuna fish production division, which is divided into 3 sub-divisions, namely the sub-division of receiving raw materials, retouching, and packing. In the sub-division of receiving raw materials, 6 observation variables are set, namely external acceptance, fillet, skinless, trimming, CO injection, and Chilling. Furthermore, the Retouching sub-division with 3 observation variables, namely retouching, vacuum, and ABF/Freezing. Then the Packing sub-division with 2 observation variables, namely packing and cold storage.

Based on the observations, the business process map in the Tuna division is as follows:

4.2. Formation and Activity

The table below shows the formation of the workforce in the tuna fish production division before Covid-19 as follows:

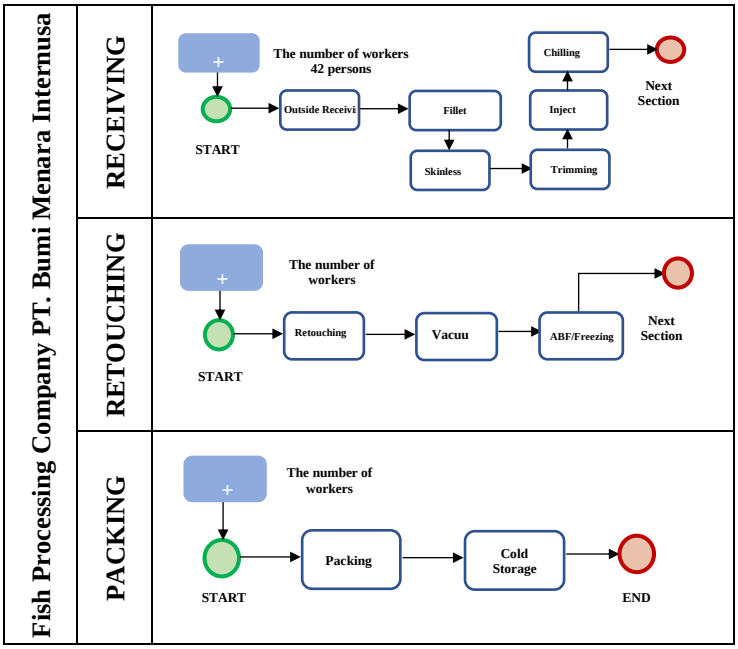

Fig. 1 Business Process PT. Bumi Menara Internusa

Table 1. Workforce formation in the tuna fish production division before the Covid-19 pandemic

No	Receiving		Retouching		Packing	
1	Outside Receiving	7	Retouching	12	Packing	14
2	Fillet	8	Vacuum	8	Cold Storage	5
3	Skinless	7	ABF/Freezing	5		
4	Trimming	8				
5	Inject CO	7				
6	Chilling	5				
	The number of workers (person)	42		25		19

The table-1 illustrates the initial formation before the Covid-19 pandemic, where the number of workers in the tuna fish production division was 86 people, with the formation in the receiving sub-division, which was opened by 42 people with the Outside Receiving section as many as 7 people, the Fillet section 4 people, the Skinless section 5 13 people, the Trimming section as many as 13 people, the Inject CO section as many as 8 people, the Chilling section 5 people, for the Retouching section with the formation opening 25 people with the Retouching section as many as 15 people, the Vacuum section as many as 7 people, the ABF/Freezing section 3 people. Then the packing section with formation opened 19 people, with the packing section as many as 14 people and the Cold Storage section as many as 5 people. After the Covid-19 pandemic, the company has reduced its workforce.

The table-2 describes the formation after the Covid-19 pandemic, where the number of workers experienced a reduction in the workforce in the tuna fish production division. As many as 68 people in the formation Receiving sub-division, a totally of 32 people, with the Outside Receiving section, as many as 6 people. The Fillet section has as many as 5 people. The Skinless group had as many as 4 people, the Trimming section 7 people, Inject CO section 6 people, the Chilling section 4 people, the Retouching section with formations totally of 20 people with Retouching section 11 people, the Vacuum section 6 people, ABF/Freezing section 3 person. Then the packing section with a formation of 16 people, with a packing section of as many as 12 people and a Cold Storage section of as many as 4 people.

After the Covid-19 pandemic, the company has reduced its workforce. Based on this, the researcher is interested in calculating the workload that occurs in the company both before the pandemic and after the Covid-19 pandemic so that reduction decisions can be considered from the results of the workload analysis.

Each process has an activity time with a predefined job description. Each sub-division has a different description and activity time for each position, as shown in the table-3.

Based on the results of the standard time calculation in the table above with an allowance factor (L) of 37% which is given for 24 days while p is the adjustment factor, this factor is taken into account if the gauge believes that the operator is working at an unnatural speed so that the standard calculation results need to be adjusted or normalized first. The goal is to get a reasonable average cycle time; the price used is $P > 1$ because it is considered to work fast.

4.3. Workload

At PT Bumi Menara Internusa, especially the tuna production division is divided into 3 divisions, namely the Raw Material Receiving, Retouching, and Packing Division. The table-4 shows the workload data obtained for each section after the pandemic. In the reception division, there are 6 sections, namely External Receipt, Fillet, Skinless, Trimming, Inject CO, and the last is Chilling section. Based on the results of the analysis obtained, workload data on the Receiving Section.

Table 2. Workforce formation in the tuna fish production division after the Covid-19 pandemic

No	Receiving		Retouching		Packing	
1	Outside Receiving	6	Retouching	11	Packing	12
2	Fillet	5	Vacuum	6	Cold Storage	4
3	Skinless	4	ABF/Freezing	3		
4	Trimming	7				
5	Inject CO	6				
6	Chilling	4				
	The number of workers (person)	32		20		16

Table 3. Activity Time

Section	Before Covid-19						After Covid-19					
	N	X (hour)	P	NT (hour)	L (%)	ST (hour)	N	X (hour)	P	NT (hour)	L (%)	ST (hour)
OUTSIDE RECEIVING	24	60.95	1.21	73.75	37%	27.29	24	71.11	1.21	86.04	37%	31.84
FILLET	24	149.09	1.21	180.40	37%	66.75	24	238.54	1.21	288.63	37%	106.79
SKINLESS	24	113.85	1.21	137.76	37%	50.97	24	199.24	1.21	241.08	37%	89.20
TRIMMING	24	107.21	1.21	129.72	37%	48.00	24	122.53	1.21	148.26	37%	54.86
INJECT CO	24	122.02	1.21	147.64	37%	54.63	24	142.36	1.21	172.26	37%	63.73
CHILLING	24	152.66	1.21	184.72	37%	68.35	24	190.82	1.21	230.89	37%	85.43
RETOUCHING	24	72.36	1.21	87.56	37%	32.40	24	77.65	1.21	93.96	37%	34.76
VACUUM	24	96.48	1.21	116.74	37%	43.19	24	142.36	1.21	172.26	37%	63.73
FREEZING	24	157.09	1.21	190.08	37%	70.33	24	209.45	1.21	253.43	37%	93.77
PACKING	24	65.70	1.21	79.50	37%	29.41	24	71.18	1.21	86.13	37%	31.87
COLD STORAGE	24	142.36	1.21	172.26	37%	63.73	24	213.53	1.21	258.37	37%	95.60

Table 4. Workload Analysis

Section	Before Staff Reduction		After Staff Reduction	
	Number of Staff	Workload	Number of Staff	Workload
A. RECEIVING				
Outside Receiving	7	38,41	6	44,82
Fillet	8	93,95	5	150,33
Skinless	7	71,75	4	125,56
Trimming	8	67,57	7	77,22
Inject CO	7	76,90	6	89,71
Chilling	5	96,21	4	120,26
B. RETOUCHING				
Retouching	12	45,60	11	48,94
Vacuum	9	60,80	6	89,71
ABF/Freezing	4	99,00	3	132,00
C. PACKING				
Packing	13	41,41	12	44,86
Cold Storage	6	89,71	4	134,57

In table 4, it can be seen that from several sub-divisions starting from the Receiving, Retouching and Packing sections, show different levels of workload before and after Covid-19. Prior to the reduction in the workforce due to Covid-19, the workload on Sub-Division activities was at normal numbers. However, the workload is overloaded in the Receiving, Retouching and Packing sub-divisions after reducing the workforce. The data shows that the workload of these sub-divisions is on Fillet, Skinless, Chilling, ABF/Freezing and Cold Storage activities.

This shows that the activity has a small workforce, but the level of work is quite heavy and complicated, so the workload increases (overload). Based on the results of the study shows that of the 11 sub-division activities in the tuna production division, there are 5 (five) activities that experience overload. This indicates that the decision to dismiss staff at this company needs to be analyzed for workloads and then becomes the basis for placing workers in accordance with the measurement of workloads in each sub-division. The workload measurement graph is as follows:

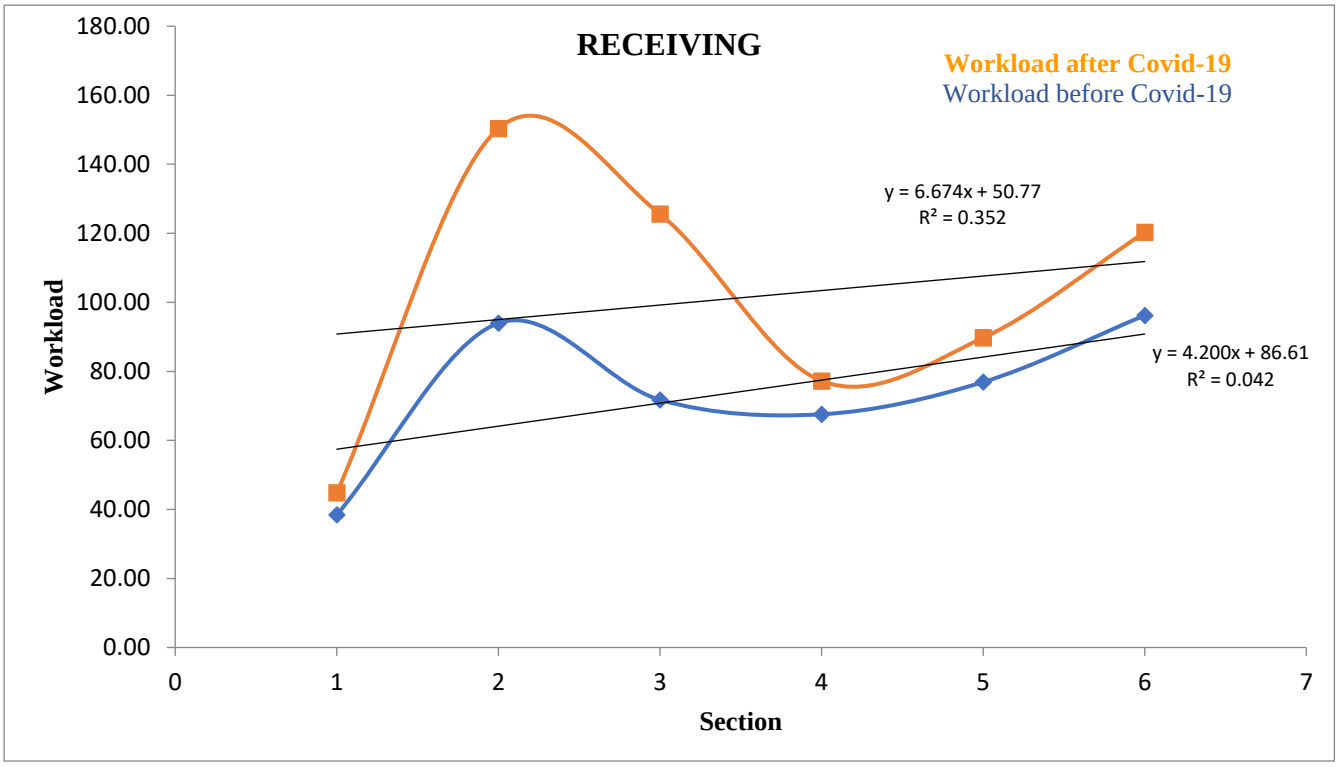

Fig. 2 Tuna Division Workload Graph in Receiving

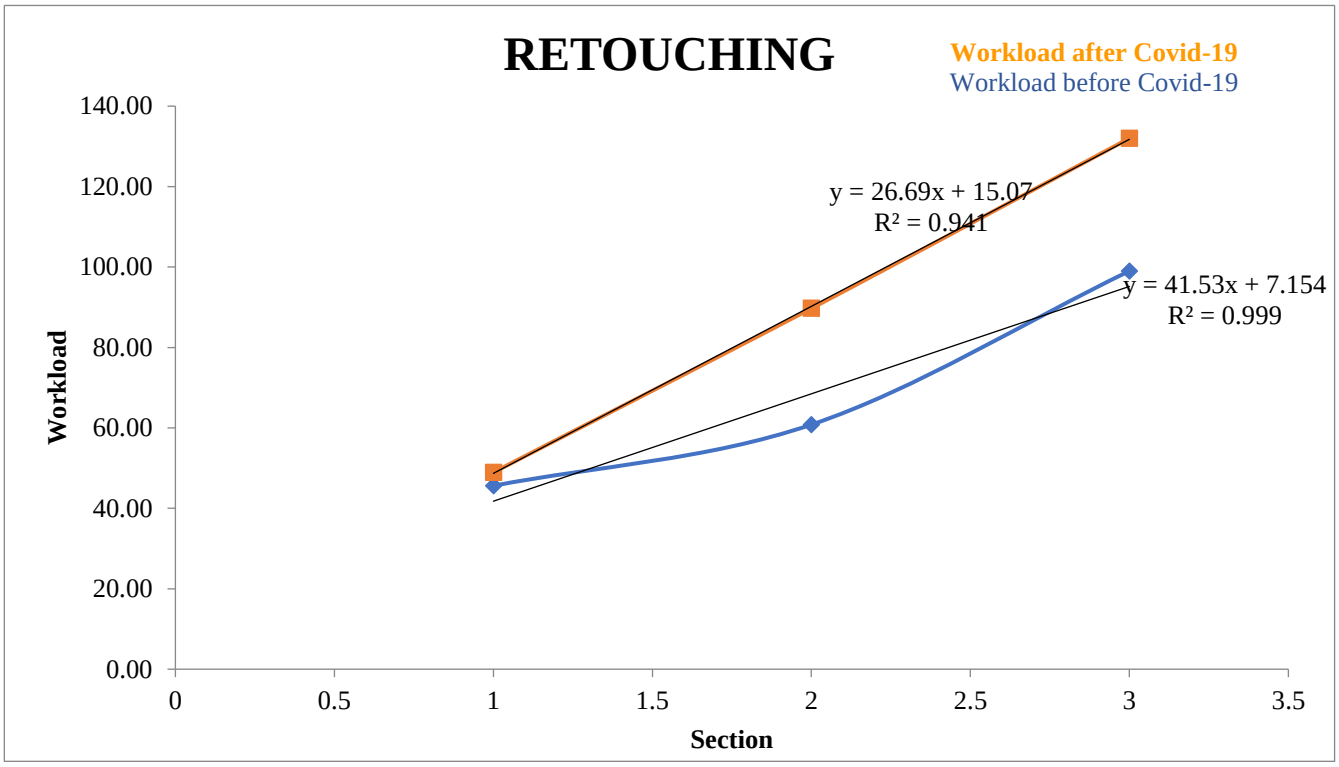

Fig. 3 Tuna Division Workload Graph in Retouching

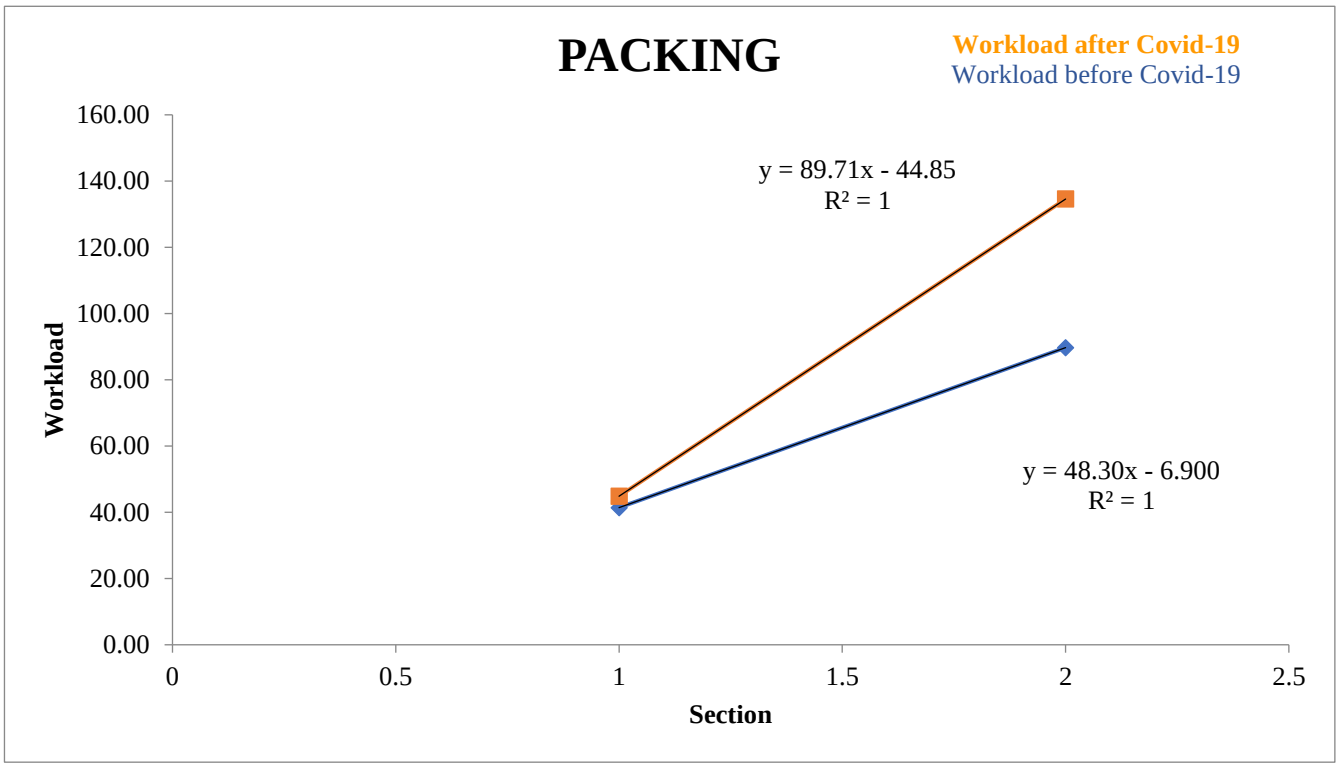

Fig. 4 Tuna Division Workload Graph in Packing

The graph provides an illustration of an increase in workload (overload) after the reduction in the workforce due to Covid-19 in the reception sub-division. Where the function of activity time against available time provides an increase in the workload of the workforce working at the company, this will have an impact on production productivity. Therefore, graphs can be used as an analytical tool in simulating workers' placement according to the time of activity in the sub-division.

5. Conclusion

The thing that affects the most employees' dismissal at this company is the occurrence of workload in several sub-divisions. Over workload impacts a company's productivity because it affects the performance of employees and the products produced. From the results of the research above, it can be concluded as follows:

Sub-division Receiving 3 activities have a workload > 100, which means the number and workload of employees are above normal, or there is a shortage of manpower and vice versa 5 activities with a workload < 100 means the number and workload are normal.

The Retouching sub-division has 1 activity that has a workload > 100, which means that the number and workload of employees are above normal or there is a shortage of manpower and 2 activities that have a workload of < 100, which means the total workload is normal.

Packing subdivision, there is 1 activity that has a workload > 100, which means the number and workload of employees are above normal, or there is a shortage of manpower and 1 activity that has a workload < 100, which means the total workload is normal.

Based on the results of the research conducted, the suggestions that are expected to be input in future improvement efforts are as follows:

The results of the study indicate the need for an overhaul in the arrangement of the number of staff in each section. Inequality in the number of existing staff can be a major factor in work overload. In addition, the workload level data can be used as basic data or company reference in seeing the efficiency or productivity of its work. (Suradi, 2016) suggests that work productivity can be described in terms of the efficiency of labor, where the workforce will be used efficiently if the number of existing workers is balanced with the workload.

In the Subdivision of Receiving, Retouching and Packing, work sections exceed the normal workload limits. The excess workload in this section can result in several things that can hamper the production process. One of the things that can result from excess workload is fatigue. Fatigue is often referred to as a stress reaction, but it is also considered a phenomenon in its own right. It is defined as losing work capacity over time for cognitive and physical work (Guastello et al., 2012).

A light workload will lead to laziness and cause employees to be involved in group politics and thus affecting their performance and careers in their field (Rajan, 2018). A low or over workload greatly affects the quality of employee performance. Employee performance is crucial to company results and success (Bruggen, 2015). So if the workload of employees/staff is not over or low, it can certainly affect the positive performance of employees. Ideally, the company considers the workload data for each section in making decisions if one day it will lay off employees to avoid excessive workloads and calculate mental costs to predict system and worker performance (Cain, 2007).

By doing this, companies can monitor and manage workload levels as part of a proactive approach to stress management in the broader context of occupational health and safety to ensure that the company can withstand any turbulence in business conditions that may affect its performance (MacDonald, 2003; Yawson, 2006).

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