



# Workload analysis to determine the optimal number of workforce using the Work Load Analysis (WLA) method at PT. Harapan Jaya Multi Bisnis

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## ABSTRACT

Workload is something that arises due to excessive activity demands. The workload is not proportional to the number of available workers because of the high target of pipe production while the number of workers is lacking so that human resources cannot work productively, especially in the production department at PT. Harapan Jaya Multi Bisnis. The purpose of this study is to determine the workload of employees in pipe production and determine the optimal number of workers. This study uses the Work Load Analysis (WLA) method to analyze the workload in determining the optimal number of workers. The results of this study after calculating the workload, it is proposed that the fixed cutting section is 2 people with a workload of 62.65%. In Branding, in real terms there is 1 person with a total workload of 11.73% and an average workload of 11.73%. After calculating the workload, it is proposed that the shooting section still be 1 person with a workload of 11.73%, because if additional workers are added, the workload will be too low. The time needed to complete the activity is 7 hours per day. After calculating the workload, Quality Control is proposed to be 1 person, because if additional workers are added, the workload will be too low, namely 7 hours per day.

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## 1. INTRODUCTION

The progress of a service can be seen from the ability of the human resource activities that work [1]. In carrying out activities, each person has their own duties so that the workload obtained is also different [2]. Human resource management abbreviated as HRM is the science of managing relationships and the role of resources (labor) owned by individuals efficiently and effectively to be optimal so that the common goals of the company, employees and society are achieved [3]. Human resources are considered one of the crucial assets in a company. Human resources with high performance undoubtedly become the most important asset in creating a competitive advantage in the market [4]. Most organizations do not provide information to their employees regarding management or the purpose of management [5]. However, having clear guidelines in the workplace during challenging times can reduce stress, boost motivation, and instill confidence in employees [6].

Workload is something that arises as a result of the demands of tasks, the influence of work environment factors, skills, behavior and perceptions of workers. The workload can be divided into two categories: qualitative and quantitative [7]. This workload is not only physical but also mental, so the workload received must be balanced between physical and mental abilities. The cognitive ability of the recipient of the load [8], each person has a different level of load so it is necessary to strive for an optimum level of load intensity, a load level that is too high will cause overstress while a load level that is too low will cause boredom and boredom or understress [9]. Knowing the workload can help determine how many human resources are needed [10]. The workload becomes a situation faced by workers, where they have to complete tasks within a set timeframe [11]. Cognitive tasks induce facultative thermogenesis. Thermogenesis is a biological process involving the generation of body heat from basal metabolism (obligatory thermogenesis) or in response to physiological work (facultative thermogenesis). Therefore, understanding the energy expenditure of cognitive and physical workloads is crucial to ensuring overall safety [12].

In calculating workload, the aim is to obtain the optimum number of employees and find out how much load is received by employees. This can determine the balance between workload and employee availability so that there are no employees piling up or lacking [13]. The levels for assessing workload are divided into 5 categories, namely (1) Very Low: 0% to 20%, (2) Low: 20.1% to 40%, (3) Medium: 40.1% to 60% , (4) High : 60.1% to 80%, (5) Very High : 80.1% to 100% [14]. Therefore, it is clear that an accurate workload measurement system is crucial [15]. Regarding workload, it can be a comparison between an employee's capabilities and job demands. This means that if an employee has higher work capabilities compared to job demands, boredom may arise. Conversely, if an employee has lower capabilities compared to job demands, feelings of boredom can also emerge [16].

Performance is an outcome achieved by an individual when carrying out assigned tasks, based on skills, experience, dedication, and time invested [17]. Employee performance is the quality and quantity of work performed by employees in fulfilling their responsibilities as assigned [18]. Performance measurement is the process of assessing work progress in managing human resources to produce goods and services, including information efficiency and effectiveness of actions in achieving organizational goals, integrated performance measurement systems are widely used in the industrial world, namely Balanced Scorecard, Integrated Performance Measurement System (IPMS) and Performance Prism, in this study researchers use performance measurement with Work Load Analysis (WLA) models [19][20].

Measuring the performance of a company to determine the characteristics and quality of performance and identify actions that need to be taken to make improvements and improve work. The more often performance measurements are carried out, the more the company will improve its performance, so that with increased performance, quality will be the main goal that can be achieved [21]. Performance measurement provides important and valuable information that enables management to monitor performance, report progress, enhance motivation and communication, as well as identify issues [22]. An increase in the level of absenteeism too much workload can also result in employees being too tired or sick, this will have a bad impact on the smooth running of the organization because the level of absenteeism is too high, so it can affect the overall performance of the organization [23].

Workload Analysis is the process of determining the number of man-hours used or required to complete a specific workload and within a certain amount of time. The number of hours worked by each employee will result in the number of employees needed [24]. The workload borne by the workforce is closely related to the efficiency and effectiveness of a job [25].

The novelty of this research is that it focuses on the production department in implementing the Work Load Analysis method as an effort to determine the optimal number of workers [26], this research seeks to distribute optimal working hours, make maximum use of employees in each work unit, as for It is hoped that the results of this research can be used as a basis for creating job descriptions and job specifications, in accordance with the benefits of implementing Work Load Analysis in determining the optimal number of working hours and number of employees as an effort to create employee work productivity.

## 2. MATERIALS AND METHODS

### 2.1. Time and Place of Research

This research will be conducted at PT. Harapan Jaya Multi Bisnis which is located on Jl Ir Sutami No 5, Makassar which is a Manufacturing & Trading Company in Makassar, South Sulawesi. This research will be carried out for approximately 1 month.

### 2.2. Data collection

This research uses primary data related to data on the number of workers, work elements in each section, productive data, non-productive data, performance ratings, allowance data and work allowances obtained by conducting direct observations and interviews with several PT employees. Harapan Jaya Multi Bisnis, especially in the pipe production section.

### 2.3. Data processing

Data processing used in this research uses WorkLoad Analysis, namely:

1. Determine the number of observations
  - a. Determine the sample size of observations, for example a sample.
  - b. Observations are set at 30% of the total observations.
  - c. Determining the observation interval, namely 08.00 – 15.00, minus 1 hour of rest (6 hours of work minus 1 hour of rest) Determining the shortest observation interval, namely 5 minutes – So the maximum number of observations/day =  $(6 \times 60)/5 = 72$  times.
  - d. 30% of 72 times is 22 times. So, the number of observations made was 22 observations per day.
2. Determine the work elements carried out by each employee. The determination of this work element is done so that during observation it can be seen what activities are being carried out by employees.
3. Determine the average productive percentage of employees.
4. Determining Data Sufficiency Test.
5. Determine Data Uniformity Test.
6. Determining Performance Rating, determining the adjustment value by grouping the skill level of workers, worker effort, working conditions of workers, consistency of worker work.
7. Determining Allowance, pocket money is given for personal needs, eliminating feelings of fatigue and obstacles that cannot be avoided.
8. Define Workload = % Productive x Performance Rating x (1 + Allowance)
9. Determine the actual number of workers

## 3. RESULTS

### 3.1. Number of Employees at PT. Harapan Jaya Multi Business

Classification of the number of employees at PT. The hope for success for Multi Business at each work stationis can be seen in [Table 1](#).

**Table 1** Number of Employees

No	Work station	Number of Workers (people)
1	Warmup	4
2	Cutting	5
3	Branding	1
4	Quality Control	3

The observation sample was set at 14 days of observation. Observations are designed using the following calculations: Determining the observation interval, namely 08.00 – 15.00, minus 1 hour rest time. Determine the shortest observation interval, namely 10 minutes - So the maximum number of observations/day =  $(5 \times 60)/10 = 30$  times Observations are carried out over 14 working days with 30 random observations/day. So there are 420 observations.

3.2. Determining the Optimal Number of Employees

Determination of Performance Rating and Allowance for Each Position. The Performance Rating (Adjustment) calculation can be done by adding up the factors that influence a person's speed in doing work and adding a value of 1. This value is a condition where a person works normally, as in Table 2.

**Table 2** Performance Rating based on Westinghouse

No	Structural Potition	Factor				Total Performance Rating
		Skills	Business	Working Conditions	Consistency	
1	Warmup	+0,06	+0,02	+0,02	+0,01	+0,11
2	Warmup	+0,06	+0,02	+0,02	+0,01	+0,11
3	Warmup	+0,06	+0,02	+0,02	+0,01	+0,11
4	Warmup	+0,06	+0,02	+0,02	+0,01	+0,11
5	Cutting	+0,06	+0,05	+0,02	+0,01	+0,14
6	Cutting	+0,06	+0,05	+0,02	+0,01	+0,14
7	Cutting	+0,06	+0,05	+0,02	+0,01	+0,14
8	Cutting	+0,06	+0,05	+0,02	+0,01	+0,14
9	Cutting	+0,06	+0,05	+0,02	+0,01	+0,14
10	Brand Label	+0,08	+0,02	+0,02	+0,01	+0,13
11	Quality Control	+0,08	+0,02	+0,02	+0,01	+0,13
12	Quality Control	+0,08	+0,02	+0,02	+0,01	+0,13
13	Quality Control	+0,08	+0,02	+0,02	+0,01	+0,13

Information :

- Skills (+0.11) : Excellent (B1)
- Skills (+0.08) : Excellent (B2)
- Skills (+0.06) : Good (C1)
- Effort (+0.05) : Good (C1)
- Effort (0.02) : Good (C2)
- Working Conditions (+0.02) : Good (C)
- Consistency (+0.01) : Good (C)

Then in determining benefits by summing external factors that have individual leeway in carrying out work and the value of each factor adjusted to the benefit table, including: energy expended, work attitude, work movement, eye fatigue, workplace temperature conditions, atmospheric conditions, good environmental conditions, and personal needs can be seen in Table 3.

**Table 3** Allowance Based on Influencing Factors

No	Work Station	Allowance Factor								Total Allowance (%)
		A	B	C	D	E	F	G	H	
1	Warmup	6,0	2,0	0,0	12,0	28	5	5	2,0	60%
2	Warmup	6,5	2,0	0,0	12,0	28	5	5	0,0	58.5%
3	Warmup	6,9	2,0	0,0	12,0	28	5	5	2,5	61.4%
4	Warmup	6,5	2,0	0,0	12,0	28	5	5	2,0	60.5%
5	Cutting	7,5	2,0	0,0	12,0	22	7	10	2,5	63%
6	Cutting	7,9	2,0	0,0	12,0	22	7	10	0,0	60.9%
7	Cutting	8,1	2,0	0,0	12,0	22	7	10	0,0	61.1%
8	Cutting	7,9	2,0	0,0	12,0	22	7	10	2,0	62.9%
9	Cutting	12,0	2,0	0,0	12,0	22	7	10	2,0	67%
10	Brand Label	12,0	1,0	0,0	12,0	22	5	2	2,0	56%
11	QC	12,3	2,0	0,0	12,0	22	0	0	0,0	48.3%
12	QC	12,0	2,0	0,0	12,0	22	0	0	2,5	50.5%

13	QC	13,0	2,0	0,0	12,0	22	0	0	0,0	49%
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Information :

A: Energy released

B: Work attitude

C: Work movement

D: Eye fatigue

E: Workplace temperature conditions

F: Atmosphere condition

G: Good environmental condition

H: Personal needs

Next, the workload value is obtained from the calculation value in Table 4, so the calculation for operator one heating process uses the following formula : workload = % Productive x Performance Rating x (1 + Allowances) Workload Heating Proses (1) = 75,00% x 0,11 x (1 + 0,6)  
= 75,00 % x 0,11 x 1,6  
= 13,20 %

The results of the Work Load calculation (%) can be seen in Table 4.

**Table 4** Workload Calculation

NO	Work Station	Productivity Percentage (%)	Performance Rating (P)	Allowance (%)	Workload (%)
1	Warmup	75,00%	0,11	1,6	13.20%
2	Warmup	73,57%	0,11	1,585	12.95%
3	Warmup	73,33%	0,11	1,614	12.91%
4	Warmup	72,38%	0,11	1,605	12.74%
5	Cutting	71,43%	0,14	1,63	12.57%
6	Cutting	70,48%	0,14	1,609	12.40%
7	Cutting	69,29%	0,14	1,611	12.19%
8	Cutting	71,43%	0,14	1,629	12.57%
9	Cutting	73,33%	0,14	1,67	12.57%
10	Brand Label	66,67%	0,13	1,56	11.73%
11	Quality Control	67,38%	0,13	1,483	11.86%
12	Quality Control	71,43%	0,13	1,505	12.57%
13	Quality Control	72,86%	0,13	1,49	12.82%

Determining the number of employees based on the workload of each operator above, the calculating for each section is as follows:

#### 1. Warmup

Average heating workload:

Total Workload

$$= 13.20\% + 12.95\% + 12.91\% + 12.74\%$$

$$= 51.79\%$$

Average Workload for Each Operator (Real Conditions)

$$= (13.20\% + 12.95\% + 12.91\% + 12.74\%) / 4 = 51.79\%$$

$$= (51.79\%) / 4$$

$$= 12.95$$

Average Workload for Each Operator (Proposed) = 51.79% = 51.79%. In real conditions, heating with 4 people has an average workload of 12.95%. For the heating section, it is proposed to have 1 person with an average workload of 51.79%, so that it is more optimal. For 3 people, the heating section was stopped, because if they were transferred to another section or work station, there would be no work load balance.

## 2. Cutting

Average Slicing workload:

Average Cutting workload:

Total Workload

$$=12.57\%+12.40\%+12.19\% \quad 12.57\%+12.57 = 46.62\%$$

Average Workload for Each Operator (Real Conditions)

$$=(12.57\%+12.40\%+12.19\%+12.57\%+12.57\%)/5=62.65\%$$

$$=(62.65\%)/5$$

$$=12.53$$

In real conditions, a group of 5 people has an average workload of 12.53%. For the Production Process section, it is proposed that there are 2 people with an average workload of 31.32% to be more optimal. For 4 people, the Cutting Department was dismissed, because if they were transferred to another section or work station, there would be no work load balance.

## 3. Branding

Average branding workload:

Total Workload = 11.73 = 11.73%

Average Workload for Each Operator (Real Conditions)

$$= 11.73/1=11.73\% = (11.73\%)/1$$

$$= 11.73\%$$

In real conditions, shooting with 1 person has an average workload of 11.73%. For the Branding section, it is proposed that the number of 1 person remains with an average workload of 11.73%, because if the Branding section is added then the average workload will be too low.

## Quality Control

Average quality control workload:

Total Workload = 11.86%+12.57%+12.82%= 37.25%

Average Workload for Each Operator (Real Conditions)

$$= ( 11.86\%+12.57\%+12.82\% )/3=37.25 = (37.25\%)/3$$

$$= 12.42\%$$

In real conditions, Quality Control totaling 3 people has an average workload of 12.42%. For the Quality Control section, it is proposed to have 1 person with an average workload of 37.25%, because if the Quality Control section is increased to 2 people, then the average workload will be too low.

## 4. DISCUSSION

Based on the work station of each section, the total can be known workload, average workload, and length of time to complete activities. The levels for assessing workload are divided into 5 categories, namely as following:

1. Very Low: 0% to 20%
2. Low: 20.1% to 40%
3. Medium: 40.1% to 60%
4. Height: 60.1% to 80%
5. Very High: 80.1% to 100%
  - a. In the warm-up, in real conditions there were 4 people in total workload of 51.79% and average workload of 12.95%. After calculating the workload, sections are proposed Heating is 1 person with a workload of 51.79%. The time needed to complete activities is 7 hours per day.
  - b. At the Cutting, in real conditions there were 5 people in total the workload is 62.65% and the average workload is 12.53%. After calculating the workload, sections are proposed Fixed cuts amounting to 2

- people with workload amounting to 62.65%. The time required to complete the activity for 7 hours per day.
- c. In Brand Granting, in real conditions there is 1 person with the total workload is 11.73% and the average workload is 11.73%. After calculating the workload, sections are proposed Shooting remains at 1 person with a workload of 11.73%, because if there is additional workforce, the workload will increase too low. The time required to complete the activity for 7 hours per day.
  - d. In Quality Control, in real conditions there are 3 people in total the workload is 37.25% and the average workload is 12.42%. After calculating the workload, Quality Control is proposed to be 1 person, because if carried out additional workforce means the workload will be too low. Time completion of activities for 7 hours per day. Of the total number of workers observed, there were 13 workers, should be reduced to achieve a good level of efficiency.

**Table 5** Optimal Number of Employees and Workload for Each Element

No	Work Elements	Workforce/Group (Before)	Workload	Workforce/Group (After)	Workload
1	Warmup	4	12,95	1	51,76
2	Cutting	5	12,53	2	62,65
3	Brand Label	1	11,73	1	11,73
4	Quality Control	3	12,42	1	37,25

## 5. CONCLUSION

Based on the results of employee workload analysis at PT. Harapan Jaya Multi Business Using workload Analysis Methods can be seen that:

1. All work stations have workloads reaching very low and high levels with values between 11.73 – 62.65
2. Based on the amount of workload, the number of workers required is:
  - a. Heating Station Number of 1 Person (51.76) with moderate workload
  - b. Cutting Station Number of 2 People (62.65) with low workload
  - c. Branding Station Number of 1 Person (11.73) with very low workload
  - d. Quality Control Station Number of 1 Person (37.25) with low workload.

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