

# Analysis of Workload Measurement of Understell Division at PT. RAPI Trans Logistik Indonesia using NASA-TLX Method

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**Abstract.** This study aims to analyze the workload of mechanics in the Understeel division at PT Rapi Trans Logistik Indonesia. Unbalanced workload can affect employee productivity and health, so measurements are needed to ensure optimal workload. The methods used in this study are Work Sampling and Workload Analysis. Data were collected through direct observation, interviews, and documentation of mechanics' daily activities. The results of the analysis show that the workload of most mechanics is in the moderate to heavy category, with some mechanics experiencing workloads that exceed optimal standards. These findings form the basis for recommendations for task redistribution, optimization of work processes, and provision of training to improve the efficiency and welfare of mechanics. This study contributes to better human resource management in supporting the operational efficiency of logistics companies.

**Keywords:** workload, mechanics, understeel division, work sampling, workload analysis.

## 1 Introduction

Workers are an important aspect in the continuity of industrial activities. Changes in the competitive business environment require organizations to improve the performance of their employees. This aims to enable organizations to compete by providing the best service to their customers (Hendrawan, 2013). Human activities in a work system structure are basically classified into physical work and mental work. This physical and mental activity has the consequence of increasing workload. Workload can be defined as the difference between workers' abilities/competencies and job demands (Permata Sari, 2018). If the worker's abilities are higher than the job demands, a feeling of boredom will arise. On the other hand, if the worker's abilities are lower than the demands of the job, excessive fatigue will appear. Both feelings of boredom and excessive fatigue will have an impact on employee performance which will then distort HR performance. This is worth considering when managing human resources.

In the realm of the logistics industry, vehicle mechanics are one of the points in determining business success. The work environment and business of the company PT. Rapi Trans Logistik Indonesia in the past was different compared to the company's current and future work and business environment. This is due to increasing work demands and competition as the company develops. For this reason, in knowing the working conditions of vehicle mechanics owned by the company, performance measurements can be carried out so that the company has an idea of the working conditions of vehicle mechanics in order to create improvements and increase performance in the future.

According to (Puteri & Sukarna, 2017) workload is the effort that must be expended by someone to fulfill the "demand" of the job. Meanwhile, capacity is human ability/capacity. This capacity can be measured from a person's physical and mental condition. The workload in question is the size (portion) of the limited operator capacity required to perform certain work. Workload analysis is widely used in determining worker needs (man power planning), ergonomic analysis, Occupational Safety and Health (K3) analysis and even payroll planning.

The human body is designed to be able to perform daily work activities. The presence of muscle mass that weighs almost more than half of the body, allows us to move the body and do work. Work on the one hand has an important meaning for progress and increased achievement. On the other hand, with work means the body will receive a load from outside the body. In other words, every job is a burden for the person concerned. The burden can be a physical burden or a mental burden.

From an ergonomic point of view, every workload received by a person must be appropriate or balanced with both the physical abilities, cognitive abilities and limitations of the person receiving the burden. According to (Suma'mur, 1984) that the work ability of a worker differs from one to another and is very dependent on the level of skill, physical fitness, nutritional status, gender, age and body size of the job concerned. According to (Rodahl, 2000), that in general in relation to workload and work capacity are influenced by various very complex factors, both external and internal factors.

Every job, whatever the type, whether the job requires muscle strength or thinking, is a burden for the person doing it. This burden can be a physical burden, mental burden, or social burden according to the type of work of the

person doing it. Each person has different abilities in relation to workload. Some people are better suited to bear physical burdens, but others are better suited to doing work that is more mental or social.

Physical work is work that requires human muscle physical energy as a source of power. Physical work is also called manual operation where work performance will depend entirely on humans who function as a source of power or work controller. Physical work can also be connoted with heavy work or manual labor because these activities require strong human physical effort during the work period. In physical work, energy consumption is the main factor used as a benchmark to determine the weight or lightness of a job.

## **2 Methodology**

### **2.1 NASA-TLX Methods**

The NASA-TLX method was developed by Sandra G. Hart of NASA-Ames Research Center and Lowell E. Staveland of San Jose State University in 1981 (Hancock and Meshkati, 1988). This method is a questionnaire developed based on the emergence of the need for subjective measurements that are easier but more sensitive to measuring workload.

(Hancock and Meshkati, 1988) explain several developments of the NASA-TLX method written in (Susilowati, 1999), including:

a. Conceptual Framework Workload arises from the interaction between task and job requirements, working conditions, behavior, and worker (technician) perceptions.

The purpose of the conceptual framework is to avoid variables that are not related to subjective workload. In the conceptual framework, different sources and things that can change workload are mentioned one by one and connected.

b. Information Obtained from Ratings

Subjective ratings are the most appropriate method for measuring mental workload and provide indicators that are generally the most valid and sensitive. Subjective rating is the only method that provides information on the subjective impact of tasks on workers or technicians and combines the influence of workload contributors.

c. Making a Workload Rating Scale

1. Selecting the most appropriate set of subscales.

2. Determining how to combine the subscales to obtain workload values that are sensitive to different sources and definitions of workload, both between tasks and between raters.

3. Determining the best procedure for obtaining the best value to obtain a numerical value for the subscale.

d. Subscale Selection

There are three subscales in the study, namely task-related scales, and behavioural scales (physical effort, mental effort, performance), subject-related scales (frustration, stress, and fatigue). (Susilowati, 1999) also explains several subscales written by (Hart and Staveland, 1981), including:

1. Task-related scales the ratings given to task difficulty provide direct information on the perception of subject needs that are differentiated by task. Time pressure is stated as a major factor in the definition and most operational models of workload, quantified by comparing the time required for a series of tasks in the experiment.

2. Scales related to the behavior of the physical effort factor manipulate the experiment with the physical demand factor as the main work component. The results of the experiment showed that the physical effort factor had a high correlation but did not contribute significantly to the overall workload. The mental effort factor was an important contributor to workload when the number of operational tasks increased because the worker's responsibilities shifted from direct physical control to supervision. Mental effort ratings correlated with overall workload ratings in each experimental category and were the second most highly correlated factor with overall workload.

3. Scales related to the subject of frustration were the third most relevant workload. Frustration ratings correlated with overall workload ratings significantly in all experimental categories. Stress ratings represented a manipulation that affected overall workload ratings and were the most independent scales.

(Hancock and Meshkati, 1988) explained the steps in measuring mental workload using the NASA-TLX method, namely:

a. Explanation of Mental Load Indicators to be Measured Weighting Indicator

In this section, respondents are asked to choose one of two indicators that are felt to be more dominant in causing mental workload on the job. The NASA-TLX questionnaire given is in the form of paired comparisons consisting of 15 paired comparisons. From this questionnaire, the number of tallies for each indicator that is felt to be the most influential is calculated. This tally number will then become the weight for each mental load indicator.

b. Rating

In this section, respondents are asked to give a rating to the six mental load indicators. The rating given is subjective depending on the mental load felt by the respondent. The rating given is subjective depending on the mental

load felt by the respondent. To obtain the NASA-TLX mental load score, the weight and rating for each indicator are multiplied, then added together and divided by 15 (the number of paired comparisons).

#### c. Interpretation of Score Results

Based on the explanation of (Hart and Staveland, 1981) in the NASA-TLX theory, the workload score obtained can be interpreted as follows:

1. A score value > 80 indicates a heavy workload.
2. A score of 50 - 70 indicates moderate workload.
3. Score < 50 indicates a rather light workload.

### 3 Results and Discussion

The object of the research taken was the understeel division mechanics who worked at PT. RAPI Trans Logistik Indonesia on May 23, 2023. The solution implemented was that the author conducted a survey of vehicle mechanics to obtain information on the workload of each vehicle mechanic by providing a questionnaire to each vehicle mechanic. The calculation of the workload carried out was measured through the mechanical response to the questionnaire given by the researcher in the following table.

**Table 1.** Job priority with the highest average workload score

Number	Type of work	Average Score	Rank
1	Turun versneleng	86	1
2	King pen	85	2
3	Kokel versneleng	84,6	3
4	Servis total	82,5	4
5	Servis ekor	82	5
6	Per depan L/R	81,3	6
7	Per spiral	80	7
8	Ganti oli mesin + stel rem total + kocak roda	75,5	8
9	Spet nepel + cek baut roda	65,3	9

### 4 Conclusion

Based on the results of the measurement of the workload of vehicle mechanics in the Understeel Division, the following conclusions were obtained:

1. In general, the average workload of vehicle mechanics in the Understeel Division at PT. Rapi Trans Logistik Indonesia Surabaya Branch is 81.33. This workload is considered high, but it must be noted that the average employee workload is >90.
2. At the overall work group unit level, the highest workload is known to be in the work of the versneleng cock, which is 84.66 and the lowest workload is known to be in the work of oil spraying, checking wheel bolts, and checking battery water, which is 65.33.
3. When measured by employee age, the greatest workload is measured in the age range below 60 years.

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