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EMPLOYEE WORKLOAD MEASUREMENT ANALYSIS USING THE FULL TIME EQUIVALENT METHOD IN THE OPERATIONAL & MAINTENANCE DIVISION OF PT. XYZ

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Abstract

This study aims to measure employee workload in the Operational & Maintenance Division of PT XYZ using the Full Time Equivalent (FTE) method. This method is used to evaluate the optimal number of workers based on available working hours and actual activity time. The analysis results show that the workload of heavy equipment operators such as excavators, trailers, and bulldozers fall into the optimal category, while for cranes there is a shortage of workforce.

Keywords: Workload, Full Time Equivalent, Operational, Heavy Equipment

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INTRODUCTION

PT XYZ is a company engaged in the construction and manufacturing service sector, providing comprehensive solutions for construction businesses by leveraging four core competencies: civil engineering, manufacturing, heavy equipment rental, and electrical and mechanical works. To date, PT XYZ has grown and developed into a service company specializing in construction and steel fabrication. In addition, it has also built reliable capabilities in executing projects, particularly factory construction.

One of the most important elements within any company is human resources (HR). Human resources play a critical role in ensuring smooth company operations. Every company expects its employees to carry out their tasks effectively, efficiently, productively, and professionally. This aims to build a high-quality workforce that is also highly competitive (Firdaus & Aprianti, 2022). Planning and managing human resources can be achieved through workload analysis. Workload analysis is conducted to determine the ideal number of workers required to complete a particular job. An uneven distribution of workload can lead to an uncomfortable working environment, as employees may feel either overburdened or underutilized. Overloaded workloads indicate that the number of employees is insufficient relative to the amount of work, potentially leading to physical and psychological fatigue, which in turn reduces productivity. Conversely, underloaded workloads suggest that there are too many employees, resulting in unnecessary labor costs with no corresponding increase in productivity (Ambarwati, 2014).

Currently, PT XYZ has not yet implemented workload measurement for each activity within the company. This may result in a mismatch between the

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workload and the number of employees. Based on this issue, it is necessary to conduct a workload measurement to serve as a basis for calculating the optimal number of workers. Analyzing and measuring workload is essential to determine the appropriate number of employees needed to complete all tasks across various activities within the company. The distinct aspect of this research is that it focuses on the operational division, where employee workload is unbalanced in certain areas. The references used in this study are based on previous related research.

No	Researcher	Title of Study	Research Objective	Differences
1.	Kadek Sumarniati/ 2023	Workload Measurement in the Operational Division of PT. Pelindo Region IV Gorontalo Using the Full Time Equivalent (FTE) Method.	To determine the extent of the workload borne by employees and to calculate the optimal number of workers using the Full Time Equivalent (FTE) method	The study was conducted in the operational division. Employee workload is unbalanced in certain areas.
2.	Herdiana Nur/ 2019	Analysis of Employee Workload Using the Full Time Equivalent (FTE) Method at PT. PLN (Persero) Distribution Jateng and DIY	To analyze workforce capacity and meet future workforce needs.	The study was conducted in the HR & Organization department. The FTE calculation results showed a shortage of 6 employees in the HR & Organization department.
3.	Linny Putri/ 2022	Analysis of Employee Workload	To calculate the workload received by employees and	The study was conducted on production staff.

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		Measurement Using the Full Time Equivalent (FTE) Method at PT. PLN (Persero) PUSHARLIS UP2W I MERAK	determine its category.	The workload received by each employee is still low (underload).
4.	Igal Laynar/ 2020	Workload Measurement of Employees Using Full Time Equivalent to Increase Productivity at CV. Gandrial Lestari, Makassar	To determine the workload value received by each employee in the production division based on the FTE index.	The study was conducted in the production section. The calculated workload for each employee ensures that the company maintains a workforce of 12 people.
5.	Heru Hardiansyah/ 2022	Workload Analysis with the Full Time Equivalent (FTE) Approach in the Production of Study Tables at CV. Setia Abadi	To identify activities causing production delays and standard worker time using the FTE method.	The workload received is still low (underload).

Based on the explanation above, the objective of this research is to measure employee workload using the Full Time Equivalent (FTE) method in the Operational & Maintenance Division of PT. XYZ. The results of this study can be used by the company as a basis for evaluating the distribution of workloads received by employees.

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LITERATURE REVIEW

Workload

Workload is a collection or number of activities that must be completed by an organizational unit or job holder within a certain period of time (Sunarso, 2010). According to Vanchapo (2020) Workload is a process or activity that must be completed immediately by a worker within a certain period of time. If a worker is able to complete and adapt to a number of tasks given, then it does not become a workload. However, if the worker is unsuccessful, then the tasks and activities become a workload. There are two types of workload, namely quantitative workload and qualitative workload (Vanchapo, 2020), Quantitative workload is an excessive physical or mental burden that requires a person to do many things in their work which can become the main source of work stress. In addition, the causative element of this quantitative workload is time pressure such as deadlines when doing a job. This can cause errors in completing tasks due to the time pressure given and the amount of work that must be completed. While qualitative workload is a workload that occurs because the demands of the work exceed the limits of the worker's abilities and techniques. This workload can cause workers to be unproductive and can also be destructive for employees. If it continues, it can cause mental fatigue and can form excessive emotional reactions. Factors that influence workload include external factors, namely the burden that comes from outside the worker's body, and internal factors, namely factors that come from within the body itself due to external workload reactions (Artadi, 2015).

Impact of Workload

Irawati (2017) stated that workload can have a negative impact on employees in the form of increased absenteeism. Excessive workload causes

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employees to be too tired, resulting in employees becoming sick. This causes the absenteeism rate to be too high and has a negative impact on the smooth running of the organization's work and affects the overall performance of the organization. Excessive and too heavy workload and not following the abilities of employees, results in a decrease in the quality of work that is not in accordance with work standards due to physical fatigue and decreased concentration, work accuracy, and self-supervision. Unsatisfactory work results and not by customer expectations given by employees can cause complaints, so that which complaints put pressure on employees.

Workload Indicators

Workload is a condition of work with a description of the tasks that must be completed within a certain time limit. According to Kusuma et al. (2020) there are 4 indicators in workload, namely:

a. Targets to be achieved

   The individual's view of the size of the work target given to complete his work. Views on the work results that must be completed within a certain period of time.

b. Working Conditions

   Includes how individuals view their working conditions, such as making quick decisions when processing goods, and dealing with unexpected events such as doing extra work outside the specified time.

c. Use of Working Time

   Time spent in activities directly related to production (circle time, or standard or basic time).

d. Work Standards

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The impressions individuals have about their work, such as feelings about the workload that must be completed within a certain time period.

Workload Measurement

Workload measurement is carried out to obtain information on the level of effectiveness and efficiency of organizational work based on the amount of work that must be completed within a period of one year (Muskamal, 2010). The following are various methods of measuring workload according to Arifin, M. F. I. N., & Purwaningsih, R. (2023), namely:

1. Physical workload method
   a. Cardiovascular Load (CVL) method, this method is used to determine the classification of workload based on the increase in work heart rate compared to the maximum heart rate due to cardiovascular load.
   b. Modified Copper Harper method, this method is a method used to analyze the physical workload used in various fields of work, especially in the human system.
   c. Work sampling method, this method is a technique for conducting a large number of observations of the work activities of workers. Observation of work activities for a time interval taken randomly from one or more workers and then recording whether the worker is working or unemployed.
   d. Full Time Equivalent (FTE) method, this method is a method where the time used to complete various jobs is compared to the effective working time available.
2. Mental workload method

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a. Subjective Workload Assessment Technique (SWAT) method, the SWAT method will describe the work system as a multidimensional model of workload, consisting of three dimensions or factors, namely time load, mental effort load, and psychological stress load
b. Defense Research Agency Workload Scale (DRAWS) method, this workload measurement is carried out subjectively, there are four variables in this method, namely, Input Demand (related to obtaining information from external sources), Central Demand (related to interpreting process information), Output demand (related to output), and time pressure (related to time constraints)
c. Rating Scale Mental Effort (RSME) method, this method is a subjective mental workload measurement with a single scale where respondents are asked to give a mark on a scale of 0 to 150, with a description at several reference points (anchor points).
d. NASA-TLX method, this method is used to measure mental workload which can be classified into objective methods (work physiology criteria) and subjective methods (worker perception with measurement justification).

Full Time Equivalent

The method of measuring workload with Full Time Equivalent (FTE) is a method where the time used to complete work is compared to the effective working time available (Anisa & Prastawa, 2019). FTE aims to simplify work measurement by converting workload hours to the number of people needed to complete a particular job (Pambudi, 2017). After calculating the workload for each position, the determination of the workload results is determined using the norm

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(normal/ overload/ underload). The FTE index is categorized into 3 parts, namely: underload, normal, and overload, each part has a range of values as follows:

1. Underload (workload below normal limits): FTE index value between 0 - 0.99
2. Normal: FTE index value 1 - 1.28
3. Overload (workload above normal limits): FTE index value greater than 1.28

RESEARCH METHOD

The research method used in this study is descriptive research with a quantitative approach. Descriptive research is not intended to test specific hypotheses, but rather to describe the actual condition of a variable as it is. In quantitative research, there is a strong emphasis on the use of numbers, starting from data collection, interpretation of the data, to the presentation of results (Arikunto, 2005). Therefore, it can be concluded that the quantitative descriptive research in this study aims to observe, describe, and examine the research object numerically as it exists, and to draw conclusions based on the phenomena observed during the research period.

Population and Sample

According to Sugiyono (2022), population refers to the general area of research consisting of objects/subjects that possess certain characteristics of interest to the researcher, from which conclusions are drawn. The population in this study consists of 27 employees in the Operational & Maintenance Division, comprising 20 operators, 2 maintenance staff, and 5 coordinators.

Sugiyono (2022) also states that a sample is a small portion of the population considered representative of the population's characteristics. In this study, purposive sampling was used, which involves selecting samples based on

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specific characteristics relevant to the research objectives, thereby enabling the research questions to be addressed effectively. The sample criteria used in this study were heavy equipment operators. This research focuses on heavy equipment operators because, considering the decreasing number of operators, labor requirements, and employee performance optimization, their workload significantly influences operational efficiency. To determine the workload experienced by each operator, workload measurements are conducted.

Type of Data

The type of data used in this study is primary data. According to Sugiyono (2019), primary data are obtained directly through activities such as interviews or questionnaires, meaning that these data sources provide information directly to the researcher. The data sources in this study were obtained directly from within the company. Sugiyono (2022) states that internal data are those obtained directly from an organization or the location where the research is conducted.

Data Collection Method

In this study, data were collected using questionnaires and documentation. The questionnaire was used to identify the activities of heavy equipment operators based on available working hours. Meanwhile, documentation was used to collect supporting data such as employee numbers and types of heavy equipment.

Data Analysis Technique

1. Determine the work unit along with the workforce categories.
2. Calculate the total activity time, allowance, and total available time.

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The formula used to calculate the FTE value, according to Prima and Izzati (2018), is as follows:

$$\text{FTE} = \frac{\textit{Total Activity Time + allowance}}{\textit{Total Available Time}}$$

Explanation:

- Total Activity Time : The total working time spent by all workers for each job description within a certain period (weekly, monthly, or yearly).
- Allowance : Allowance time refers to the rest time provided by the company, which is 1 hour per day. (1 hour × 238 working days = 238 hours annually).
- Total Available Time : The total standard full-time working hours considered available in the same period. To calculate the total available time, the effective working days in a year are determined first. In 2024, there are 366 days – 104 weekend days (Saturdays and Sundays) – 24 national holidays = 238 effective working days in a year. Then, the total available working time in one year is calculated as: 8 hours/day × 238 days = 1,904 working hours annually.

Calculate the required number of workers per unit. At this stage, the researcher aims to determine the actual number and categories of employees needed to carry out tasks in accordance with the workload.

RESULTS AND DISCUSSION

Respondent Data

This study took a sample of employees from the Operational & Maintenance Division of PT. XYZ, specifically focusing on operators of each type of heavy equipment. This was done to describe or characterize the respondents who are the subjects of this research, based on their characteristics as heavy equipment operators. The respondent data were obtained by directly

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administering questionnaires to the sampled employees, namely the heavy equipment operators at PT. XYZ. The respondent data can be seen in Table 1.

Table 1.
Respondent Data

No	Name	Functional Position	Age	Year of Experience
1	Respondent 1	Crane Operator	43 years	13 years
2	Respondent 2	Excavator Operator	40 years	12 years
3	Respondent 3	Bulldozer Operator	37 years	9 years
4	Respondent 4	Trailer Operator	41 years	11 years

Source: Internal company data

Total Available Time in a Year

Table 2.
Number of Effective Working Days

Description	Number of Days
Total days in a year	366 days
Total Saturdays & Sundays	104 days
Total national holidays	24 days
Total effective working days	238 days

Source: Processed Data

Total available time is obtained by calculating the total effective working days for a year, in 2024. The number of days in a year is 366 days – 104 days (Saturday & Sunday) – 24 days (national holidays) = 238 effective working days for a year. So the total available time in one year, 1 working day is: 8 hours x 238 days = 1,904 working hours in a year.

Time Periods in a Year

The following table shows the time periods in a year derived from the total number of effective working days in 2024:

Table 3.
Time Periods

Period	In a Year
Daily	238 days

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Weekly	52 weeks
Monthly	12 Months
Actually	1 Year

Source: Processed Data

Allowance

Allowance, also known as break time, refers to activities that are not directly related to work, such as rest breaks, prayer, trips to the restroom, and other similar activities. Each employee is granted an allowance of 1 hour per day. The total allowance for a year is calculated as:

1 hour/day × 238 days = 238 hours.

Trailer Operator

Table 4.
Description of Trailer Operator Activities

Job Desc	Activiity Description	Period	Time per Activity (Hours)			Freq	Qty	Total
		D/W/M/A	HOUR	CONV	TIME			
Fixed Activities								
Daily Inspection & Maintenance	Checking the condition of the trailer before operating	D	1	238	238	1	1	238
Loading trailer	Performing routine maintenance on heavy equipment	W	1,5	52	78	1	1	78
	Loading materials into the trailer	D	4	238	952	1	1	952
Reporting and Coordination	Collecting and compiling daily load data	D	0,5	238	119	1	1	119
	Coordinating with the team for the loading process	D	1	238	238	1	1	238
	Evaluation and monitoring	M	4	12	48	1	1	48
Total Activity								1673
Allowance								238
Total Time Available								1904

Source: Processed Data

From the calculations in Table 4 using the formula FTE = $\frac{Total\ Activity\ Time+Allowance}{Total\ Availabel\ Time}$, it can be determined that the workload obtained by the Trailer Operator is 1,003.

Table 1.
Trailer Operators Workload

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Description	FTE	Number of Employees	Total FTE
Trailer Operator	1,003	2	2,006

Total FTE Trailer Operator	Effective Workforce	Realized Workforce
2,006	2	2

Source: Processed Data

Based on the workload calculation using the FTE (Full Time Equivalent) method for the Trailer Operator, it can be concluded that the current workforce is in an optimal condition. The Trailer Operator is able to complete the tasks assigned within the available time. Therefore, the current workload is consistent with the capacity of the existing workforce, and no additional or reduction in workforce is required.

Operator Crane

Table 6.
Description of Crane Operator Activities

Job Desc	Activiity Description	Period	Time per Activity (Hours)			Freq	Qty	Total
		D/W/M/A	HOUR	CONV	TIME			
Fixed Activities								
Workshop Standby	Check and Repair of equipment	D	0,75	238	178,5	1	1	178,5
Operational Report and Coordination	Dismantling of used production tanks	D	4	238	952	1	1	952
	Lifting of compressor machines	D	2	238	476	1	1	476
	Assisting in installing foundations	W	4	52	208	1	1	208
Reporting and Coordination	Evaluation and monitoring	M	4	12	48	1	1	48
Allowance		D	1	238	238	1	1	238
Total Activity								2100,5
Allowance								238
Total Time Available								1904

Source: Processed Data

From the calculations in Table 6 using the formula FTE = $\frac{\textit{Total Activity Time+Allowance}}{\textit{Total Availabel Time}}$, it can be determined that the workload obtained by the Crane Operator is 1,103.

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Table 7.
Crane Operators Workload

Description	FTE	Number of Employees	Total FTE
Crane Operators	1,103	13	14,339

Total FTE Crane Operators	Effective Workforce	Realized Workforce
14,339	14	13

Source: Processed Data

After calculating the workload using the FTE (Full Time Equivalent) method for the Crane Operator, it was found that the current number of workers is less than the optimal workforce required. Based on the workload analysis, the proposed optimal number of workers after calculation is 14 , but the current realization or actual condition shows that only 13 workers are assigned to the Crane Operator position.

Operator Bulldozer

Table 8.
Description of Bulldozer Operator Activities

Job Desc	Activiity Description	Period	Time per Activity (Hours)			Freq	Qty	Total
		D/W/M/A	HOUR	CONV	TIME			
Fixed Activities								
Daily Inspection and Maintenance	Checking fuel, oil, and hydraulic systems before and after operations.	D	0,5	238	119	1	1	119
Operation	Operating bulldozers to level land	D	4	238	952	1	1	952
	Measuring and marking work areas	D	2	238	476	1	1	476
Reporting and Coordination	Coordinating with field supervisors, mechanics,	W	1	52	52	1	1	52

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	and project teams regarding work plans and heavy equipment conditions.							
	Evaluation and monitoring	M	4	12	48	1	1	48
Allowance		D	1	238	238	1	1	238
Total Activity								1885
Allowance								238
Total Time Available								1904

Source: Processed Data

From the calculations in Table 8 using the formula FTE = $\frac{\textit{Total Activity Time+Allowance}}{\textit{Total Availabel Time}}$, it can be determined that the workload obtained by the Bulldozer Operator is 0,99.

Table 9.
Bulldozer Operators Workload

Description	FTE	Number of Employees	Total FTE
Bulldozer Operators	0,99	2	1,98

Total FTE Bulldozer Operators	Effective Workforce	Realized Workforce
1,98	2	2

Source: Processed Data

Based on the workload calculation using the FTE (Full Time Equivalent) method for the Bulldozer Operator, it can be concluded that the current workforce is in an optimal condition. The bulldozer operators are able to complete the assigned tasks within the available working time. Therefore, the current workload aligns with the capacity of the existing workforce, and there is no need for additional hiring or reduction of staff.

Operator Excavator

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Table 10.
Description of Excavator Operator Activities

Job Desc	Activiity Description	Period	Time per Activity (Hours)			Freq	Qty	Total
		D/W/M/A	HOUR	CONV	TIME			
Fix Activity								
Equipment inspection	Checking the physical condition of the excavator	D	0,5	238	119	1	1	119
	Ensuring the work area is safe	D	0,75	238	178,5	1	1	178,5
Excavator operation	Excavation of soil according to instructions	D	7	238	1666	1	1	1666
Reporting and Coordination	Evaluation and monitoring	M	4	12	48	1	1	48
Allowance		D	1	238	238	1	1	238
Total Activity								2250
Allowance								238
Total Time Available								1904

Source: Processed Data

From the calculations in Table 10 using the formula FTE = $\frac{\textit{Total Activity Time+Allowance}}{\textit{Total Availabel Time}}$, it can be determined that the workload obtained by the Excavator Operator is 1,181.

Table 11.
Excavator Operators Workload

Description	FTE	Number of Employees	Total FTE
Excavator Operators	1,181	2	2,362

Total FTE Excavator Operators	Effective Workforce	Realized Workforce
2,362	2	2

Source: Processed Data

Based on the results of the workload calculation using the FTE (Full Time Equivalent) method on excavator operators, it can be concluded that the number of workers currently available is in optimal condition. Excavator operators are

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able to complete the tasks given in the time available. Thus, the current workload is in accordance with the capacity of the existing workforce, and there is no need to add or reduce the workforce.

Interpretation

Based on the results of the workload analysis carried out using the FTE (Full Time Equivalent) method, it shows that the number of heavy equipment operators on excavators, trailers, and bulldozers is said to be optimal and there is no indication of excess labor. This indicates a balance between workforce capacity and the company's needs in carrying out the tasks and responsibilities that have been determined. Meanwhile, in the crane heavy equipment operator section, it was found that the number of workers currently available is experiencing a shortage of labor needs based on the workload that has been analyzed where after the calculation it produces a proposal for an optimal workforce of 14 workers, but in the current conditions the workforce filling that position is 13 workers. This shortage of labor has the potential to have an impact on the company, especially during operations. This situation causes an increase in the workload on operators because the available time is not used optimally. This causes an imbalance and affects individual and team productivity. Steps to overcome the shortage of labor include recruiting. Recruitment is a systematic process to attract candidates who have the qualifications and competencies according to the needs of the organization (Robbins & Judge, 2019). The types of recruitment according to Rodiyah and Agustina (2020) include Internal recruitment, which is the search for prospective employees from within the organization or internal company. For example, through promotion, transfer, and job rotation. External recruitment, the

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search for prospective employees carried out from outside the company or organization through advertisements, job fairs, and social media.

According to Mangkunegara (2023) to overcome the shortage of workers, it can be overcome by hiring contract workers, part-time, or outsourcing for temporary needs. This strategy can be applied flexibly by looking at the conditions and number of existing workers. Companies can overcome the shortage of workers efficiently and maintain the stability of the workload.

PT. XYZ has implemented an appropriate strategy to address the issue of labor shortages by considering the company's condition and the number of operators who have been laid off. The addition of manpower is carried out conditionally through internal recruitment, namely by recalling laid-off employees when needed.

According to Dessler (2020) in his book Human Resource Management, the recruitment process must be aligned with business needs and the external environment, such as technology and labor market competition. The implementation of conditional recruitment offers several benefits for the company. It enables the company to be more responsive to urgent needs by quickly filling sudden vacancies, such as projects that require additional workers in a short period. Moreover, conditional recruitment increases time and cost efficiency, as the hiring process can be conducted more selectively according to the company's needs.

According to Sudiro in Saputra (2020) conditional recruitment shows that the recruitment process is flexible and responsive, meaning that it is carried out based on conditional or situational needs that arise. By only hiring according to

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actual needs, companies can reduce the risk of overstaffing, which is an excess of unproductive labor, which can result in wasted resources.

CONCLUSION

The conclusion of this study was conducted to determine the workload on heavy equipment operators using the FTE (Full Time Equivalent) method. Based on the existing discussion, it can be concluded that the number of heavy equipment operators on excavators, trailers, bulldozers is said to be optimal and there is no indication of excess labor. Meanwhile, the number of workers available on crane heavy equipment is experiencing a shortage of labor. After analyzing and calculating the workload on each operator, there are heavy equipment operators who are experiencing a shortage of labor. This is proven by the results of calculations using the FTE (Full Time Equivalent) method.

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