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ANALYSIS OF RATING SCALE MENTAL EFFORT (RSME) TO DETERMINE THE MENTAL WORKLOAD OF WORKERS AT SUGAR FACTORY IN SOUTH SULAWESI

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Abstract

Unconducive working conditions triggered fatigue and anxiety for the workers, such as an increase in mental workload. Mental workload is a work load that arises and can be seen from the work that has been carried out, which is formed cognitively (mind). Generally, mental workload is the difference between mental work demands and mental abilities possessed by the worker concerned. The level of workload of workers can be determined by applying workload analysis. One of the mental workload analysis methods is the Rating Scale Mental Effort (RSME) which is a method of mental workload measurement. The aims of this research are to determine the level of mental workload of workers, to identify the main causes of mental workload in the sugar production division, and also to provide suggestions to the company on the basis of identifying the mental workloads. The results ofthe study using workload analysis showed that the mental workload was quite high, i.e., the morning shift reached 97.3, the afternoon shift reached 101.8 and the night shift reached 99.66. The mental workload occurred due to continuous activities such as the sugar production process and excessively hot environment, as well as too high company targets.

Keywords: *mental workload, rating scale mental effort, work performance*

INTRODUCTION

PT. Perkebunan Nusantara XIV Camming Sugar Factory is a state-owned company located in Bone Regency, South Sulawesi Province. The main raw material for this product is sugar cane which comes from the sugarcane plantations owned by the company and the people around the Camming Sugar Factory who sell sugar cane or use the sugar milling service at the Camming Sugar Factory. The operational period of the Camming Sugar Factory comes during the time which is often called the sugar milling period, which is when the raw material (sugarcane) experiences a sufficient harvest period to be milled in production. The production process at PT. Perkebunan Nusantara XIV Camming Sugar Factory is started from the milling process, i.e., sugarcane from the plantations will be placed in the factory yard for weighing and milling.

In Sugar Factory, the current issue in high mental workload among factory workers. Generally, mental workload is the difference between mental work demands and mental abilities of the workers, Mental workload also occurs at the sugar production division. The mental workload that occurs is caused by ongoing activity continuously, such as sugar production process activities. As for the process production starting from milling, refining, evaporation, cooking, and screening of sugar products. From brief observations, we found

that almost all workers are tired easily, headaches, less focus, and high pressure at work. Therefore, this research aimed to identify mental workload among factory workers using the Mental Effort Rating Scale method (RSM).

LITERATURE REVIEW

Work Environment

According to Sedarmayanti (2013), the conditions of the work environment are considered good or appropriate if humans can carry out the activities in an optimal, healthy, safeand comfortable manner. As specified by Cain (2007) that workload is defined as the job responsibilitiesreceived by individuals and organizations within acertain period. In the opinion of Nitisemito (2013), work environment is everything that is around the employee and can affect him in carrying out the tasks assigned, for example by the presence of an Air Conditioner (AC), adequate lighting and the others. Also, Soleman (2013) mentioned that in general the relationship between workload and work capacity is influenced by various very complex factors, i.e., internal and external factors. In addition, Permendagri (Minister of Home Affairs Regulation) No. 12/2008 (2008) states that workload is the amount of work that must be carried by a position / organizational unit and is the product of multiplication of the work volume and the time norm.

Mental Workload

High workloads (long hours) are some of the most important factors leading to fatigue. According to Pracinasari (2013) and Sunarno (2010), mental workload is a work load that arises and can be observed from the work done, which is formed cognitively (mind). As mentioned by Grandjean (1993), every mental activity will always involve elements of perception, interpretation and mental processes of information received by the sensory organ to make a decision or process of remembering past information.

Rating Scale Mental Effort (RSME)

The Rating Scale Mental Effort is one of the scales that is used for the measurement of mental workload. The RSME consists of a line with a length of 150 mm marked with nine anchor points, each accompanied by a descriptive label indicating a degree of effort. The RSME is conceptually similar to the effort scale of the NASA-TLX and The RSME scale requires no special device. In addition, according to Sartang dkk (2017) that this method is simple and cheap, quick response and applicability in the workplace without interfering with the work of individuals.

METHOD

This research was conducted at PT Perkebunan Nusantara XIV Camming Sugar Factory, Bone Regency, South Sulawesi Province and at Work Analysis and Ergonomics Laboratory of FTI-UMI in December 2020 – March 2021.

Data Collection

The data collection method used in this research was library research conducted by looking fordata from journals or company data and direct research in the field in the form of observations. The types of data used were qualitative and quantitative data. The types of data used were respondent questionnaire data and direct interview-to-respondent data.

Data Processing

The data processing in this study employed the Rating Scale Mental Effort (RSME) method to identify the value of mental workload and Fishbone Diagram to determine the cause of mental workload.

RESULTS AND DISCUSSION

In accordance with the results of the respondents' questionnaires and the results of direct interviews with the respondents, the results are as follows:

Characteristics of Respondents by Gender

Table 1. Characteristics of Respondents by Gender

Gender	Frequency (Persons)	Percentage (%)
Males	36	90
Females	4	10
Total	40	100

Characteristics of Respondents by Age

Table 2. Characteristics of Respondents by Age

Age Group (years old)	Frequency (Persons)	Percentage (%)
25-35	7	17,5
36-45	15	37,5
46-55	18	45
Total	40	100

Table 2 shows the number of employees aged 25-35 years by 7 people with the total percentage of 17,5%, the employees at the age of 36-45 years by 15 people with the total percentage 37,5%, then those at the age of 46- 55 years by 18 people with the total percentage of 45%. From these data, it can be concluded that the number of employees who feel the mental workload at the age of 46-55 years is more than those at the age of 25-35 years, and aged 36-45 years.

Mental Workload Value

The value of mental workload on the employees from 3 shifts can be observed in tables 4, 5, and 6 below, i.e.; on the morning shift the Workload component reached 97.27, on the afternoon shift the Workload component reached 101.78, and on the night shift the Workload component reached 99.66. These are included in the category of large undertaking showing the dissatisfaction of employees in carrying out their work at PT. Perkebunan Nusantara XIV Camming Sugar Factory. Based on tables 4, 5, and 6, the mental workload diagram can be displayed as follows:

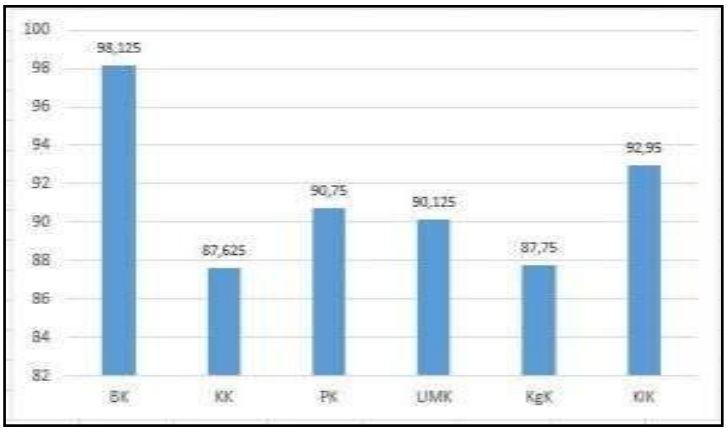

Figure 1. Overall Mental Workload Value

Data Processing Using Fishbone Diagram

The cause-effect diagram shows the relationship between the problems faced and the possiblecauses as well as the factors influencing them. The causes of mental workload at PT.Perkebunan Nusantara XIV Camming SugarFactory in the production division were due to factors such as; work environment, equipment or facilities, human and methods. The mental workload was affected by the work environment, which was assumed to be the results of unsupportive temperature of the work area, not- too-good working conditions and too high company targets. These causes were obtained from direct interviews with the research respondents.

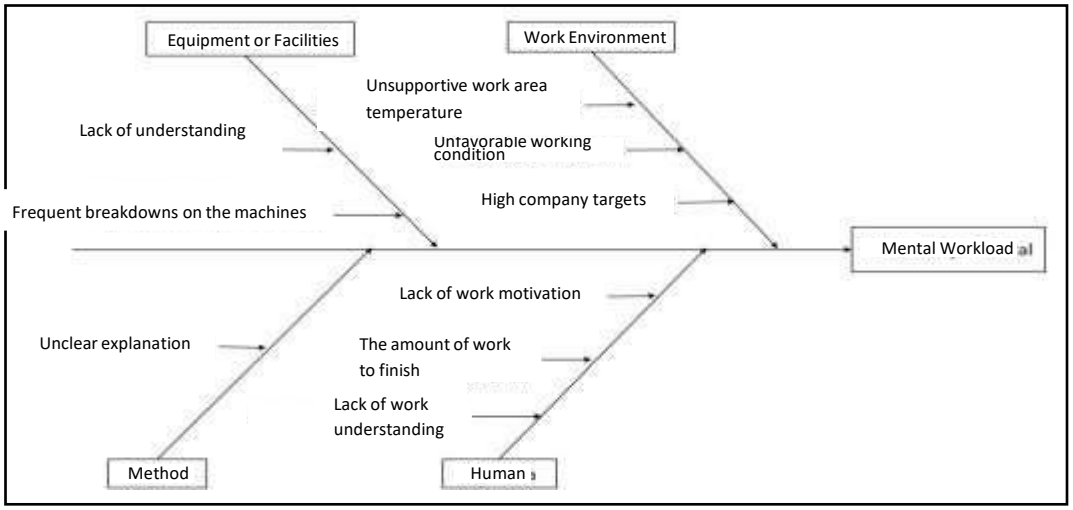

Figure 2. Cause-effect diagram

Table 4. Results of Data Processing on the Afternoon Shift

Respondents	Workload(BK)	Working Difficulty (KK)	Work Performance (PK)	Work Mental Effort (UMK)	WorkAnxiety (KgK)	Work Fatigue (KIK)
1	80	100	70	105	80	90
2	100	80	85	90	90	80
3	70	90	100	70	80	120
4	100	80	80	80	75	100
5	90	70	80	120	85	90
6	95	85	110	70	90	80

Table 4. Results of Data Processing on the Afternoon Shift (Continued)

Respondents	Workload(BK)	Working Difficulty (KK)	Work Performance (PK)	Work Mental Effort (UMK)	WorkAnxiety (KgK)	Work Fatigue (KIK)
7	100	90	80	120	85	100
8	80	80	120	80	75	90
9	90	75	90	85	90	90
10	120	85	90	70	80	120
11	80	75	100	120	90	110
Average	**91.36**	**82.72**	**91.36**	**91.81**	**83.63**	**97.27**
Min	**70**	**70**	**70**	**70**	**75**	**80**
Max	**120**	**100**	**120**	**120**	**90**	**120**
Reach	**50**	**30**	**50**	**50**	**15**	**40**
SD	**13.80**	**8.47**	**14.84**	**20.76**	**5.95**	**14.20**

Table 5. Results of Data Processing on the Afternoon Shift

Respondents	Workload (BK)	Working Difficulty (KK)	Work Performance (PK)	Work Mental Effort (UMK)	Work Anxiety (KgK)	Work Fatigue (KIK)
1	100	85	110	90	120	85
2	90	110	85	100	85	110
3	100	120	85	110	80	87
4	120	90	80	70	110	120
5	90	80	75	90	100	85
6	85	100	90	120	75	100
7	120	90	110	85	75	70
8	110	80	80	80	90	110
9	110	120	90	90	75	81
10	90	70	80	75	100	85
11	80	80	100	75	80	90
12	120	90	100	80	80	120
13	90	80	70	120	90	110
14	120	80	90	75	100	80
Average	**101.7**	**91.71**	**88.92**	**90**	**90**	**95.21**
Min	**80**	**70**	**70**	**70**	**75**	**70**
Max	**120**	**120**	**110**	**120**	**120**	**120**
Reach	**40**	**50**	**40**	**50**	**45**	**50**
SD	**14.62**	**15.71**	**12.27**	**16.64**	**14.14**	**16.13**

Table 6. Results of Data Processing on the Night Shift

Respondents	Workload (PK)	Working Difficulty (KK)	Work Performance (PK)	Work Mental Effort (UMK)	Work Anxiety (KgK)	Work Fatigue(KIK)
1	120	80	90	75	100	80
2	100	80	80	100	85	80
3	75	90	120	80	75	80
4	75	80	70	120	75	120
5	100	80	80	85	90	100
6	120	80	100	100	80	80

Table 6. Results of Data Processing on the Night Shift (Continued)

Respondents	Workload (PK)	Working Difficulty (KK)	Work Performance (PK)	Work Mental Effort (UMK)	Work Anxiety (KgK)	Work Fatigue(KIK)
7	120	80	80	90	90	120
8	120	90	110	80	80	80
9	90	90	80	75	100	80
10	100	85	80	100	75	80
11	80	75	80	75	100	80
12	120	90	120	100	80	85
13	90	120	80	90	120	80
14	85	120	100	80	80	90
15	100	80	110	85	100	80
Average	**99.66**	**88**	**92**	**89**	**88.66**	**87.66**
Min	**75**	**75**	**70**	**75**	**75**	**80**
Max	**120**	**120**	**120**	**120**	**120**	**120**
Reach	**45**	**45**	**50**	**45**	**45**	**40**
SD	**17.05**	**13.86**	**16.56**	**12.84**	**13.02**	**14.25**

Judging from the equipment and facilitiesthat can cause mental workload.

1. There is lack of understanding of the equipment generated by lack of counseling from the company to the employees regarding understanding of the machines. In addition, the employees themselvesshow lack of initiatives to seek moreknowledge about the machines.
2. The machines frequently experiencebreakdowns that are caused by employees' lack of knowledge about the machines. Hence, they do not know how to operate and maintain the machines properly.

Judging from human that can cause mentalworkload.

1. There is lack of work motivation due to the lack of comfort in the working places, resulting employees being bored and easily tired
2. There is large amount of work that must be carried out because the employees need to think a lot, resulting in mental workload on the employees.
3. There is lack of work understanding as a result of the employees' nescience to do their job well and properly.

Judging from the work environment that cancause mental workload.

1. The temperature of the work area is less supportive due to the excessive heat felt by the employees which can disturb them mentally.
2. The working condition is unfavorable because of unclean company environment which can lead to less comfort for the employees.
3. The company targets are too high which make the employees feel pressured because they are required to produce a lotof products.

Judging from the method factors that cancause mental workload.

The explanation is unclear due to the lack of organization in the structure of the division of labor from the company to the employees. In an effort to prevent and reduce the occurrence of mental workload, suggestions are proposed to improve the factors that cause mental workload. The proposed improvements are that the employees must understand the working conditions well, have high work motivation, have more clarified

job descriptions by making a diagram of the duties and responsibilities of each work station, and have additional workers on the condition that they must have work experience regarding production so as to prevent the occurrence of workload on the camming sugar factory company.

CONCLUSSION

On the basis of the results of data processing and analysis, several conclusions can be drawn as follows:

1. Based on the results of data collection and data processing that have been performed, the level of mental workload is quite high, i.e.,
   97.27 on the morning shift, 101.87 on theafternoon shift and 99.66 on the night shift.
2. The causes of mental workload are due to factors such as: work environment, equipment or facilities, human, and methods.
3. The company can assign the employees according to the needs and guidance of workers for certain functions.
4. The addition of employees is carried out on the condition that the employee selection is in accordance with a person's abilities or skills in the production sector.

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